DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS FOR M.Tech (CSE) PROGRAMME

CHOICE BASED CREDIT SYSTEM

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RAJIV GANDHI UNIVERSITY,

RONO HILLS, DOIMUKH

Course Structure

FIRST SEMESTER

Paper Code	Title	Credit L-T-P	Mark Distribution			
			End Semester	Sessional	Practical	Total
CSEC-411	Theory of computation	3-1-0	80	20	-	100
CSEC-412	Computer Systems	3-1-0	50	20	30	100
CSEC-413	Design and Analysis of Algorithms	3-1-0	80	20	-	100
CSEC-414	Advanced Data Structures Laboratory	0-0-2	-	-	-	50
CSEE-41X	***Elective-I (Any one from the list)***	3-1-0	80	20	-	100
	CSEE-415: High Performance Computer Architecture					
	CSEE-416: Artificial Intelligence					
	CSEE-417: Computer Graphics					
	Total Credits	**18**				

SECOND SEMESTER

Paper Code	Title	Credit L-T-P	Mark Distribution			
			End Semester	Sessional	Practical	Total
CSEC-421	Advanced Computer Networks	3-1-1	50	20	30	100
CSEC-422	Advanced Database	3-1-1	50	20	30	100
CSEC-423	Advanced Operating Systems	3-1-1	50	20	30	100
CSEE-42X	***Elective-II (Any one from the list)***	3-1-1	50	20	30	100
	CSEE-424: Data Mining					
	CSEE-425: Advanced Compiler Design					
	CSEE-426: Multimedia Systems					
	Total Credits	**20**				

THIRD SEMESTER

Paper Code	Title	Credit L-T-P	Mark Distribution			
			End Semester	Sessional	Practical	Total
XXXO-5XX	**Open Elective offered by other faculties**	4-0-0	80	20		100
CSEO-511	Formal Languages and Automata Theory **[Non CS/CSE students only]**	3-1-0	80	20		100
CSEE-51X	***Elective-III (Any one from the list)***	3-0-1	50	20	30	100
	CSEE-512: Speech Signal Processing					
	CSEE-513: Digital Image Processing & Computer Vision					
	CSEE-514: Pattern Recognition					
	Elective-IV (Any one from the list)	3-1-0	80	20	-	100
	CSEE – 515: Wireless Communication					
	CSEE- 516: Cryptography					
	CSEE-517: Machine Learning					
	CSEE-518: Embedded Systems					
CSEC-519	PROJECT – I	0-0-10	-	-	-	250
	Total Credits	**22**				

FOURTH SEMESTER

Paper Code	Title	Credit	Mark Distribution			
			End Semester	Sessional	Practical	Total
CSEC-521	PROJECT – II	0-0-20	-	-	-	500
	Total Credits	**20**				

TOTAL CREDITS TO BE CLEARED=80

MASTER OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING [M.Tech. (CSE)]

FIRST SEMESTER

CSEC 411: THEORY OF COMPUTATION (3-1-0)

Unit I: Finite automata, regular expressions, push-down automata, context free grammars, pumping lemmas.

Unit II: Turing machines (deterministic, non-deterministic, multitape), Church-Turing Thesis, Decidability and undecidability, diagonalization, and reducibility, Halting problem, Post correspondence problem, Rice's Theorem, and other undecidability results

Unit III: Time and space complexity P vs. NP, NP-completeness, Cook's Theorem, and other NP-complete problems

Unit IV: PSPACE, PSPACE-completeness, PSPACE-complete problems L vs. NL, NL-completeness, Savitch's Theorem, Immerman-Szelepcsenyi Theorem.

Books/References:

1. J. E. Hopcroft, R. Motwani, J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", PEARSON Education
2. Michael Sisper, "Introduction to the Theory of Computation", Cengage Learning
3. John C. Martin, "Introduction to Languages and Theory of Computation", McGraw-Hill Higher Education

CSEC 412: COMPUTER SYSTEMS (3-1-0)

UNIT I: Introduction to Machine Architectures, ISA, instruction pipelining, Memory hierarchy concepts, virtual memory, caches, multiprocessors.

UNIT II: Introduction to system software; assemblers, linkers, loaders, debuggers; case study of Linux Linking system

UNIT III: Compiler concepts, lexical, syntax analysis and basic code generation; case study of Lex and Yacc tools.

Unit IV: Operating system concepts: process, deadlocks, basic memory management, I/O and File Systems: Case study of Linux process control facilities and shell scripting.

Books/References:

1. M. Morris Mano, "Computer System Architecture", 3rd Edition, Prentice Hall
2. Leland L. Beck, "System Software An Introduction to Systems Programming", Addison Wesley Longman
3. A.V.Aho, Monica S. Lam, R. Sethi, J.D. Ullman, "Compilers: Principles, Techniques, and Tools", Prentice Hall
4. Avi Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley

CSEC-413: DESIGN AND ANALYSIS OF ALGORITHMS (3-1-0)

UNIT I: Review of basic data structures such as stack, queue, linked list, trees and graphs; Concepts in algorithm analysis, Asymptotic complexity.

UNIT II: Domain independent algorithm design techniques such as divide and conquer, greedy method, dynamic programming, back tracking, branch and bound.

UNIT III: Example algorithms for sets, graphs, text processing, internal and external sorting, height balanced trees, B-trees, hashing, dynamic storage allocation, garbage collection. Basic ideas about neural network, genetic algorithms and simulated annealing.

UNIT IV: Study of space and time complexity using asymptotic notations. Pseudorandom functions. Parallel and distributed functions and applications. Lower bound theory and NP-hard problems.

Books/References:

1. Aho A, Hopcroft J., Ullman J., "The Design and Analysis of Algorithms", Addison- Wesley.
2. Corman et al., "Introduction to Algorithms", PHI.
3. M T Goodrich, R Tamassia, "Algorithm Design- Foundations, Analysis & internet Examples", John Wiley & Sons.
4. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithms", PHI.

CSEC-414: ADVANCED DATA STRUCTURES LABORATORY (0-0-2)

Laboratory ADTs, linked-lists, stack, queue, binary trees, threaded trees, balanced trees, hashing and set operations, tree traversal, sorting and searching Introduction to template based programming of data structures in C++, compile-time versus run-time polymorphism, design patterns.

Books/References:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2005.
2. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education.
3. Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides. "Design Patterns: Elements of Reusable Object-Oriented Software", Addison Wesley Professional.
4. Bjarne Stroustroup, "The C++ Programming Language", Addison-Wesley

CSEE-415: HIGH PERFORMANCE COMPUTER ARCHITECTURE (3-1-0)

UNIT I: Basic CISC and RISC designs and performance measurements,; Instruction and Arithmetic pipelining, data, control and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques. Compiler techniques for improving performance.

UNIT II: Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT III: Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIW processor architectures. Array and vector processors. Multiprocessor architecture: taxonomy of parallel architectures.

UNIT IV: Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers. ARM Processor Architecture, Pipelines, Exception Vector Tables, ARM and Thumb Instruction set overview.

Books/References:

1. Hennessey and Patterson, "Computer Architecture A Quantitative Approach", Elsevier.
2. Kai Hwang, "Advanced Computer Architecture - Parallelism, Scalability, Programmability", Tata McGraw Hill.
3. Steve Furbe "ARM System-on-Chip Architecture" , Pearson Education

CSEE-416: ARTIFICIAL INTELLIGENCE (3-1-0)

Unit I: Introduction: AI problem; AI techniques, problem as a state space search, Production Systems, Issues in design of search programs.

Unit II: Heuristic Search Techniques : Generate and test, Hill Climbing, Best-First Search, Problem reduction, Means- Ends analysis.

Unit III: Knowledge Representation : Knowledge representation issues, Predicate logic, knowledge representation using rules, weak slot-and-Filler structure.

Unit IV: Natural Language Processing : Syntactic processing, semantic analysis, Discourse and pragmatic processing. Expert Systems : Representation using domain knowledge, Expert System shell, knowledge acquisition.

Books/References:

1. Artificial Intelligence: E. Rich & K. Knight, Tata McGraw Hill.
2. Principles of Artificial Intelligence, N.J. Nilson, Narosa Pub. House.

CSEE-417: COMPUTER GRAPHICS (3-1-0)

Unit I: 2D primitives, output primitives, Line, Circle and Ellipse drawing algorithms Attributes of output primitives, Two dimensionalGeometric transformation - Two dimensional viewing – Line, Polygon, Curve and Text clipping algorithms

Unit II: 3D concepts, Parallel and Perspective projections - Three dimensional object representation – Polygons, Curved lines,Splines, Quadric Surfaces,- Visualization of data sets - 3D transformations – Viewing -Visible surfaceidentification.

Unit III: Graphics Programming, Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Keyframe - Graphics programming using OPENGL – Basic graphics primitives – Drawing three dimensional objects -Drawing three dimensional scenes

Unit IV: Rendering, Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows ofobjects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows.

Unit V: Fractals, Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives –Adding Surface texture – Reflections and Transparency – Boolean operations on Objects.

Books/References:

1. James D. Foley, Andries Van dam, Steven K. Feiner & John F. Hughes, "Computer Graphics – Principles and Practices", Pearson Education.
2. Donald Hearn and M Pauline Baker, "Computer Graphics", PHI
3. Woo, Neider, Davis, Shreiner, "Open GL Programming Guide", Pearson Education.
4. David F. Rogers, "Procedural Elements for Computer Graphics", Tata-McGraw Hill.
5. F.S. Hill, "Computer Graphics using OPENGL", Pearson Education,

SECOND SEMESTER

CSEC-421: ADVANCED COMPUTER NETWORKS (3-1-1)

UNIT I: Introduction to Circuit and Packet switched Networks -- delay, Loss and Throughput Issues; end-to-end design principles, Applications like HTTP, SMTP, FTP and P2P networks. Layered architecture, OSI and TCP/IP models.

UNIT II: Transport Layer issues like multiplexing, stop-and-wait and pipelined protocols for reliable data transfer, Flow and congestion control, TCP variants, LFN issues and solutions.

UNIT III: Routing and forwarding Issues, switching and routing fabric, IPV4 addressing, VLSM, CIDR, NAT and its limitations, IPv6, migration and issues. Routing algorithms – shortest path variants, OSPF and BGP introduction.

Unit IV: High speed networks – gigabit Ethernet in backbone networks, MPLS networks and their mechanisms, QoS: traffic characteristics and metrics, emerging trends in networks

Books/References:

1. J.F. Kurose, K.W. Ross, "Computer Networking: A Top-Down Approach", Pearson
2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, Elsevier.
3. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw-Hill.

CSEC-422: ADVANCED DATABASE (3-1-1)

Unit I: Review of ER/EER and other semantic data models; Network, Hierarchical and Relational Data Models. Query Processing: Various Operations such as Join, Selection, sorting, expression evaluation, etc

Unit II: Concurrency Control Mechanism: Protocols, Multiple Granularity, Multi-version schemes, Deadlock handling, Recovery: Recovery and atomicity, various techniques, buffer management, Advanced Recovery Techniques;

Unit III: Database Security: Authentication, Various Access Control Mechanisms, etc. Distributed Databases: Distributed Query Processing, Transaction Model, deadlock handling, multi-database systems;

Unit IV: Object Oriented Database: OO Data Model e.g. UML, OO DBMS architectures, Client-Server Approach, Query Processing, Object Relational Databases, Spatial Databases: Data Models, various representation schemes, architectures, Query Processing, Storage Structures; Image and Multimedia Databases

Books/References:

1. Silberschatz and Korth, Database system concepts, McGraw Hill.
2. Elmasri and Navathe, Fundamentals of database systems; Narosa Publishing Co.
3. John G Hughes, Object Oriented Databases; Prentice Hall Int'nl Series in Computer Science
4. Andleigh and Thakrar, Multimedia Systems Design, Prentice Hall PTR
5. R Raghuramakrishnan & J Gehrke, Database Management System
6. Alhir, UML: In A Nutshell, O'Reilly

CSEC-423: ADVANCED OPERATING SYSTEMS (3-1-1):

Unit I: Message passing, features of a good message passing system, IPC by message passing, synchronization, buffering, encoding and decoding of message data, process addressing, failure handling, group communication.

Unit II: RPC model, transparency, implementing RPC, RPC message, Server management, Communication protocol for RPC, Clent server binding, RPC in heterogeneous environments.

Unit III: Distributed Shared memory, Architecture of DSM system, structure of shared memory spece, heterogeneous DSM, Advantage of DSM. Clock Synchronisation, event ordering, mutual exclusion, deadlock, election algorithm.

Unit IV: Resource management, process management. Distributed File System, File models, File accessing model, file sharing semantics, file caching schemes, file replication, fault tolerance, atomic transaction, design principles.

Case studies: UNIX, LINUX, Windows and MAC, laboratory in shell and python programming.

Books/References:

1. Tanenbaum, Modern Operating Systems, PHI (EEE)
2. Milenkovic, Operating Systems: Concepts and Design, McGraw Hill.
3. Sillberschatz et. al, Operating Systems, Wiley India.
4. W.R. Steveans, Advanced Progamming in the UNIX Environment, Addison Wesley.
5. M.J. Bach, The Design of the UNIX Operation System, PHI(EEE).
6. Singhal and Shivaratri, Advanced Concepts in Operating Systems, TMH

CSEE-424: DATA MINING (3-1-1)

Unit I: Data Clustering: Partitioning, Hierarchical, Density-based, Grid-Based and Model Based Methods;

Unit II: Classification & Prediction: Decision Tree Techniques, Back-Propagation Method, Bayesian Method

Unit III: Association Rule Mining Techniques: Frequent Itemset Generation, Apriori, Horizontal Method, Sampling Approach, Hashing Approach; Dynamic Association Rule Mining;

Unit IV: Mining of Complex Types of Data: Mining of Spatial Databases, Multimedia Databases, Time-series and sequence Data, Text Databases, WWW Data;

Books/References:

1. Jiawei Han and Micheline Kamber, 'Data Mining: Concepts and Techniques' 3rd Edition, Morgan Kaufmann, India, 2012
2. A K Pujari, 'Data Mining Techniques, 3rd Edition, Orient BlackSwan, October 2013
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 2nd Edition, Addison-Wesley, September 2015

CSEE-425: ADVANCED COMPILER DESIGN (3-1-1)

Unit I: Foundations of compilation; Lexical analysis process and regular expressions, transition diagrams, difficulties in lexical analysis, error reporting, implementation. Regular definition, lex tool.

Unit II: Syntax analysis, CFGs, top down parsing, grammar transformations, bottom up parsing, operator precedence and LR parsers, yacc tool.

Unit III: Syntax directed definitions: attributes, evaluation order,. type system, equivalence and conversion, overloaded and polymorphic functions. Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation

Unit IV:. Intermediate code generation: translation of various code constructions like function calls and assignment statements; code generation : basic blocks and flow graphs, dags, register allocation, optimization strategies, code generator generators.

Books/References:

1. V. Aho, R. Sethi, and J. D. Ullman: Compilers: Principles, Techniques and Tools, PEARSON Education.
2. C. Fischer and R. LeBlanc: Crafting a Compiler in C , PEARSON Education.
3. A. I. Holub: Compiler Design in C, PHI
4. Andrew W. Appel and Maia Ginsburg: Modern Compiler Implementation in C, Cambridge Press.

CSEE-426: MULTIMEDIA SYSTEMS (3-1-1)

Unit I: Concept of Multimedia Data; Various File Formats; Multimedia data Model e.g. RMDM, Compression & Decompression: Binary Image compression: Various CCITT standards Color Image compression : JPEG Methodology, DCT, MPEG Methodology

Unit II: Storage & Retrieval Merthods: Magnetic Media Technology, RAID Technology, Optical Media, Hierarchical Strage Management; Cache Management;

Unit III: Architectural Issues: Specialized processor, Memory System, LAN-WAN connectivity, Client-Server approach; Distributed Multimedia System: various components;

Unit IV: Multimedia Authoring; Authoring Tools and their design issues, Hypermedia Application Design issues; User Interface: Hypermedia Interface Design Issues;

Books/References:

1. Ralf Steinmetz and Llara Nahrstedt, “Multimedia: Computing, Communications & Applications”, Pearson Education
2. P.K. Andleigh and K.Thakrar, “Multimedia Systems Design” , Prentice Hall India.
3. John Vince, “Virtual Reality Systems”, Thomson training & Simulation Ltd.
4. Fred Halsall, “Multimedia Communications”, Addison Wesley Longman Publishing Co.

THIRD SEMESTER

CSEO-511: FORMAL LANGUAGES AND AUTOMATA THEORY

Unit I: Automata Theory: formal proof techiques, Finite Automata, DFA and NFA.

Unit II: FA and Regular Expressions, closure properties, equivalence and minimization of automata, non-regular languages.

Unit III: Context Free Grammars and Languages: Parse Trees, ambiguity, PDA, DPDA, equivalence of CFG and PDA.

Unit IV: Properties of Context-Free Languages: Normal forms, Pumping Lemma for CFL, Closure Properties, Turing Machines, TM programming.

Unit V: Undecidability: Non-RE problems, undecidable problems about Turing Machine, Post's Correspondence Problem, The classes P and NP.

Books/References:

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", Pearson Education
2. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Pearson Education.
3. Michael Sipser, "Introduction of the Theory and Computation", Thomson Brokecole.
4. J. Martin, "Introduction to Languages and the Theory of computation", Tata Mc Graw Hill.

CSEE-512: SPEECH SIGNAL PROCESSING (3-1-0)

Unit I: Basic Concepts: Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short - Time Fourier Transform, Filter -Bank and LPC Methods.

Unit II: Speech Analysis: Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Unit III: Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum -Welch Parameter Re-estimation, Implementation issues.

Unit IV: Speech Recognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

Unit V: Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status

Books/References:

1. Lawrence Rabiner and Biing-Hwang Juang, Fundamentals of Speech Recognition, Pearson Education.
2. Daniel Jurafsky and James H Martin, Speech and Language Processing, Pearson Education
3. T.E.Quatieri, Speech Signal Processing, Pearson Education
4. Ben Gold , Nelson Morgan and Dan Ellis, Speech and Audio Signal Processing: Processing and Perception of Speech and Music, WILEY Publication
5. John G. Proakis, Dimitris K Manolakis, Digital Signal Processing, Pearson Education

CSEE-513: DIGITAL IMAGE PROCESSING & COMPUTER VISION (3-1-0)

Unit I: Introduction to Image Processing & Computer Vision, Image processing system components, image sensing & Acquisition, sampling & Quantization. Neighbors of a pixel adjacency connectivity, regions & boundaries, Distance Measures, stereo vision. Image Formation: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, stereo and multi view geometry, Binocular imaging systems.

Unit II: Image Enhancement & Restoration: Spatial filtering: Intensity transformations – piece-wise linear transformations, bit plane slicing, histogram equalization, smoothing filtering masks, sharpening filters – gradient operators and Laplacian filters. Frequency domain filtering: Image sampling, 2D Discrete Fourier Transform, lowpass filteringideal and Gaussian, highpass filtering- ideal, Gaussian, Laplacian. Noise Models. Mean, median and min-max filters. Minimum mean square error filter.

Unit III: Colour Image Processing: Colour models, pseudocolour, image processing, colour transformation, segmentation. Wavelets and Multi resolution Processing: Image pyramids, subband coding, Harr transform, multi resolution expansions, discrete and continuous wavelet transforms

Unit IV: Image Compression: Fundamentals, Basic compression methods – Huffman, Arithmetic, LZW, run length coding schemes, Error free & Lossy compression, Standards: JPEG, JBIG. Edge and Boundary Detection: Edge detection, boundary detection, edge detection performance, boundary detection performance.

Unit V: Morphological Image Processing: Erosion and dilation, opening and closing, boundary extraction, hole filling. Motion Estimation, Detection & Tracking: Regularization theory, optical computation, Motion estimation, Structure from motion.Shape Representation & Reconstruction: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis.

Books/References:

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, Pearson Education.
2. D.Forsyth, J Ponce, Computer Vision – A Modern Approach, Prentice Hall, India
3. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall India
4. E.Trucco, A Verri, Introductory Techniques for 3-D Computer Vision, Prentice Hall.

CSEE-514: PATTERN RECOGNITION (3-1-0)

Unit I: Bayes Decision Rules for two Class problem, Bayes maximum likelihood rule, minimum distance classifier, error probabilities for classifier, Mahalanobis distance, Bound for error probabilities, Estimation of parameters, Learning.

Unit II: Single layer perceptron, Clustering, Minimum within cluster distance criterion, k-means algorithm, single linkage, complete linkage and average linkage algorithms, Isodata algorithm etc.

Unit III: Feature Selection: Algorithms for feature selection such as Branch and Bound, Sequential forward and backward selections, GSFS and GSBS, (L, R) algorithm, Criterion function: Probabilistic Separability criterion, error probability based criterion, entropy based criterion, minimum within class distance based criterion, probabilistic independence, Principal Component Analysis

Unit IV: Fuzzy Set-theoretic Pattern Recognition: Usual Fuzzy set theoretic operations –union, intersection etc., Multitvalued Logic: Zade Compositional Rule of inference, Fuzzy C-means algorithm, Supervised Classification: Multitvalued Recognition System, Fuzzy set theoretic based feature selection criteria.

Books/References:

1. Duda and Hart, "Pattern Classification ad Scene Analysis", John Willey.
2. P.A. Devijver and J. Kittler, "Pattern Recognition: A Statistical Approach".
3. K. Fukunga, "Introduction to Statistical Pattern Recognition", Academic Press
4. S.K. Pal and Dutta Mazumdar, "Fuzzy Set Theroetic Methods for Patern Recognition", John Willey.

CSEE – 515: WIRELESS COMMUNICATION (3-1-0)

Unit I: Wireless transmission fundamentals: Electromagnetic spectrum, radiation patterns, Power Density, intensity, beamwidth, directivity and gain, isotropic and omni-directional antenna, Friis transmission equation. free space propagation, free space propagation model, introduction to large-scale path-loss models, fast and slow fading and distributions.

Unit II: Modulation Techniques for Mobile radio: FM and AM, digital modulation overview, BPSK, QPSK and variants, Gram-schmidt orthogonalization procedure. Spread-spectrum modulation techniques, DSSS and FHSS and their performance.

Unit III: mobile cellular communication: frequency reuse, cluster size; cellular system architecture, channel assignment strategies, call splitting, sectoring, Introduction to GSM architecture, channel types, call setup, mobility in cellular networks and handoff. introduction to CDMA

Unit IV: Introduction to WiFi networks and ad-hoc networks, Routing protocols in ad-hoc networks, specialized sensor networks. Emerging trends in wireless networking.

Books/References:

1. Rappaport, Wireless Communications: Principles and Practice, PEARSON
2. Andreas F. Molisch, Wireless Communications, Wiley India Pvt Ltd
3. W. Stallings, Wireless Communications and Networks, Pearson education publishing

CSEE- 516: CRYPTOGRAPHY (3-1-0)

Unit I: Introduction to Cryptography, Mathematical Foundation of Cryptography : Information Theory, Complexity Theory, Number Theory, Probability Theory;

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

Unit III: One-Way Hash Functions and Data Integrity: Snefru, MD4, MD5, SHA, HAVAL; Cryptanalysis of hash functions;Public Key Cryptography: Mathematical Foundation, RSA, Security Analysis of RSA

Unit IV: Key Establishment Protocols: Symmetric key based and Asymmetric Key based protocols, KERBEROS, EKE, DH-EKE, PAKE, etc; Secret Sharing;Digital Signature Schemes: RSA and other related signature schemes, Possible Attacks, DSA and other related signature schemes;

Books/References:

1. Manezes, Oorschot and Vanstone, Handbook of Applied Cryptography, CRC Press
2. B Schnier, Applied Cryptography, PHI

CSEE-517: MACHINE LEARNING(3-1-0)

Unit I: Overview of Machine Learning, Concept of Learning and the General – to – specific ordering,

Unit II: Decision tree learning, Neural Network, Evaluation Hypothesis, Bayesian Leaning, Computational Learning Theory, Instance Based Learning,

Unit III: Generic algorithms, Learning sets and rules, Analytical learning, combining Inductive and Analytical learning, Reinforcement learning

Books/References:

1. Tom Mitchell, “Machine Learning”, McGraw.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press.

CSEE-518: EMBEDDED SYSTEMS(3-1-0)

Unit I: Introduction to Embedded systems, hardware/software code sign, Embedded micro controller cores, embedded memories, Examples of embedded systems, sensors and interfacing techniques,

Unit II: RTOS, scheduling paradigms, blocking, unpredictability, interrupts, caching.
Unit III: Case studies of OSs for embedded systems, programming languages, system support for embedded systems,
Unit IV: Case studies of embedded system-based applications, software development methodology

Books/References:

1. D. Gajski, F. Vahid, S. Narayan, and J. Gong, “Specification and Design of Embedded Systems”, PEARSON Education
2. Syaunstrup and W. Wolf, “Hardware Software Co-design: Principles and Practice”, Kluwer Academic Publishers

CSEC-519: PROJECT – I (0-0-10)

FOURTH SEMESTER

CSE-521: PROJECT –II (0-0-20)