

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

**DEPARTMENT OF COMPUTER APPLICATIONS
KOCHI – 682 022, KERALA, INDIA**



**MSc (COMPUTER SCIENCE)
with specialization in SOFT COMPUTING**

**SYLLABUS
(2016 ADMISSION)**

**M.Sc COMPUTER SCIENCE with specialization in SOFT COMPUTING
COURSE STRUCTURE (2016 ADMISSION)**

Semester I

Course Code	Paper	Marks		Credit
		Sessional	Final	
CAM 2101	Mathematical Foundations for Computer Science	50	50	3
CAM 2102	Principles of Programming Languages	50	50	4
CAM 2103	Advanced Data Structures and Algorithms	50	50	3
CAM 2104	Programming in Python	50	50	3
CAM 2105	Artificial Intelligence	50	50	3
CAM 2106	Data Structures and Programming Language LAB	50	50	2
Total				18

Semester II

Course Code	Paper	Marks		Credit
		Sessional	Final	
CAM 2201	Advanced Networks and Data Communication	50	50	4
CAM 2202	Advanced Operating System	50	50	4
CAM 2203	Intelligent Systems	50	50	3
	Elective	50	50	3
	Elective	50	50	3
CAM 2206	Networking LAB	50	50	2
Total				19

Semester III

Course Code	Paper	Marks		Credit
		Sessional	Final	
CAM 2301	Machine Learning	50	50	3
CAM 2302	Data Mining #	50	50	3
	Elective	50	50	3
	Elective	50	50	3
	Elective	50	50	3
CAM 2306	Seminar	50	50	2
Total				17

Semester IV

Course Code	Paper	Marks		Credit
		Sessional	Final	
CAM 2401	Internship/Project Work	200	200	18
Total				18

Syllabus to be approved

Note: Students are expected to do at least 20 programs covering all the units of the prescribed syllabi of the concerned subjects. During the examination one or two programs are expected to be asked from the above topics which can be completed in three hours of time.

LIST OF ELECTIVES (M.Sc Computer Science)	
Second Semester	CAM 2313 Android Application Programming
CAM 2211 Wireless Networks #	CAM 2315 Agents Oriented Software Engineering #
CAM 2212 Distributed Computing	CAM 2316 Operations Research
CAM 2213 Grid and Cloud Computing #	CAM 2317 Digital Speech Processing #
CAM 2214 Web Technology and Web Programming #	CAM 2318 Cryptography and Network Security
CAM 2215 Knowledge based Systems #	CAM 2319 Information Retrieval Systems #
Third Semester	CAM 2320 Research Methodology #
CAM 2311 Pattern Recognition Systems #	CAM 2321 Digital Signal Processing
CAM 2312 Artificial Neural Networks #	CAM 2322 Natural Language Processing

Syllabus to be approved

CAM 2101 MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

- UNIT I** Mathematical Data Types - Sets, Sequences, Functions - Types of function, Composition of functions, Recursive functions. Binary Relation, Properties of Binary Relation, Matrix representation of Relation, Equivalence Relation, Partial Order Relation.
Algebraic Structures: Properties, Semi Group, Groups, Subgroups, Abelian Group, Cyclic Groups, Cosets, Lagarange's Theorem, Normal subgroups, Rings, Euclidean ring, Fields.
- UNIT II** Propositions from propositions, Propositional Logic in Computer Programs, Equivalence and Validity, The Algebra of Propositions, The SAT Problem, Predicate Formulas.
Introduction to Regular Expression, Finite Automata, NFA, DFA, Conversion of NFA to DFA
- 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** Graphs - Vertex Adjacency and Degrees ,Some Common Graphs ,Isomorphism Bipartite Graphs & Matchings ,The Stable Marriage Problem, Coloring, Walks and Paths
Connectivity, Odd Cycles and 2-Colorability , Forests & Trees ,Planar Graph, Directed graphs & Partial Orders , Digraphs & Vertex Degrees ,Digraph Walks and Paths ,Adjacency Matrices, Walk Relations ,Directed Acyclic Graphs & Partial Orders.

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

CAM 2102 PRINCIPLES OF PROGRAMMING LANGUAGES

- UNIT I** Programming domains. Language Evaluation. Programming paradigms- Imperative programming, Functional programming, Object oriented programming, Logic programming. Formal methods of describing syntax and semantics- Backus Naur Form, Attribute grammars. Describing semantics - Denotational semantics.
- UNIT II** Datatypes, Names, Variables, Bindings, Scope and lifetime, Referencing Environments-Named Constants - Variable Initialization - Subprograms - Parameter Passing - Coroutines.
- UNIT III** Data abstraction and encapsulation. Polymorphism and inheritance. Features of object - Oriented languages - Smalltalk, C++ and Java. Design and implementation issues. Exception handling.
- UNIT IV** Functional programming languages- Lambda calculus –Introduction to pure LISP. Application of functional programming languages.
- UNIT V** Logic programming languages - a brief introduction to predicate calculus – Horn clauses - Logic programming. Introduction to Prolog. Applications of Logic programming.

TEXT BOOKS

1. Robert W Sebesta, "**Concepts of Programming Languages**" Addison-Wesley; 11th edition, 2015
2. RaviSethi, "Programming Languages-concepts and constructs", Addison Wesley, 2nd Edition, 1996.

REFERENCES

- 1.Thomson Learning, Kenneth C Loudon, "Programming Languages: Principles And Practices", Brooks / cole Publishing Company, 2ndEd, 2002
2. Michael L Scott, "Programming Language Pragmatics" – Elsevier, 1999
3. Alan A. A. Donovan, Brian W. Kernighan, "The Go Programming Language", 1st Edition Addison-Wesley , 2015.

CAM 2103 – ADVANCED DATA STRUCTURES AND ALGORITHMS

- UNIT I** **Algorithm Analysis:** Mathematics Review, Mathematical Background, Model, Complexity Analysis – Computational and Asymptotic Complexity, Asymptotic Notations , 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, application of priority queues, 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, Theoretical improvements for arithmetic problems, 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

CAM 2104 – PROGRAMMING IN PYTHON

- UNIT I** **Introduction:** The Process of Computational Problem Solving, Python Programming Language, Python Data Types: Expressions, Variables and Assignments, Strings, List, Objects and Classes, Python Standard Library, Imperative Programming: Python programs, Execution Control Structures, User-Defined Functions, Python Variables and Assignments, Parameter Passing.
- UNIT II** **Text Files:** Strings, Formatted Output, Files, Errors and Exception Handling, Execution and Control Structures: if Statement, for Loop, Two Dimensional Lists, while Loop, More Loop Patterns, Additional Iteration Control Statements, Containers and Randomness: Dictionaries, Other Built-in Container Types, Character Encoding and Strings, Module random, Set Data Type.
- UNIT III** **Object Oriented Programming:** Fundamental Concepts, Defining a New Python Class, User-Defined Classes, Designing New Container Classes, Overloaded Operators, Inheritance, User-Defined Exceptions, Namespaces: Encapsulation in Functions, Global versus Local Namespaces, Exception Control Flow, Modules and Namespaces.
- UNIT IV** **Objects and Their Use:** Software Objects, Turtle Graphics, Modular Design: Modules, Top-Down Design, Python Modules, Recursion: Introduction to Recursion, Examples of Recursion, Run Time Analysis, Searching, Iteration Vs Recursion, Recursive Problem Solving, Functional Language Approach.
- UNIT V** **Numerical Computing in Python:** NumPy, Vectorized Algorithms, Graphical User Interfaces: Basics of tkinter GUI Development, Event-Based tkinter Widgets, Designing GUIs, OOP for GUI, The Web and Search: The World Wide Web, Python WWW API, String Pattern Matching, Database Programming in Python.

TEXT BOOK

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

REFERENCES

Charles Dierbach, “Introduction to Computer Science Using Python: A Computational Problem-Solving Focus”, Wiley, 2013.

CAM 2105 – ARTIFICIAL INTELLIGENCE

- UNIT I** What is AI, History of AI, Intelligent Agents – Agents and environments – Good behavior – The nature of environments – Structure of agents – Problem Solving – Problem solving agents – Example problems – Searching for solutions – Uniformed search strategies – Avoiding repeated states – Searching with partial information. Informed Search Strategies – Heuristic function
- UNIT II** Local search algorithms and optimisation problems – Local search in continuous spaces – Searching with non-deterministic Actions-Searching with Partial observations-Online search agents and unknown environments –Adversarial Search – Games – Optimal decisions in games –Alpha – Beta Pruning – imperfect real-time decision – Games that include an element of chance. Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems.
- UNIT III** Logical Agents- Knowledge based Agents, The Wumpus world, Logic, Propositional Logic, Reasoning pattern in propositional logic, Effective propositional inference, Agents based on Propositional Logic 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 – Resolution
- 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 – Mental events and mental objects.
- UNIT V** Learning From Observations – forms of learning – Inductive learning - Learning decision trees – Ensemble learning

TEXT BOOK

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.

CAM 2201 ADVANCED NETWORKS AND DATA COMMUNICATION

- UNIT I** Protocols and Standards, The OSI Model and the TCP/IP Protocol Suite , Network Layer Services, Other Network Layer issues, IPv4 Addresses, 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) , Stream Control Transmission Protocol Services, Features, Packet format.
- UNIT III** Application Layer, FTP, TFTP, Electronic Mail – Architecture, User Agent, Message Transfer Agent - SMTP, Message Access Agent - POP, IMAP, MIME, E-mail Security.
- UNIT IV** Network Management: SNMP, IPv6 Addressing, IPv6 Protocol – Packet format, Transition from IPv4 to IPv6, ICMPv6 – Error messages, Information messages, Neighbor- discovery messages, Group membership messages.
- UNIT V** Cryptography and Network Security – Introduction, Traditional Ciphers, Modern Ciphers, Asymmetric Key Ciphers, Internet Security – Network layer Security, Transport layer Security, Introduction to NS2 Programming.

TEXT BOOKS

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

CAM 2202 ADVANCED OPERATING SYSTEM CONCEPTS

- 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 BOOKS

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.

CAM 2203 INTELLIGENT SYSTEMS

- UNIT I** Introduction to knowledge based intelligent systems. Rule based expert systems-Rules as Knowledge representation techniques, Structure of Rule Based System, Expert System, Forward and Backward Chaining, Conflict Resolution. Uncertainty Management in Rule based Systems- Probability Theory, Bayesian Reasoning.
- UNIT II** Fuzzy Expert systems-Fuzzy sets, Linguistic variables and hedges, operations of fuzzy sets, fuzzy rules and inference, building a fuzzy expert system. Frame Based Expert Systems-frames as Knowledge representation technique, Inheritance, Methods and demons, Interaction of frames and rules. Artificial Neural Networks- Introduction, Neuron, Perceptron, Multilayer Neural Networks, Accelerated Learning, Hop field network, Bidirectional Associative Memory, Self organizing Neural Networks.
- UNIT III** Evolutionary Computation- Introduction, Genetic Algorithms, evolution strategies, genetic programming.
- UNIT IV** Hybrid Intelligent Systems- Introduction, Neural Expert System, Neuro fuzzy Systems, Adaptive Neuro Fuzzy Inference Systems, Evolutionary Neural Networks, Fuzzy Evolutionary Systems
- UNIT V** Knowledge Engineering, Data Mining and Knowledge Discovery – Introduction, Statistical Methods and data visualization, principal component analysis, Decision trees.

TEXT BOOK

Michael Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 3/E – 2011, Pearson

REFERENCES

1. Artificial intelligence and Intelligent Systems, N. P. Padhy, Oxford University Press, 2007
2. Intelligent Systems: Alexander m Maystal & James S Albus, John Wiley, 2002

CAM 2301 MACHINE LEARNING

- UNIT I** Introduction: Machine Learning, Applications, Supervised Learning: Learning a Class from Examples, Vapnik - Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm, Bayesian Decision Theory: Introduction, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules.
- UNIT II** Parametric Methods: Introduction, Maximum Likelihood Estimation, Evaluating an Estimator- Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures, Multivariate Methods: Multivariate Data, Parameter Estimation, Estimation of Missing Values, Multivariate Normal Distribution, Multivariate Classification, Tuning Complexity, Discrete Features, Multivariate Regression.
- UNIT III** Dimensionality Reduction: Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding, Clustering: Introduction, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters
- UNIT IV** Nonparametric Methods: Introduction, Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric Regression-Smoothing Models, Decision Trees: Introduction, Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees, Introduction to Linear Discrimination, Generalizing the Linear Model.
- UNIT V** Multilayer Perceptrons: Introduction, The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, Backpropagation Algorithm, Training Procedures, Competitive Learning, Radial Basis Function, Introduction to Kernel Machines, Optimal Separating Hyperplane, The Nonseparable Case-Soft Margin Hyperplane, ν -SVM, Kernel Trick, Vectorial Kernels, Defining Kernels

TEXT BOOKS

Ethem Alpaydin, "Introduction to Machine Learning", Second Edition, 2010

REFERENCES

Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning – Data Mining, Inference, and Prediction", Springer, Second Edition.

ELECTIVES

CAM 2212 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 Wesley, 2012

REFERENCES

1. A. S. Tanenbaum , “Distributed Operating Systems “ , Pearson, 2009.
2. Shubhra Garg , “Fundamentals of Distributed Operating Systems” , S.K. Kataria & Sons, 2013.

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-Meng Lee, "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

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 System – 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 Gupta, 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.

CAM 2318 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 Exchange 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 Stallings, Cryptography and Network Security, Principles and Practices. 6th Ed., Pearson Education, 2013

CAM 2321 – 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

CAM 2322 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.
