ANNA UNIVERSITY:: CHENNAI - 25

FACULTY OF INFORMATION AND COMMUNICATION ENGINEERING

Approved Special Electives for M.S. / Ph.D. Degree Programs

(upto 21 st AC 07.01.2016)

ANNA UNIVERSITY :: CHENNAI – 600 025.

SPECIAL ELECTIVES FOR FACULTY OF INFORMATION AND COMMUNICATION ENGINEERING

COURSE CODE	COURSE TITLE	L	T	P	M/C
FI1911	Brain control interfaces	3	0	0	100
FI1912	Human-computer interaction and usability engineering	3	0	0	100
FI1913	Biometrics for network security	3	0	0	100
FI1914	Medical image retrieval	3	0	0	100
FI1915	Wireless sensor networks	3	0	0	3
FI1916	Performance evaluation of computer systems and networks	3	0	0	3
FI1917	Content based information retrieval	3	0	0	3
FI1918	Pattern recognition	3	0	0	3
FI1919	Trusted services and public key infrastructure	3	0	0	3
FI1920	Game theory	3	0	0	3
FI1921	Speech and music signal processing	3	0	0	3
FI1922	Peer-to-peer computing	3	0	0	3
FI1923	Optical switching architectures	3	0	0	100
FI1924	CDMA signal detection	3	0	0	100
FI1925	Next generation wireless networks	3	0	0	100
FI1926	Advances in wireless communication	3	0	0	100
FI1927	Swarm intelligence	3	0	0	100
FI1928	Security in sensor networks	3	0	0	3
FI1929	Virtual machines	3	0	0	3
FI1930	Program slicing	3	0	0	3
FI1931	Reengineering legacy code	3	0	0	3
FI1932	Image Acquisition and Image Processing	3	0	0	3
FI1933	Adhoc and sensor networks	3	0	0	100
FI1934	Multimedia security	3	0	0	100
FI1935	Wireless sensor networks	3	0	0	100
FI1936	Optical CDMA architectures	3	0	0	3
FI1937	Micro electromechanical system (MEMS)	3	0	0	3

FI1938	Network coding	3	0	0	3
FI1939	Scheduling and load balancing algorithms for grid computing	3	0	0	3
FI1940	Modeling and simulation of wireless systems	3	0	0	100
FI1941	Statistical Pattern Classification	3	0	0	100
FI1942	Advanced Adhoc Networks	3	0	0	100
FI1943	Computational Methods for Sequence Analysis	3	0	0	3
FI1944	Security in Grid	3	0	0	3
FI1945	Check pointing in Grid and Multiobjective Optimization	3	0	0	3
FI1946	Logic Programming	3	0	0	3
FI1947	Belief Revision	3	0	0	3
FI1948	Ultra Wideband Communication	3	0	0	3
FI1949	3G Mobile Networks	3	0	0	3
FI1950	HF Filter Design	3	0	0	3
FI1951	OFDM Systems	3	0	0	3
FI1952	Radio over Fiber Technologies	3	0	0	3
FI1953	Evolutionary Multiobjective Optimization Techniques	3	0	0	3
FI1954	Science of Emotion and Emotions in Speech	3	0	0	3
FI1955	Voice-over-Internet Protocol (VOIP)	3	0	0	3
FI1956	Rateless codes	3	0	0	3
FI1957	Wireless MAN	3	0	0	3
FI1958	SOA for Transaction Processing System	3	0	0	3
FI1959	Reconfigurable Architectures	3	0	0	3
FI1960	Evolvable Hardware	3	0	0	3
FI1961	Web Data Mining	3	0	0	3
FI1962	Current Trends in Web Security	3	0	0	3
FI1963	Semantic Web Services	3	0	0	3
FI1964	Bio-inspired Computing	3	0	0	3
FI1965	Information Ecosphere	3	0	0	3
FI1966	Grid Scheduling	3	0	0	3
FI1967	Context Modeling	3	0	0	3
FI1968	Basics of Cerebral Information Processing and its relationship with NIRS	3	0	0	3
FI1969	Type Systems	3	0	0	3

FI1970	Advanced Security Mechanism	3	0	0	3
FI1971	Lexical Semantics	3	0	0	3
FI1972	Ultrasonic Principles and Applications in Medicine	3	0	0	3
FI1973	Discourse Analysis–Western and Eastern Perspective	3	0	0	3
FI1974	Semantic Web and E-Learning	3	0	0	3
FI1975	Quantum Computing	3	0	0	3
FI1976	Cross-Layer Optimization and Video Transmission	3	0	0	3
FI1977	Next Generation in IP Networks	3	0	0	3
FI1978	3D Imaging and Image set Retrieval	3	0	0	3
FI1979	Data Mining Algorithms, Analysis and Parallelization	3	0	0	3
FI1980	Software defined Radio and Cognitive radio Technologies	3	0	0	3
FI1981	Adaptive Antenna Arrays	3	0	0	3
FI1982	Electromagnetic and Photonic Band Gap Structures for Antenna Engineering	3	0	0	3
FI1983	Cross Layer Design	3	0	0	3
FI1984	4G Wireless Networking	3	0	0	3
FI1985	Grid Resource Management	3	0	0	3
FI1986	Industrial and Systems Engineering in Healthcare	3	0	0	3
FI1987	Methods for Selfish / Malicious Node Detection	3	0	0	3
FI1988	Advanced Java	3	0	0	3
FI1989	Applied Cryptography	3	0	0	3
FI1990	Multi-Sensor Data and image Fusion	3	0	0	3
FI1991	Electronic Nose	3	0	0	3
FI 9001	Semantic Interpretation	3	0	0	3
FI 9002	XML Encryption Techniques	3	0	0	3
FI 9003	Elliptic Curve Cryptography	3	0	0	3
FI 9004	Mathematics for Computing Research	3	0	0	3
FI 9005	Cross Layered Wireless AD HOC and Sensor Networks	3	0	0	3
FI 9006	Underwater Acoustic Signal Processing	3	0	0	3
FI 9007	Oceanography and Instrumentation	3	0	0	3
FI 9008	Web Multimedia	3	0	0	3
FI 9009	Image, Audio and Video Processing	3	0	0	3

FI 9010	Hardware Verification Techniques	3	0	0	3
FI 9011	Evolvable Hardware	3	0	0	3
FI 9012	Tamil Computing	3	0	0	3
FI 9013	Information Coding Theory	3	0	0	3
FI 9014	Nanoscale Transistors	3	0	0	3
FI 9015	Process and Device Simulation	3	0	0	3
FI 9016	Multiprocessor Interconnection Networks	3	0	0	3
FI 9017	Security in Wireless Sensor Networks	3	0	0	3
FI 9018	Wireless Mesh Networks	3	0	0	3
FI 9019	3d Image Techniques	3	0	0	3
FI 9020	Anatomy of Lung and Image Processing Techniques	3	0	0	3
FI 9021	Agile Processes in Software Engineering	3	0	0	3
FI 9022	Emotion Recognition	3	0	0	3
FI 9023	Network Congestion Control Avoidance Technique	3	0	0	3
FI 9024	Multimedia Compression Techniques	3	0	0	3
FI 9025	Design of Asynchronous Circuits Using Null Convention Logic (Ncl)	3	0	0	3
FI 9026	Three Dimensional Network on Chip	3	0	0	3
FI 9027	Social Networking and Applied Graph Theory	3	0	0	3
FI 9028	Knowledge Management for E–Learning	3	0	0	3
FI 9029	Advanced Digital Image Processing	3	0	0	3
FI 9030	Retinal Image Analysis	3	0	0	3
FI 9031	Principles of Aviation Acoustics	3	0	0	3
FI 9032	Multimedia Medical Data	3	0	0	3
FI 9033	Location Based Services	3	0	0	3
FI 9034	Parallel Programming Models	3	0	0	3
FI 9035	Digital Video Processing	3	0	0	3
FI 9036	Wireless Body Area Networks	3	0	0	3
FI 9037	Molecular Fundamentals In Biology	3	0	0	3
FI 9038	Optical Switching Techniques	3	0	0	3
FI 9039	Single Electron Devices	3	0	0	3
FI 9040	Speech Technology	3	0	0	3
FI 9041	Medical Image Registration	3	0	0	3
FI 9042	Phase Lock Loops	3	0	0	3
FI 9043	Fault Tolerant Computing System	3	0	0	3
FI 9044	Scheduling and Load Balancing Algorithms for	3	0	0	3

	cloud				
FI 9045	Social Network Mining	3	0	0	3
FI 9046	Web Mining	3	0	0	3
FI 9047	RFID Technology and Applications	3	0	0	3
FI 9048	Numerical Techniques in Electromagnetics	3	0	0	3
FI 9049	Security Issues in Wireless Body Area Networks	3	0	0	3
FI 9050	Resource Scheduling in Virtual Machines	3	0	0	3
FI 9051	Heterogeneous Computing	3	0	0	3
FI 9052	Tamil Text And Sign Language Technologies	3	0	0	3
FI 9053	Machine Translation	3	0	0	3
FI 9054	Non Linear Signal Processing	3	0	0	3
FI 9055	Applied and Clinical Thyroid **(**	3	0	0	3
FI 9056	Renal Disease Specific Imaging Modalities	3	0	0	3
FI 9057	Digital Logic Circuits Design using Carbon Nano Tube Field Effect Transistor (CNTFET)	3	0	0	3
FI 9058	Quantum Cellular Automata – Digital Logic Circuits Design	3	0	0	3
FI 9059	Digital and Analog PLL Design	3	0	0	3
FI 9060	Reconfigurable and Wearable Antennas	3	0	0	3
FI 9061	Carbon Nanotubes	3	0	0	3
FI 9062	Anatomy, Physiology and Clinical Thyroid	3	0	0	3
FI 9063	Wireless Sensor Networks and its Routing Protocols	3	0	0	3
FI 9064	Rough Set Theory and Applications	3	0	0	3
FI 9065	Sensor Networks for Marine Applications	3	0	0	3
FI 9066	Collaborative E Learning	3	0	0	3
FI 9067	Chemical Text Mining	3	0	0	3
FI 9068	Algorithms for Graphics and Combinatorial Problems	3	0	0	3
FI 9069	Text Mining	3	0	0	3
FI 9070	Heterogeneous Computing	3	0	0	3
FI 9071	Opto Electronic Theory	3	0	0	3
FI 9072	Cloud Security and Privacy	3	0	0	3
FI 9073	Cloud Infrastructure and Virtualization	3	0	0	3
FI 9074	Compressed Sensing	3	0	0	3
FI 9075	Information Security	3	0	0	3
FI 9076	Big Data	3	0	0	3
FI 9077	Nano Sensor Communication Networks	3	0	0	3
FI 9078	Software Risk Management	3	0	0	3
FI 9079	Technological Advancements in Text-to-Speech Synthesis	3	0	0	3
FI 9080	Broadband Microstrip Antennas	3	0	0	3
FI 9081	Wireless Communication Systems	3	0	0	3
FI 9082	Cyber Security	3	0	0	3

FI 9083	Advanced Ontology	3	0	0	3
FI 9084	Femtocells	3	0	0	3
FI 9085	Chip Design Validation	3	0	0	3
FI 9086	Biomechanics of Human Movement and Wearable Robots	3	0	0	3
FI 9087	Fundamentals of Bibliometrics Research	3	0	0	3
FI 9088	Ultra Wideband Antennas	3	0	0	3
FI 9089	Frequency Selective Surfaces	3	0	0	3
FI 9090	Semantic Computing	3	0	0	3
FI 9091	Security Analytics	3	0	0	3
FI 9092	Integration of RFID and Wireless Sensor Networks	3	0	0	3
FI 9093	Reconfigurable Antennas	3	0	0	3
FI 9094	Electromagnetic Non-Destructive Testing of Composites	3	0	0	3
FI 9095	Predictive Analytics	3	0	0	3
FI 9096	Stream Data Analytics	3	0	0	3
FI 9097	Underwater Acoustic Modeling and Simulation	3	0	0	3
FI 9098	Multilevel Inverters	3	0	0	3
FI 9099	Image Feature Detection Techniques Implementation	3	0	0	3
FI 9100	Free Space Optical Networks	3	0	0	3
FI 9101	UAV Aided Military Communications	3	0	0	3
FI 9102	Deep Learning Techniques	3	0	0	3
FI 9103	Cognitive Computation for Health Care	3	0	0	3
FI 9104	Computational Intelligence and Feature Selection	3	0	0	3
FI 9105	Fog Computing	3	0	0	3
FI 9106	Power Testing For CMOS Devices	3	0	0	3
FI9107	Biomedical Text Mining	3	0	0	3
FI 9108	Next Generation Mobile Networks	3	0	0	3

FI1911 BRAIN CONTROL INTERFACES L T P C
3 0 0 100

UNIT I INTRODUCTION TO BCI 8

Concept of BCI – Invasive and Non-invasive Types – EEG Standards – Signal Features – Spectral Components – EEG Data Acquisition – Pre-processing – Hardware and Software – Artifacts – Methods to Remove – Near Infrared BCI.

UNIT II BCI APPROACHES 7

Mu Rhythm – Movement Related EEG Potentials – Mental States – Visual Evoked Potential Based – P300 component.

UNIT III EEG FEATURE EXTRACTION METHODS 10

Time/Space Methods – Fourier Transform – Wavelets – AR models – Band pass filtering PCA – Laplacian Filters – Linear and Non-linear Features.

UNIT IV EEG FEATURE TRANSLATION METHODS 10

LDA – Regression – Memory Based – Vector Quantization – Gaussian Mixture Modeling – Hidden Markov Modeling.

UNIT V CASE STUDY 10

Case Study of Problems in BCI Competition III(2005) – Dataset I, II, III, IV and V Solutions.Case Study of Brain Actuated Control of Khepera Mobile Robot.

TOTAL: 45 PERIODS

REFERENCES:

1. Special Issue on Brain Control Interfaces, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol 14, June 2006.
2. Andrew Webb, “Statistical Pattern Recognition”, Wiley International, Second Edition, 2002.
3. R.Spehlmann, “EEG Primer”, Elsevier Biomedical Press, 1981.
4. Arnon Kohen, “Biomedical Signal Processing”, Vol I and II, CRC Press Inc, Boca
5. Rao, Florida.
6. Bishop C.M, “Neural Networks for Pattern Recognition”, Oxford, Clarendon Press, 1995.
7. Torsten Felzer, “On the possibility of Developing a Brain Computer Interface”, Technical Report, Technical University of Darmstadt, Germany, 2001.
8. Wolpaw J.R, N.Birbaumer et al, “Brain control interface for Communication and control”, Clinical Neurophysiology, 113, 2002.
9. Jose del R.Millan et al, “Non-invasive brain actuated control of a mobile robot by humanEEG”,IEEETransactions on iomedical Engineering, Vol 51, No.6, 2004 June.
10. S.Coyle, T.Ward et al, “On the suitability of near infra red systems for next generation Brain Computer interfaces”, Physiological Measurement, 25, 2004.
11. Carlo Tomasi, “Estimating Gaussian Mixture Densities with EM – A Tutorial”, Duke University, 2000.
12. R.Dugad, U.B Desai, “ A Tutorial on Hidden Markov Modeling”, Signal Processing and Artificial Neural Networks Laboratory, IIT Bombay, 1996.

FI1912 HUMAN-COMPUTER INTERACTION AND USABILITY ENGINEERING **L T P C 3 0 0 100**

UNIT I INTRODUCTION TO HCI **9**

Human Computer Interaction Models – Ergonomics – Industrial Interface Design – Basics of Interaction Devices – Interaction Styles – Utility of Hypertext – Multimedia Signal Aspects – World Wide Web.

UNIT II USABILITY ENGINEERING PROCESS **8**

Paradigms – Principles Supporting Usability – User Interface Generation – Usability Engineering Life Cycle – Different Stages – Requirements Modeling – Task Analysis and Uses – Dialog Notations – System Models – Implementation.

UNIT III USABILITY HEURISTICS, TESTING AND EVALUATION **8**

Heuristics in Usability Engineering – Testing – Types of Evaluating and Assessing the Design – Implementation Aspects.

UNIT IV APPLICATION AREAS **10**

Applications Involving Speech, Handwriting and Gesture Recognition – Computer Vision – Virtual Reality – Unconventional Human Computer Interfaces.

UNIT V CASE STUDY **10**

Case Study of Dasher, Interface for Entering Text – Case Study of P300 Based Brain Computer Interface.

TOTAL: 45 PERIODS

REFERENCES:

1. Alan J Dix, Janet E Finlay, Greogory D Abowd, Russel Beale, “Human Computer Interface”, 2nd Edition, Prentice Hall, 1998.
2. Jakob Nielsen, “Usability Engineering”, Morgan Kaufmann Publishers, 1992.
3. Ben Shneiderman, “Designing the user interface: Strategies for effective human computer interaction”, 4th Edition, Reading, 2004.

FI1913 BIOMETRICS FOR NETWORK SECURITY **L T P C 3 0 0 100**

UNIT I INTRODUCTION TO BIOMETRICS **9**

Introduction and background – biometric technologies – passive biometrics – active biometrics – Biometric systems – Enrollment – templates – algorithm – verification – Biometric applications – biometric characteristics – Authentication technologies – Need for strong authentication – Protecting privacy and biometrics and policy – Biometric applications – biometric characteristics.

UNIT II FINGERPRINT TECHNOLOGY **9**

History of fingerprint pattern recognition – General description of fingerprints – Finger print feature processing techniques – fingerprint sensors and RF imaging techniques – finger point quality

assessment – computer enhancement and modeling of fingerprint images – finger print enhancement – Feature extraction – fingerprint classification – fingerprint matching.

UNIT III FACE RECOGNITION AND HAND GEOMETRY 9

Introduction to face recognition, Neural networks for face recognition – face recognition from correspondence maps – Hand geometry – scanning – Feature Extraction – Adaptive Classifiers – Visual-Based Feature Extraction and Pattern Classification – feature extraction – types of algorithm – Biometric fusion.

UNIT IV MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION 9

Introduction to multimodal biometric system – Integration strategies – Architecture – level of fusion – combination strategy – training and adaptability – examples of multimodal biometric systems – Performance evaluation – Statistical Measures of Biometrics – FAR – FRR – FTE – EER – Memory requirement and allocation.

UNIT V BIOMETRIC AUTHENTICATION 9

Introduction – Biometric Authentication Methods – Biometric Authentication Systems – Biometric authentication by fingerprint – Biometric Authentication by Face Recognition – Expectation – Maximization theory – Support Vector Machines. Biometric authentication by fingerprint – biometric authentication by hand geometry – Securing and trusting a biometric transaction – matching location – local host – authentication server – match on card (MOC) – Multibiometrics and Two-Factor Authentication.

REFERENCES:

1. Paul Reid, “Biometrics for Network Security”, Pearson Education, 2004.
   Nalini K.Ratha,RundBolle,“Automatic fingerprint recognition system, Springer”, 2003.
2. L C Jain, I Hayashi, S B Lee, U Haleci, “Intelligent Biometric Techniques in Fingerprint and Face Recognition”.
3. S.Y.Kung,S.H.Lin,M.W.,“MakBiometricAuthentication:A Machine Learning Approach”.
4. John Chirillo, Scott Blaul, “Implementing Biometric Security”, John Wile, 2003.
5. IEEE – T- PAMI (IEEE transaction on Pattern Analysis and Machine Intelligence) International journal of computer vision, Springer.

Faculty of I and C Engg (**Approved in 9th AC 02.12.2006) ITEM NO. FI 9.5(4)**

FI1914 MEDICAL IMAGE RETRIEVAL L T P C
3 0 0 100

UNIT I INTRODUCTION TO MEDICAL IMAGE RETRIEVAL 7

Need for Intelligent Databases – Significance of Feature Space Selection – Towards Advanced Image Retrieval – Multimedia Systems and Image Retrieval Systems – Wavelet Transforms.

UNIT II IMAGE RETRIEVAL SYSTEMS 10

Systems Using Edge Points – Colour Histograms – Textures, Fuzzy Based Image Retrieval – System-Clustering Based Image Retrieval System – Texture Based and Content based Image Retrieval Systems – Meta data based image retrieval system – Web based image retrieval system – Neural based approaches for image retrieval system.

UNIT III CONTENT BASED IMAGE AND VIDEO RETRIEVAL SYSTEMS 10

Feature Extraction and representation – Feature classification and selection – Colour based – Features – Color models – Representation of colors properties – Texture based features – Shape based features – Specialized features – Video Parsing – Shot boundary Detection – Scene boundary detection – Video abstraction and summarization Keyframe extraction – Highlight sequences – Video content representation indexing and retrieval – video browsing schemes.

UNIT IV ONTOLOGY BASED MEDICAL IMAGE RETRIEVAL SYSTEM 9

Digital Image management in biomedicine – Ontologies and models for the handling of medical images – Advances in Image Databases languages – Indexing Large collections of medical Images – Telematics in Health care – Wavelet based medical Image distribution – Understanding and using DICOM – The data interchange standard for Bio medical Imaging.

UNIT V APPLICATIONS AND CURRENT TRENDS 9

Image retrieval in pathology – mammography – Biomedical applications – Web related applications – ADL (Alexandria Digital Library) – AMORE (Advanced Multimedia Oriented Retrieval Engine) – BDLP (Berkeley Digital Library Project) – Blobworld CANDID (Comparison Algorithm for navigating digital image databases) – CBVQ (content based visual query) – CHROMA (colour hierarchical Representation Oriented Management Architecture).

REFERENCES:

1. Gong Yihong Gong, Intelligent Image Databases: Towards Advanced Image Retrieval, Springer, USA, 1997.
2. James Z Wang, Integrated Region – Based Image Retrieval, Springer USA, 2001.
3. Remco C Veltkamp, Hans Burkhardt, Hans-Peter Kriegel, State-Of-The-Art in Content-Based Image and Video Retreval, Springer, USA, 2001.
4. Milan Petkovic, Willem Jonker, Content-Based Video Retrieval, Springer, USA, 2003.
5. C. Brodley, A. Kak, C.Shyu, J.Dy, L.Broderick, and A.M.Aisen. Content-Based Retreival from Medical Image Databases: A Synergy of Human interactions, Maching Learning and Computer Vision, In Proc. of the Sixteenth National Conference on Artificial Intelligence (AAAI'99), Orlando Florida, July 1999.
6. C.H.Wei, C-Li and R.Wilson. A General Framework for Content-Based Medical Image Retrieval with its Application to Mammograms. In Proc. SPIE Int'l Symposium on Medical Imaging, San Diego, February, 2005.
7. Tagore, D.H., Jaffe, C.C., & Duncan. J. Medical Image Databases: A Content-based retrieval approach. Journal of American Medical Informatics Association, 4(3),1997, pp.184-198.

FI1915 WIRELESS SENSOR NETWORKS (DIRECTED STUDY) **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture –Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks– WINS ,µAMPS Underwater Acoustic and Deep space networks.

UNIT II PHYSICAL LAYER **9**

Introduction wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication , packet transmission and synchronization, quality of wireless channels and measures for improvement, physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management .

UNIT III DATA LINK LAYER **9**

MAC protocols –fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols, Link Layer protocols –fundamentals task and requirements ,error control ,framing, link management

UNIT IV NETWORK LAYER **9**

Gossiping and agent-based uni cast forwarding , Energy-efficient unicast, Broadcast and multicast, geographic routing , mobile nodes, Data –centric and content-based networking –Data –centric routing, Data aggregation, Data-centric storage, Higher layer design issues

UNIT V CASE STUDY **9**

Target detection tracking, Habitat monitoring, Environmental disaster monitoring, Practical implementation issues, IEEE 802.15.4 low rate WPAN, Sensor Network Platforms and tools-Sensor node hardware, Node-level software platforms, node –level simulators.

REFERENCES:

1. Wireless Sensor Networks: an information processing approach – Feng zhao, Leonidas guibas, Elsivier publication, 2004.
2. Wireless Sensor Networks –C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, Springer publication, 2004.
3. Wireless Sensor Networks : Architecture and protocol –Edgar H .Callaway, CRC press.
4. Protocol and Architecture for Wireless Sensor Networks –Holger Karl , Andreas willig ,John wiley publication, Jan 2006.
5. Wireless Sensor Networks: First European workshop, EWSN 2004, Berlion, germany, January 2004 proceedings –Holger Karl , Andreas willig,Adam holisz,Springer publication.
6. .I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, “Wireless sensor networks: a survey”, computer networks, Elsevier, 2002, 394 - 422.
7. Jamal N. Al-karaki, Ahmed E. Kamal, ” Routing Techniques in Wireless sensor networks: A survey”, IEEE wireless communication, December 2004, 6 – 28.

FI1916 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS **L T P C 3 0 0 3**

UNIT I INTRODUCTION AND DESIGN PERFORMANCE 9

The Art of Performance Evaluation, Professional Organization, Performance Projects, an overview of Queuing Network Modeling – queuing model, definition, parameters evaluation, conducting a modeling study– modeling cycle, workload characterization, sensitivity analysis, sources of insight, common mistakes, Systematic approach ,Selection of evaluation techniques and performance metrics, Utility Classification and setting performance requirements.

UNIT II BOUNDS OF PERFORMANCE 9

Fundamental laws – basic quantities, little's law, the forced flow law, the flowassumption, Queuing Network Model Inputs and Outputs –model inputs ,outputs, multiple class models, Bounds on performance – Asymptotic bounds, balanced system bounds.

UNIT III MEASUREMENT TECHNIQUES AND TOOLS 9

Types of workloads – addition Instruction, kernels, synthetic programs, application benchmarks, popular benchmarks, The art of workload selection –services, levels , representative ness, timeliness, other considerations, workload characterization Techniques –Terminology, Averaging, Specifying Dispersion, Single-Parameter Histograms, Multi-parameter Histogram, Principal components Analysis, Markov models, Clustering. The Art of Data Presentation- Types of variables, graphics chart, Pictorial games, Gantt charts, Kiviat graphs, Schumacher charts, Decision maker's games, Ratio games – Selection of appropriate Base System and Ratio metric, strategies, correct analysis.

UNIT IV EXPERIMENT DESIGN AND SIMULATION 9

Terminology, Types of experimental design,2 Factorial design , effects of computation , sign table method, allocation of variation, estimation of experimental errors, analysis of variance, visual diagnostic tests, confidence intervals for effects, Simulation – common mistake, causes of failure, terminology, selection of language, types, event-set algorithms, models with one job class, multiple job classes, flow equivalence and hierarchical modeling, disk I/O.

UNIT V QUEUING THEORY 9

Introduction to Queuing theory –Notations, rules, little's law, types of stochastic processes, Analysis of single queue – Birth –death processes, M/M/1 ,M/M/m , M/M/m/B with finite buffer, Queuing networks –Open and Closed, Product form, Queuing network models for computer systems. Case studies.

TOTAL: 45 PERIODS

REFERENCES:

1. Raj Jain,"The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling",Wiley-Interscience, 1991
2. E.D. Lazowska, J. Zahorjan, G.S. Graham & K.C. Sevcik, "Quantitative System Performance", Prentice-Hall, 1984.
3. L. Kleinrock, "Queueuing Systems, Vol. 1: Theory", Wiley,1975.
4. L. Kleinrock, "Queueuing Systems, Vol. 2: Applications",Wiley 1976.
5. K.S. Trivedi, "Probability and Statistics with Reliability,Queueing and Computer Science Applications", Prentice-Hall,1982.
6. D.Ferrari,G.Serazzi&A.Zeigner,"Measurement and Tuning of Computer Systems", Prentice-Hall

FI1917 CONTENT BASED INFORMATION RETRIEVAL L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain Gray level Transformations - Histogram Processing -- Spatial Filtering – Smoothing and Sharpening.Frequency Domain : Filtering in Frequency Domain – DFT, FFT, DCT – Smoothing and Sharpening filters – Homomorphic Filtering.

UNIT III MULTIMEDIA DATABASES 8

Definition – Applications – Data Structures – Image Databases – Video and Audio Processing – Query Languages – SQL Extension – Colour Based Retrieval – Texture Based Retrieval – Shape Based Retrieval – Multimedia Retrieval Frameworks.

UNIT IV IMAGE RETRIEVAL 10

Classification of Images Based on features – Image Segmentation – Region and Object Extraction – Video Parsing for Information Retrieval – Intelligent Search Agents – Evaluation of Image and Video Retrieval – Metrics for evaluation and procedures.

UNIT V CONTENT BASED IMAGE RETRIEVAL 9

Multimedia Query Languages – Semantic Image Features – Image QueriesClassification and Indexing schemes – Video Retrieval – Image Data Management – Standards – Current trends and applications.

TOTAL: 45 PERIODS

REFERENCES:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Person Education, 2003.
4. Michael S.Lew “Image and Video Retrieval”, Springer – Verlag, 2002.
5. J.K.Wu, M.S.Kankanhalli, J.H.Lim, D.Z.Hong “Perspectives on Content Based Multimedia Systems”, Kluwer Academic publishers,Boston,2000.
6. V.S.Subrahmanian and Susil Jajodia (Eds), “Multimedia Database Systems Issues and Reaserch directions”,Springer –Verlag, 1996.
7. Setrag Khosafian and A.Brad Baker, “Multimedia and Image Databases” Morgan Kaufmann, 1996. <http://www.cultivate-int.org/issue6/retrieval/>

FI1918 PATTERN RECOGNITION L T P C
3 0 0 3

UNIT I PATTERN CLASSIFIER 10

Overview of pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum likelihood estimation – Bayesian parameter estimation – Perceptron algorithm – LMSE algorithm – Problems with Bayes approach – Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT II UNSUPERVISED CLASSIFICATION 8

Clustering for unsupervised learning and classification – Clustering concept – C-means algorithm – Hierarchical clustering procedures – Graph theoretic approach to pattern clustering – Validity of clustering solutions.

UNIT III STRUCTURAL PATTERN RECOGNITION 8

Elements of formal grammars – String generation as pattern description – Recognition of syntactic description – Parsing – Stochastic grammars and applications – Graph based structural representation.

UNIT IV FEATURE EXTRACTION AND SELECTION 9

Entropy minimization – Karhunen – Loeve transformation – Feature selection through functions approximation – Binary feature selection.

UNIT V RECENT ADVANCES 10

Neural network structures for Pattern Recognition – Neural network based Pattern associators – Unsupervised learning in neural Pattern Recognition – Self-organizing networks – Fuzzy logic – Fuzzy pattern classifiers – Pattern classification using Genetic Algorithms.

TOTAL: 45 PERIODS

REFERENCES:

1. Robert J.Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
3. Duda R.O., and Har P.E., Pattern Classification and Scene Analysis, Wiley, New York, 1973.
4. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993.

FI1919 TRUSTED SERVICES AND PUBLIC KEY INFRA STRUCTURE L T P C
3 0 0 3

UNIT I OVERVIEW OF PKI TECHNOLOGY 9

Overview of PKI Technology: Symmetric Vs. Asymmetric Ciphers, PKI Services, PKI Enabled Services, Certificates and Certification, Digital Signatures, Securing Web Transactions, Key and Certificate Life Cycles, PKI Standards, Third Party CA Systems, Secure Socket Layer(SSL), CA System Attacks, Key Escrow Vs Key Recovery, Certification Practices, Securing Business Applications, PKI Readiness.

UNIT II PKI ALGORITHMS 9

Public Key Algorithms, Knapsack, RSA, Pohlig-Hellman, Rabin, Elgamal, McElliece, Elliptic Curve Cryptosystems, LUC, Finite Automation Public Key Cryptosystems, Public Key, Digital Signature Cryptosystems: GOST, ESIGN.

UNIT III DESIGN, IMPLEMENTATION, MANAGEMENT 9

Design, Implementation and Management of PKI: PKI Design Issues, PKI-ROI, Architecture for PKI (APKI), Implementing Secure Web services Requirements using PKI, Versign's Foundation in Managed Security Services, Implementation and Deployment, Implementation Costs, PKI Performance, Obtaining a Certificate, Certification Revocation with Managed PKI, Open Revocation Solutions for Today's Enterprise PKI needs.

UNIT IV E-COMMERCE SECURITY THREATS 9

Security Threats to E-commerce: Internet Security Issues Overview, Intellectual Property Threats, Threats to the Security-Client Computers, Communication Channels, Server Computers, Implementing Electronics Commerce Security: Objects, Protecting- Client Computers, Communication Channels, Web Server, Access Control: Authentication, Authorization and Accountability Controls.

UNIT V APPLICATIONS OF PKI 9

Applications of PKI: Trust Models, Deployment and Operation, X.509 Certificates, E-commerce: the building blocks – Trusted Business Environment for E-commerce, Certification, Certification Practice and Policy, Registration, Certification usage and revocation, PKI in Electronic Government; Trusted Services and PKI: Technology Commonality in Approaches and Government Initiatives.

TOTAL: 45 PERIODS

REFERENCES:

1. Larry Caffrey, Rogers W'o Okot-Uma, "Trusted Services and Public Key Infrastructure PKI) International Council of Information Technology in Government Administration, 2000.
2. Cartisle Adams, Steve Lloyd, "Understanding PKI: Concepts, Standards and Deployment Considerations:, Pearson Education, 2003.
3. Vacca R Vacca, "Public Key Infrastructure: Building Trusted Applications and Web Services", CRC Press LLC 2004.
4. Andrew Nash, William Daune, Celia Joseph and Derek Brink, "PKI – Implementing and Managing E-Security, Tata McGraw-Hill Edition, 2001.
5. Gray P.Schneider, "Electronic Commerce", Fourth Annual Edition, 2003.
6. Roberta Bragg, mark Phodes-Ousley and Keith Strassberg, "The Complete Reference Network Security", Tata McGraw-Hill Edition, 2004.
7. Bruce Schneier, "Applied Cryptography", John Willey and Sons, 2001.

Faculty of I and C Engg **(Approved in 9th AC 02.12.2006) ITEM NO. FI 9.5(10)**

FI1920 GAME THEORY L T P C
3 0 0 3

UNIT I I NTRODUCTION 9

Introduction – Rules of the game- Strategic games – Introduction to zero sum games – Nash Equilibrium – Bayesian game- Mixed Strategic Nash Equilibrium.

UNIT II EXTENSIVE GAME WITH PERFECT INFORMATION 9

Extensive game with perfect information – Bargaining games – repeated games – sub game perfect equilibrium.

UNIT III EXTENSIVE GAME WITH IMPERFECT INFORMATION 9

Extensive game with Imperfect Information – Equivalence of Extensive games – mixed strategy – strategy as machine.

UNIT IV COALITION GAME THEORY 9

Coalition Game with transferable payoff- Exchange economy – Stable Set Bargaining – Shapley Value.

UNIT V EVOLUTIONARY GAME THEORY 9

Evolutionary theory – stability – Dynamic structure – Stochastic stability.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Oborne Martin.J, "An Introduction to Game Theory", Oxford University Press – 2003.
2. Martin J. Osborne, Ariel Rubinstein, "A course in Game Theory", MIT press – 1984.

REFERENCES:

1. Eric Rasmesen "Games and Information: An Introduction to game theory",MIT press.
2. Joel Watson, "Strategy: An Introduction to Game Theory"W.W. Norton & Company – 2001.

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FI1921 SPEECH AND MUSIC SIGNAL PROCESSING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Overall Introduction – Brief History of Automatic Speech Recognition (ASR) – ASR Background – Early History of Synthetic Audio – Speech Analysis/Synthesis. Overview – Spoken Language System Architecture and Structure – Sound and Human Speech System – phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability Theory – Estimation Theory – Significance Testing – Mathematical Background – Speech Recognition Overview – Pattern Classification – Statistical Pattern Classification – Expectation Maximization(EM).

UNIT II ACOUSTICS & AUDITORY PERCEPTION 9

Wave Basics – Speech Production Models – Music Production Models – Room Acoustics – Ear Physiology – Psychoacoustics – Models of Pitch Perception – Models of Speech Perception – Human Speech Recognition – Speech features – The Auditory System as a Filter Bank – Filter Banks and Cepstral Analysis – LPC for Speed Analysis.

UNIT III SPEECH CODING AND RECOGNITION 12

Perceptual Motivated Representations – Formant Frequencies – Role of Pitch – Pitch Detection of Speech and Music – Channel Vocoders and Predictive Coding Scalar Waveform Coders – Scalar Frequency Domain Coders – Code excited linear Prediction Low – Bit rate Speech coders, Speech

Recognition – Hiden Markov Models (HMM) – Practical Issues in Using HMMs – HMM Limitations. Acoustic Modeling – Phonetic Modeling – Language Modeling – Speaker Recognition Algorithm – Signal Enhancement for Mismatched Conditions.

UNIT IV PSYCHOPHYSICS OF MUSIC 9

Time elements in music – Sound vibrations – pure tones and perception of pitch – auditory coding in the nervous system – subjective pitch and role of nervous system – Sound waves – acoustical energy – perception of loudness, pitch, timbre – Pitch contour Musical Struture – Detecting beats, rhythm, meter – recognizing pitch – melody, auditory streaming – tonality and context – algorithms – Grammar for music.

UNIT V INTERACTIVE AUDIO SYSTEMS 6

Dialog Structure – Semantic Representation – Sentence Interpretation – Discourse Analysis – Dialog Management – Response Generation and Rendition – Generating music – Creating expression for music – Digital representation of music – Case Study.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Thomas F.Quatieri, "Discrete – Time Speech Signal Processing", Pearson Eduation, 2002.
2. B.Gold and N.Morgan, "Speech and Audio Signal Processing", Wiley and Sons, 2000.
3. Xuedong Huang, Alex Acero, Hsiad, Wuen Hon, "Spoken Language Processing", Prentice Hall 2001.
4. Daniel J.Epstein, "Music Perception and Cognition", Springer 2005.

REFERENCES:

1. M.R.Schroeder, "Computer Speech – Recognition, Compression, Synthesis", Springer Series in Information Sciences, 1999.
2. A Brief Introduction to Speech Analysis and Recognition, An Internet Tutorial – http://www/mor.itesm.mx/-omayora/Tutorial/tutorial.html
3. Daniel Jurafsky & James H.Martin, "Speech and Language Processing", Pearson Education, 2000.
4. R.Duda, P.Hart and D.Stork, "Pattern Classification". Wiley Interscience, 2001 edition, (Note: the 1973 version entitled "Pattern Classification and Scene Anaysis" and without stork as co-author, is still useful.

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FI1922 PEER-TO-PEER COMPUTING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Understanding of p2p – understanding p2p distributed computing – application of p2p – privacy – security – p2p and intellectual property.

UNIT II FILE SHARING 9

File Sharing – file sharing with Instant Massaging – Media – sharing services – Free-net Napster – Guntalla network.

UNIT III COLLABORATION 9

Introduction – Groova network and other p2pgroupware – p2p gaming – p2p collaborative application.

UNIT IV COMMUNICATION 9

Understanding p2p communication – AIM windows Massage – Intranet Telephone – Video Conferencing.

UNIT V SECURITY 9

Trust – Reputation – Attacks – Security on nodes – security on files – free-riding problem Malicious peer.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Dane Moore and John Hebelar, "Peer-to-peer: Building Secure, Scalable and Manageable networks" – McGraw-Hill Osborne Media 2001.

REFERENCES:

1. Michael Miller, "Peer-to-peer Harnessing the power of distributed technologies" Mike miller – O'Reilly-2001.
2. Michael Miller, "Discovering peer to peer", Michael Miller Sybex; First edition 2001.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(1)**

FI1923 OPTICAL SWITCHING ARCHITECTURES L T P M
3 0 0 100

UNIT I ACCESS NETWORKS 9

Network architecture overview - today's access networks - future Access networks - optical access network architecture - application area – Passive optical networks- Broadcast Select PON – WRPON - Case study – SUCCESS HPON- Network topology – Media access control protocol – Scheduling algorithm- Ethernet based passive optical networks –QoS.

UNIT II VIRTUAL TOPOLOGY DESIGN 9

Design problem – design heuristics – topology reconfiguration due to traffic changes- Network management- Protection concepts in Ring Networks, Mesh Networks- Handling node failures- Combined SONET/WDM network design – Regular virtual topologies – Shuffle net – Implementation in broadcast select network

UNIT III OPTICAL INTERNET NETWORKS 9

Optical Circuit switching- Optical Burst switching- Optical packet switching – MPLS in WDM Networks -Types MPLS Nodes – Multi protocol lambda switching – MPLS and Optical TE similarities – IP, MPLS and Optical control planes –LSP routing.

UNIT IV OPTICAL SWITCHING 9

Free-space optical switching – multistage optical interconnection networks- back plane optical interconnects, optical memory for switching – logic functionality – nonlinear fiber couplers, photonic switch architectures based on TDM, WDM, OCX, ATM.

UNIT V WAVELENGTH- CONVERTIBLE NETWORKS 9

Routing in convertible networks – Performance Evaluation – Network with sparse wavelength conversion – Converter Placement problem – Converter problem – Rerouting - Benefits and Issues, Light path Migration, Rerouting Schemes, Algorithms- AG, MWPG.

TOTAL: 45 PERIODS

REFERENCES:

1 C.Siva Rama Murthy and Mohan Gurusamy, " WDM Optical Networks – Concepts, Design and Algorithms", Prentice Hall of India Pvt. Ltd, New Delhi –2002.
2 Uyless Black, "Optical Network: Third Generation Transport System", Pearson Education, Ist edition, 2002.
3 Hussein T.Mouftah and Jaafar M.H.Elmirghani, "Photonic Switching Technology – Systems and Networks ",IEEE Press, New York -10016-5997,ISBN – 0-7803-4707-2.
4 Rajiv Ramaswamy and Kumar N.Sivarajan, "Optical Networks – A Practical Persepctive", Morgan Kauffman, 2004
5 Bahaa E.A. Saleh, Malvin Carl Teich, "Fundamentals of Photonics" Wiley Interscience; 1st edition, 2002.
http://www.wdm.stanford.edu/ snrc-access/

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(2)**

FI1924 CDMA SIGNAL DETECTION L T P M
3 0 0 100

UNIT I CDMA BASIC THEORY 9

Spreading Codes – Orthogonal Codes, Pseudo- Noise Codes, Synchronization Codes autocorrelation and Cross-Correlation. Intercell Interference – Channel Coding – Coding Processes. Coding Theory – Block Codes – Convolutional Codes – Turbo Codes.

UNIT II CDMA CHANNEL 9

Basic Synchronous & asynchronous CDMA model – Signature waveforms – Data streams – Modulation – Fading – Background noise – Discrete time models – Hypothesis testing – Optimal receiver for the single user channel.

CDMA SINGLE-USER MATCHED FILTER

Matched filter in CDMA system – Asymptotic Multi-user efficiency and related measures Coherent single user matched filter in Rayleigh fading – Differentially coherent demodulation – Noncoherent modulation.

UNIT III OPTIMUM MULTIUSER DETECTION 9

Optimum detector for synchronous channels – Optimum detector for asynchronous channels – Minimum error probability in synchronous channel - K user optimum asymptotic efficiency and near far resistance - Minimum error probability in asynchronous channel – performance analysis in the Rayleigh fading – Optimum no n coherent multi-user detection.

UNIT IV SPREAD SPECTRUM SYSTEMS & CDMA STANDARDS 9

Types of Techniques – Direct sequence spread spectrum – CDMA system – TIA IS – 95 system – CDMA standards – Layers – Call processing – Service configuration – System & networks identification – Registration – Wideband CDMA.

UNIT V MANAGEMENT OF CDMA NETWORKS 9

Telecom Management Networks – Wireless network management – Configuration, Fault and performance management – internetworking issues – dual mode digital / AMPS systems – wireless intelligent networks – multiple beam adaptive array.

TOTAL: 45 PERIODS

REFERENCES:

1. Juha Korhonen, "Introduction to 3G mobile communications", Second Edition, Artech House, 2003.
2. Daniel Collins, Clint Smith, "3G Wireless Networks", McGraw Hill, 2001.
3. Roman Ritka, Richard Levine, Lawrence J.IlJarte, "3-G Wireless Demystified McGraw Hill, 2001.
4. Sergio Verdu, "Multiuser detection ", Cambridge University Press,1998.
5. Comaniciu, Cristina, Mandayam, Narayan B., Poor Vincent, "Wireless Networks: Multiuser Detection in Cross-Layer Design Series. InformationTechnology: Transmission, Processing & Storage ", Springer, 2005.
6. Vijay K.Garg: Kenneth smelik, Joseph E.Wilkins "Application of CDMA in wireless Personal Communication", Prentice Hall 1999.
7. Dr.Man Young Rhee, "CDMA Cellular Mobile Communication & Network Security "Prentice Hall 1998.
8. Raymooud Steele: Chin Chn Lee & Peter Gould, "GSM CDMA One and 3G systems ", ohn Wiley 2001.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(3)**

FI1925 NEXT GENERATION WIRELESS NETWORKS L T P M
3 0 0 100

UNIT I WIRELESS IP NETWORK ARCHITECTURES 9

Packet Data Networks, Network Architecture, Protocol Reference Model, Packet Data Protocols, Bearers, and Connections for Packet Services, Packet Data Protocol (PDP) Context, Steps for a Mobile to Access 3GPP Packet-Switched Services, User Packet Routing and Transport, Configuring PDP Addresses on Mobile Stations, GPRS Attach Procedure, PDP Context Activation and Modification, Radio Access Bearer Assignment, Packet-Switched Domain Protocol Stacks, Accessing IP Networks through PS Domain, 3GPP2 Network Architecture, 3GPP2 Packet Data Network Architecture, MWIF All-IP Mobile Networks, Network Architectures, Access to MWIF Networks, Session Management

UNIT II IP MULTIMEDIA SUBSYSTEMS AND APPLICATION-LEVEL SIGNALING 9

Signaling in IP Networks, Session Initiation Protocol (SIP), Session Description Protocol (SDP),3GPP IP Multimedia Subsystem (IMS), IMS Architecture, Mobile Station Addressing for Accessing the IMS, Reference Interfaces, Service Architecture, Registration with the IMS, Deregistration with the IMS, End-to-End Signaling Flows for Session Control, 3GPP2 IP Multimedia Subsystem (IMS)

UNIT III MOBILITY MANAGEMENT 9

Basic Issues in Mobility Management, Impact of Naming and Addressing on Mobility Management, Location Management, Packet Delivery to Mobile Destinations, Handoffs, Roaming, Mobility Management in IP Networks, Naming and Addressing of IP Terminals, Mobile IPv4 , MIPv4 Regional

Registration, Paging Extensions to Mobile IPv4, Mobile IPv6, SIP-Based Mobility Management, Cellular IP, HAWAII, Mobility Management in 3GPP Packet Networks, Packet Mobility Management (PMM) Context and States , Location Management for Packet-Switched Services , Routing Area Update, Serving RNS Relocation, Hard Handoffs, Paging Initiated by Packet-Switched Core Network, Service Request Procedure, Handoff and Roaming Between 3GPP and Wireless LANs, Location Management for Packet Data Services, Handoffs for Supporting Packet Data Services

UNIT IV SECURITY 9

Different Facets of Security, Security Attacks, Cryptography, Public-Key Infrastructure (PKI), Internet Security, IP Security (IPsec), Authentication, Authorization, and Accounting (AAA), Security in Wireless Networks, Security in IS-41, Secret Keys, Authentication, Privacy, Security in GSM, Security in GPRS, Security in 3GPP, Security Principles, Security Architecture, Network Access Security, Network Domain Security.

UNIT V QUALITY OF SERVICE 9

Internet QoS, Integrated Services (Int-Serv), Differentiated Services (Diff-Serv), Comparison of Int-Serv and Diff-Serv, Policy-Based QoS Management , QoS Challenges in Wireless IP Networks, QoS in 3GPP, UMTS QoS Architecture, UMTS QoS Management, UMTS QoS Classes, QoS Attributes (QoS Profile), Management of End-to-End IP QoS, QoS in 3GPP2, 3GPP2 QoS Architecture, 3GPP2 QoS Management, 3GPP2 QoS Classes, QoS Attributes (QoS Profile), Management of End-to-End IP QoS

TOTAL: 45 PERIODS

REFERENCE:

1. JYH – CHENG CHEN, TAO ZHANG, “IP – Based Next Generation Wireless Networks (Systems, Architectures and Protocols)”

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(4)**

FI1926 ADVANCES IN WIRELESS COMMUNICATION L T P M
3 0 0 100

UNIT I WIRELESS CHANNEL AND POINT TO POINT COMMUNICATION 9

Wireless systems- Physical modeling for wireless channels- Input /output model of the wireless channel- Time and frequency coherence-Statistical channel models Detection in a Rayleigh fading channel- Time diversity-Antenna diversity-frequency diversity-impact of channel uncertainty

UNIT II CELLULAR SYSTEMS DESIGN-MULTIPLE ACCESS AND INTERFERENCE MANAGEMENT 9

Narrow band cellular system- GSM system-Wide band systems-CDMA-uplink-CDMA down link-OFDM-Allocation design principles-Hopping pattern-receiver design-sectorization

UNIT III MULTI USER CAPACITY OF WIRELESS CHANNELS AND OPPORTUNISTIC COMMUNICATION 9

AWGN channel capacity-resources of the AWGN channel-Linear time –invariant Gaussian channels-capacity of fading channels-Uplink AWGN channel-Down link AWGN channel-uplink fading channel-down link fading channel-Frequency selective fading channel-Multi user diversity

UNIT IV MIMO CHANNEL MODELING -CAPACITY AND ARCHITECTURES **9**

Multiplexing capability of deterministic MIMO channels- Physical modeling of MIMO channels-Modeling of MIMO fading channels-The V-BLAST architecture-fast fading MIMO channel-receiver architectures- slow fading MIMO channel- D-BLAST outage optimal architecture

UNIT V MIMO DIVERSITY MULTIPLEXING-MULTI USER COMMUNICATION **9**

Diversity –multiplexing tradeoff-universal code design for optimal diversity-Uplink with multiple receive antennas-MIMO uplink-Down link with multiple transmit antennas- MIMO down link

TOTAL: 45 PERIODS

TEXT BOOK:

1. David Tse, Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005

REFERENCES:

1. Paulraj, Rohit Nabar, Dhananjay Gore, "Introductin to Space Time Wireless Communication Systems", Cambridge University Press, 2003.
2. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(5)**

FI1927 SWARM INTELLIGENCE L T P C
3 0 0 100

UNIT I FUNDAMENTALS **9**

Foundations – Models and Concepts of Life and Intelligence – Symbols, Connections and Optimization by Trail and error.

UNIT II SOCIAL ORGANISM, PARTIAL SWARM TECHNIQUES AND COLLECTIVE INTELLIGENCE TECHNIQUES **9**

Non-Existence as Entities: The Social Organism, Human – Actual, Imagined and Implied, Thinking is Social, Introduction to Partial Swarm Techniques and Collective Intelligence Techniques.

UNIT III COLLECTIVE INTELLIGENCE AND PARTIAL SWARM INTELLIGENCE **9**

Variations,Comparisons, Implications and speculations in Collective Intelligence and Partial Swarm Intelligence.

UNIT IV ANT COLONY OPTIMIZATION **9**

Introduction to Ant Systems, Ant Colony Optimization Technique, Pheromones and its Density as Deciding Factor, Applications of Ant Colony Optimization in Discrete Mathematics Problem – Travelling Salesman Problem.

UNIT V APPLICATIONS OF SWARM INTELLIGENCE 9

Applications in Wired, Wireless and Wireless Sensor Networks – Routing and Clustering, Applications in other Computer Science Areas.

TOTAL : 45 PERIODS

REFERENCES:

1. James Kennedy, Russell C. Eberhart, with Yuhui Shi, “Swarm Intelligence”, Morgan Kaufmann, 2001.
2. Andries P. Engelbrecht, “Computational Swarm Intelligence“, Wiley, John & Sons, 2006.
3. Eric Bonabeau, Marco Dorigo, and Guy Theraulaz, “Swarm Intelligence: From Natural to Artificial Systems”, Oxford University Press, 1999.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(6)**

FI1928 SECURITY IN SENSOR NETWORKS L T P C
3 0 0 3

UNIT I 9

Introduction- Overview of Sensor Networks - Classification of sensor networks -Architecture and Protocol Stack -Communication Protocols for Sensor Networks-Energy Efficient hardware design-Factors Influencing WSN-Wireless Sensor Network Applications

UNIT II 9

Protocols-Application Layer -Transport Layer -Routing Algorithms -Medium Access Control-Error Control -Physical Layer –Localization-Time Synchronization –QOS

UNIT III 9

Security-Security for Wireless Sensor Networks-Overview-Basic cryptographic primitives, including encryption, authentication, hashing, signatures and attacks they can prevent-Key Management-Security in Sensor Networks: Watermarking Techniques

UNIT IV 9

Localization and management-Group communication-Coordination and Communication Problems in WASNs-Localization in Sensor Networks-Sensor Management-.Adapting to the inherent dynamic nature of WSNs, and Sensor Networks and mobile robots.

UNIT V 9

Broadcast Authentication protocols-TELSA-Variation of TELSA-BiBa-HORNS-Sensor network simulators.

TOTAL: 45 PERIODS

REFERENCES:

1. Donggang Liu, Peng Ning, “Security for Wireless Sensor Networks”, Springer. ISBN: 0387327231, December 2006.
2. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati, "Wireless sensor networks", Springer ISBN 1402078838, 2004.
3. Steven Strauss, S Iyengar Sitharama Iyengar, Brooks R R, IYENGAR S SITHARAMA, "Distributed Sensor Networks", CRC Press Technology ISBN 1584883839 , 2004.

4. Edgar H. Callaway, "Wireless Sensor Networks: architectures and protocols", CRC Press ISBN 0849318238, 2004.
5. Holger, "Protocols and Architectures for Wireless Sensor Networks", John Wiley and Sons Technology & IndustrialArts ISBN 0470095105, 2005.
6. Ivan Stojmenovi,"Handbook of Sensor Networks: Algorithms and Architectures", CRC Press ISBN: 978-0-471-68472-5, 2005.
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks",Springer ISBN 0792376501, 2006.
TinyOS 2.0 Simulation Working Group
http://tinyos.stanford.edu:8000/SimWG

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(7)**

FI1929 VIRTUAL MACHINES L T P C
3 0 0 3

UNIT I INTRODUCTION TO VIRTUAL MACHINES 7

Computer Architecture - Virtual Machine Basics - Process Virtual Machines - System Virtual Machines - Key Concepts - Multiprocessor Virtualization - Partitioning of Multiprocessor Systems.

UNIT II EMULATION AND PROCESS VIRTUAL MACHINES 8

Interpretation and Binary Translation: Basic Interpretation - Threaded Interpretation – Pre-decoding and Direct Threaded Interpretation - Interpreting a Complex Instruction Set Binary Translation - Code Discovery and Dynamic Translation - Control Transfer Optimizations - Instruction Set Issues.
Process Virtual Machines: Virtual Machine Implementation – Compatibility - State Mapping - Memory Architecture Emulation - Instruction Emulation - Exception Emulation Operating System Emulation - Code Cache Management - System Environment.

UNIT III DYNAMIC OPTIMIZATION 10

Dynamic Program Behavior – Phased Program Behavior - Profiling - Optimizing Translation Blocks - Optimization Framework - Code Reordering - Code Optimizations - Same-ISA Optimization Systems: Special-Case Process Virtual Machines - Adaptive Optimizations.

UNIT IV HIGH-LEVEL LANGUAGE VIRTUAL MACHINE ARCHITECTURE & IMPLEMENTATION 10

Object-Oriented High-Level Language Virtual Machines - The Java Virtual Machine Architecture - The Microsoft Common Language Infrastructure - Dynamic Class Loading Implementing Security - Garbage Collection - Java Native Interface - Basic Emulation - High-Performance Emulation - Case Study: The Jikes Research Virtual Machine.

UNIT V CO-DESIGNED VIRTUAL MACHINES 10

Memory and Register State Mapping - Self-Modifying and Self-Referencing Code - Support for Code Caching - Trace Generation - Implementing Precise Traps - Input/Output - Applying Co-designed Virtual Machines - Case Study: Transmeta Crusoe, IBM AS/400.

TOTAL: 45 PERIODS

REFERENCES:

1. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
2. Bill Venners, Inside the JAVA 2 Virtual Machine, 2e, McGraw Hill, 2000.

3. David Stutz, Ted Neward, Geoff Shilling, Shared Source CLI Essentials, O'Reilly, 2003.
4. Tim Lindholm and Frank Yellin, The Java Virtual Machine Specification, Addison-Wesley Longman Publishing Co., Inc., 1999.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(8)**

FI1930 **PROGRAM SLICING** **L T P C**
3 0 0 3

UNIT I **9**

Introduction to program slicing-Definitions- Slicing criterion- Types: static and dynamic slicing – Slices: data slice-control slice - Conditioned Slicing- Amorphous Slicing- Proof slicing-Control flow graph-Computation of slices-Data flow diagram and analysis-Slicing control flow graphs-Union slices-Parallel slicing-Reaching definitions-Control flow analysis-Applications of slicing.

UNIT II **9**

Program slicing metrics- Introduction- Program Slicing and Software Evolution- Slicing metrics- Inertia and evolvability - Applying slice-based metrics to inertia - A formal method for program slicing-Modular Monadic Program Slicing-Forward slices Vs backward slices-Proposition- Source Code Analysis- Implications- Bug Classification Using Program Slicing Metrics- UC metrics and PS metrics.

UNIT III **9**

An empirical study of executable concept slice size- Concept Assignment - Executable Concept Slicing - Graph-less dynamic dependence-based dynamic slicing algorithms- Demand-Driven Algorithms- Practical Global Algorithms- Parallel Global Algorithms - An extension to robustness slicing algorithm based on dynamic array- Extension to SmallC and Transformation *T.*

UNIT IV **9**

Stop-list slicing- Threats to Validity -Static slicing for pervasive programs – CM Centric Programs - Slicing component-based systems- A Dependence Model - Method Dependence Graph- Operation Dependence Graph - Interface Dependence Graph- Component Dependence Graph- System Dependence Graph- Data Reverse Engineering- Slicing with Embedded Code - SDG Construction-Slicing with DAM - DML Code Analysis.

UNIT V **9**

Search–based amorphous slicing- Slicing and Amorphous Slicing - Search Algorithms -Computation of dynamic slices for object-oriented concurrent programs- Object Oriented Concurrent Program Dependence Graph (OOCPDG)- Dynamic Slicing of Concurrent Object Oriented programs by Edge Marking - The Slicing Tool CDSOOCP - Study and analysis-implementation-Proof Slicing-PS for Web services.

TOTAL: 45 PERIODS

REFERENCES:

1. Norman E – Fentar, Share Lawrence Pflieger, “Software Metrics”, International Thomson Computer Press, 1997.
2. S.H. Kin, “Metric and Models in Software Quality Engineering”, A.Wesley, 1997.
3. Tracy Hall and Paul Wernick, “Program Slicing Metrics and Evolvability: an Initial Study”, Proceedings of the 2005 IEEE International Workshop on Software Evolvability (Software-Evolvability’05) 0-7695-2460-5/05,2005.

4. Heng Lu, Heng Lu, T.H. Tse, “Static Slicing for Pervasive Programs”, Proceedings of the Sixth International Conference on Quality Software (QSIC'06)0-7695-2718-3/06, 2006.
5. Kai Pan, Sunghun Kim, E. James Whitehead, Jr, “Bug Classification Using Program Slicing Metrics”, Proceedings of the Sixth IEEE International Workshop on Source Code Analysis and Manipulation (SCAM'06) 0-7695-2353-6/06,2006.
6. David Binkley Nicolas Gold, Mark Harman, Zheng Li and Kiarash Mahdavi, “An Empirical Study of Executable Concept Slice Size”, Proceedings of the 13th Working Conference on Reverse Engineering (WCRE'06) 0-7695-2719-1/06,2006.
7. A´ rpa´d Besze´des, Tama´s Gergely and Tibor Gyimo´thy, “Graph-Less Dynamic Dependence-Based Dynamic Slicing Algorithms”, Proceedings of the Sixth IEEE International Workshop on Source Code Analysis and Manipulation (SCAM'06) 0-7695-2353-6/06, 2006.
8. Yancheng Wang, Bixin Li, Xufang Gong, “An Extension to Robustness Slicing Algorithm Based on Dynamic Array”, Proceedings of the Seventh ACIS International Conference on Software Engineering,Artificial Intelligence, Networking, and Parallel/Distributed Computing (SNPD’06) 0-7695-2611-X/06,2006.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(9)**

FI1931	**REENGINEERING LEGACY CODE**	**L T P C** **3 0 0 3**

UNIT I **9**

Introduction to system reengineering- Reengineering software systems-Information system evaluation-Opportunism and reengineering - Orchestrating reengineering –Developing strategies-Quality and Information Technology-Reengineering techniques-Operational analysis-Structured project management-Creating an evolutionary system-Rule based system technology.

UNIT II **9**

Reengineering legacy source code to model driven architecture- Meta-Model Architecture- Aspect-Oriented Techniques - Extracting business rules from legacy systems into reusable components-Reusable Components - Recovering Business Rules - Extreme programming for distributed legacy system reengineering-XP Organization for Lattice System Reengineering.

UNIT III **9**

Object-Oriented legacy system trace-based logic testing-Run-Time Information Requirements - Trace-Based Logic Testing and Patterns- Parallel changes: Detecting semantic interferences- Parallel Changes and Research Context - slicing and the detection process - Interference Sets- Optimistic CMS and Concurrent Changes -Extracting reusable object-oriented legacy code segments with combined formal concept analysis and slicing techniques for service integration- High-level Analysis via FCA- Low-level Analysis via Program Slicing- Extracted Legacy Code Segment Integration.

UNIT IV **9**

Migrating interactive legacy systems to web service- Migrating Interactive Legacy Systems - The migration Process -A Grid oriented approach to reusing legacy code in ICENI Framework- Legacy System Decomposition- Selected Code Componentisation-Using formal concept analysis for scheduling legacy system iterative reengineering process- FCA-aided schedule approach.

UNIT V **9**

Towards the automatic evolution of reengineering tools- Grammar evolution using GA -A refactoring-based tool for software component adaptation- Software component refactoring - Software component restructuring process - Component fragmentation and generation of the needed structures - Assembly of the new components - Integration of the adaptation -A framework for reengineering software development methods- Method engineering - Approaches to SME.

TOTAL: 45 PERIODS

REFERENCES:

1. Miller Howard W, "Reengineering legacy software systems", Boston, Mass. Oxford Digital, 1997.
2. Stephen H. Kin, "Metric and Models in Software Quality Engineering", AddisonWesley, 1995.
3. K. Gowthaman, K. Mustafa & R. A. Khan, "Reengineering Legacy Source Code to Model Driven Architecture", Proceedings of the Fourth Annual ACIS International Conference on Computer and Information Science (ICIS'05) 0-7695-2296-3/05, 2005.
4. Chia-Chu Chiang, "Extracting Business Rules from Legacy Systems into Reusable Components", Proceedings of the 2006 IEEE/SMC International Conference on System of Systems Engineering, 1-4244-0188-7, USA, April 06.
5. Zhuopeng Zhang and Hongji Yang, William C. Chu, "Extracting Reusable Object-Oriented Legacy Code Segments with Combined Formal Concept Analysis and Slicing Techniques for Service Integration", Proceedings of the Sixth International Conference on Quality Software (QSIC'06),0-7695-2718-3/06,2006.
6. Jue-Feng Li, Xiao-Hu Yang, Zhi-Jun He, "Using formal concept analysis for scheduling legacy system iterative Reengineering process", Proceedings of the Fifth International Conference on Machine Learning and Cybernetics, 1-4244-0060-0/06, Dalian, 13-16 August 2006.
7. Marko Bajec, Rok Rupnik, Marjan Krisper, "A Framework for Reengineering Software Development Methods", Proceedings of the International Conference. On Software Engineering Advances (ICSEA'06) 0-7695-2703-5/06, 2006.
8. Igor Ivkovic and Kostas Kontogiannis, "A Framework for Software Architecture Refactoring using Model Transformations and Semantic Annotations", Proceedings of the Conference on Software Maintenance and Reengineering (CSMR'06), 0-7695-2536-9/06, 2006.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007)ITEM NO. FI 10.2(10)**

FI1932 IMAGE ACQUISITION AND IMAGE PROCESSING L T P C
3 0 0 3

UNIT I IMAGE ACQUISITION **9**

Image acquisition systems - Sampling and Quantization – Understanding data acquisition-A/D and S/H Circuits - Pixel relationships –Colour fundamentals and models File formats- Steps in image processing systems - Image operations.

UNIT II IMAGE TRANSFORMS **9**

1D DFT- 2D Transforms – DFT - DCT - Inverse DCT - Discrete Sine – Walsh - Hadamard -Wavelet Transforms - Inverse Wavelet Transforms.

UNIT III IMAGE SIGNAL PROCESSING **9**

Representation of continuous time signals by its samples – Sampling theorem – reconstruction of a signal from its samples – aliasing – Discrete time processing of continuous time signals – sampling

of band-limited signals. 2D–DFT in Matlab - M-function Programming . Principles and properties of the z – Transform – Computation of impulse response and transfer function using z – Transform.

UNIT IV IMAGE ENHANCEMENT 9

Spatial Domain: Gray level Transformations – Histogram processing – Spatial filtering smoothing and sharpening-Restoration in midst of noise. Frequency Domain: Filtering in frequency domain – Smoothing and sharpening filters – Homomorphic Filtering - Design of 2D FIR filters – Image restoration – degradation model . Unconstrained and constrained restoration – Inverse filtering – removal of blur caused by uniform linear motion – Weiner filtering – Gray level interpolation.

UNIT V MORPHOLOGICAL IMAGE PROCESSING 9

Dilation,Erosion and Skeletonization of Binary Images - Morphological reconstruction of Images, Grey scale morphology - point, line and edge detection, Thresholding in local and global Image - Region based Image Segmentation. Need for data compression, Huffman , Run-length Encoding – Vector quantization, Block Truncation coding , Transform coding , JPEG standard , JPEG 2000 , SPIHT , MPEG Standards.

TOTAL: 45 PERIODS

REFERENCES:

1. John G.Proakis, Dimitris G.Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, PHI.
2. S.Salivahanan, A.Vallavaraj and C.Gnanapriya “Digital Signal Processing”TMH 2000.
3. A.V. Oppenheim and R.W.Schafer, Englewood “Digital Signal Processing”, Prentice-Hall, Inc, 1975.
4. R.C.Gonzalez, R.E.Woods and S.L. Eddins, ‘Digital Image Processing using Matlab’, PearsonEducation. Education, 2002.
5. Anil. K. Jain, ‘Fundamentals of Digital Image Processing’, Pearson education, Indian Reprint 2003.
6. Kevin M. Daugherty, “Analog – to – Digital conversion – A Practical Approach”, McGraw Hill International Editions, 1995.
7. N. Mathivanan , “Microprocessors, PC Hardware and Interfacing”, Prentice –Hall of India Pvt. Ltd. , 2003

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(11)**

FI1933 ADHOC AND SENSOR NETWORKS L T P M
3 0 0 100

UNIT I AD-HOC NETWORKS 9

Introduction of Ad-Hoc networking - IEEE 802.15 – WPAN – Home RF – Blue tooth – Interference between Blue tooth and IEEE 802.11

UNIT II WIRELESS GEOLOCATION SYSTEM 9

Introduction to Geo location – Wireless Geo location System Architecture – Technologies for Wireless Gen location – Geo location Standards for E-911 Services – Performance of Geo location Systems.

UNIT III WIRELESS SENSOR NETWORKS 9

Introduction to sensor networks – unique features – constraints and challenges, Advantages of sensor networks, Sensor network applications, collaborative processing, Canonical problem: Localization and tracking – A tracking scenario, tracking multiple objects, sensor models, performance comparison and

metrics, Networking sensors – MAC, general issues, geographic energy – aware routing, Attribute – Based routing.

UNIT IV SENSOR TASKING, NETWORK DATABASES AND APPLICATIONS **9**

Sensor tasking and control – Task-Driven sensing, roles of sensor nodes and utilities, Information Based sensor tasking, Joint routing and information aggregation, Sensor Network Databases – Sensor database challenges, Querying the physical environment, Query Interfaces, High-Level Database Organization, In-Network Aggregation, Data-centric storage, Data Indices and Range Queries, Distributed Hierarchical aggregation – Applications.

UNIT V PROTOCOLS, VISUAL SENSING, IDENTIFICATION AND LOCATIONS SENSORS **9**

Protocols – Auto configuration, Energy-Efficient Communication, Mobility Requirements, Energy aware routing , Fault Toleration and Reliability, Energy Efficiency – A Vision-Based Identification sensor – The need for TRIP: A Vision-Based Identification / Location sensor Tags, TRIP sensor Adaptive operation.

TOTAL: 45 PERIODS

REFERENCES:

1. Kaveth Pahlavan, K.Prasath Krishnamoorthy, “Principles of Wireless Networks”, Pearson Education Asia, 2002. [Units 1,2].
2. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks – An information processing approach”, Elsevier Publications, 2005.[Units 3,4]
3. Uwe Hansmann, Lother Merk, Martin S Nicklous and Thomas Stober, “Principles of Mobile Computing”, Springer Publications, Second Edition, 2004. [Unit 5]

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(12)**

FI1934 MULTIMEDIA SECURITY **L T P C**
3 0 0 100

UNIT I **9**

Introduction Multimedia Security and DRM System Overview, Multimedia Technologies.

UNIT II **9**

Fundamentals of Multimedia Security Multimedia Encryption, Multimedia Authentication, Key Management Encryption, Multimedia Authentication, Key Management for Multimedia Access and Distribution, Biometric Based Media Security.

UNIT III **9**

Digital Watermarking, Digital Fingerprinting, Stegnanlysis, Reversible Watermarking.

UNIT IV **9**

Format Complaint Content Protection, Secure Streaming Media protection, Broadcast Encryption, Digital Media Forensics and Security in Distributed Multimedia Systems.

UNIT V **9**

STANDARDS MPEG 4/21 IPMP, DVD, OMAP, The Digital Millennium Copyright Act, Security issues in State-of-the-art Multimedia Protocols, Applications, and Systems (Wired and Mobile Wireless), VOIP Security, Media Sensor Networks.

TOTAL: 45 PERIODS

REFERENCES:

1 Zeng, Yu and Lin (Eds), "Multimedia Security Technologies for Digital Rights Management", Elsevier, July 2006.
2 Andreas Uhi, Andreas Pommer, " Image and Video Encryption from Digital Rights Management to Secured Personal Communication", Springer, 2005.
3 B.Furht and D.Kirovski, editors, "Multimedia Security Handbook", CRC Press, Boca Ranton, Florida, 2004.
4 Cox etal, "Digital Watermarking", Elsevier Science and Technology Books, Oct 2001.
5 Journal of Multimedia Computing and Security, Springer – Verlag.
http://www.drmwatch.com/

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(13)**

FI1935 **WIRELESS SENSOR NETWORKS** **L T P C**
3 0 0100

UNIT I WIRELESS SENSOR NETWORKS **9**

Introduction to sensor networks – unique features – constraints and challenges, Advantages of sensor networks, Sensor network applications, collaborative processing, Canonical problem: Localization and tracking – A tracking scenario, tracking multiple objects, sensor models, performance comparison and metrics, Networking sensors – MAC, general issues, geographic energy – aware routing, Attribute – Based routing.

UNIT II SENSOR TASKING, NETWORK DATABASES AND APPLICATIONS **9**

Sensor tasking and control – Task-Driven sensing, roles of sensor nodes and utilities, Information Based sensor tasking, Joint routing and information aggregation, Sensor Network Databases – Sensor database challenges, Querying the physical environment, Query Interfaces, High-Level Database Organization, In-Network Aggregation, Data-centric storage, Data Indices and Range Queries, Distributed Hierarchical aggregation, Temporal data, Applications – Emerging applications, Future Research Directions.

UNIT III PROTOCOLS, APPROACHES AND SOLUTIONS **9**

Protocols – Auto configuration, Energy-Efficient Communication, Mobility Requirements Approaches and Solutions – Deployment and configuration, Routing, Fault Toleration and Reliability, Energy Efficiency.

UNIT IV VISUAL SENSING, IDENTIFICATION AND LOCATION SENSORS **9**

Introduction – Definition of context, sentient computing, the importance of location, Infrastructure support of sentient computing, Related topics – Location technologies overview, Management of context information, Applications, acceptability of sentient computing. A Vision-Based Identification sensor – The need of TRIP: A Vision-Based Identification / Location sensor Tags, TRIP sensor Adaptive operation.

UNIT V MIDDLEWARE SUPPORT FOR SENTIENT COMPUTING 9

Sentient programming Abstractions – the TRIP Directory service, the sentient information Framework, Sensor fusion through context abstractors, Adaptation and Discovery of middleware services, Software support for sentient computing, the Local Middleware, Case studies : Smart Room using Visual Sense Ptolmey, JSim.

TOTAL: 45 PERIODS

REFERENCES:

1. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks – An information processing approach", Elsevier Publications, 2005.[Units 1, 2]
2. Frank Adelstein, Sandeep K.S.Gupta, Golden G.Richard III and Loren Schwibert. "Fundamentals of Mobile and Pervasive Computing", Tata McGraw – Hill Publications, 2005. [Unit 1, 3, 4, 5]
3. Uwe Hansmann, Lother Merk, Martin S Nicklous and Thomas Stober, "Principles of Mobile Computing", Springer Publications, Second Edition, 2004. [Unit 1, 3, 5]

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(14)**

FI1936 OPTICAL CDMA ARCHITECTURES L T P C
3 0 0 3

UNIT I INTRODUCTION TO OCDMA 9

Optical code division multiple access: A historical perspective, Optical CDMA codes; Overview, Constructions of Coherent Codes , Constructions of Incoherent Codes , Performance Analysis and Comparison of Coherent and Incoherent Codes, Advanced Incoherent Codes, Information Capacity of Fiber-Optical CDMA Systems, Advanced Coding Techniques for Performance Improvement.

UNIT II FIBER BRAGG GRATING TECHNOLOGY 9

Optical code-division multiple-access enabled by fiber bragg grating technology; Introduction, Fiber Bragg Grating Technology, FBGs for FOCDMA, Encoding/Decoding for OCDMA Systems.

UNIT III COHERENT OPTICAL CDMA SYSTEMS 9

Introduction, Coherent OCDMA Approaches, Subsystem Technologies, Code Selection for SPC-OCDMA, OCDMA Network Architectures for SPC-OCDMA.

UNIT IV INCOHERENT OPTICAL CDMA SYSTEMS 9

Introduction, WHTS System Architecture, Technologies for WHTS, OCDMA, Experimental Demonstration of WHTS OCDMA.

UNIT V HYBRID MULTIPLEXING TECHNIQUES 9

Introduction, Hybrid Multiplexing Transmission System, Photonic Gateway: Multiplexing Format Conversion, OCDMA/WDM Virtual Optical Path Cross Connect, .Optical CDMA netwrk architectures and applications, Local Area Networks,Application Demonstrations.

TOTAL: 45 PERIODS

REFERENCES:

1. Paul R. Prucnal, "Optical Code Division Multiple Access- Fundamentals and Applications", Taylor & Francis Ltd; Har/Cdr edition, 2005.
2. Guu-Chang Yang & Wing C. Kwong, "Prime Codes with Applications to CDMA Optical and Wireless Networks", Artech House, 2002.

FI1937 MICRO ELECTROMECHANICAL SYSTEM (MEMS) L T P C
3 0 0 3

UNIT I INTRODUCTION TO MEMS 9

MEMS and Microsystems Micro sensors, icro actuation, MEMS with micro actuators, Micro accelerometers, Micro fluidics, MEMS materials, fabrication process – bulk micromachining, surface micromachining, LIGA.

UNIT II MECHANICS FOR MEMS DESIGN 9

Elasticity, Stress, Strain and material properties, Bending of thin plates, Spring configurations, Thermo mechanics – actuators, force and response time, Fracture and Thin film mechanics.

UNIT III ELECTRO STATIC DESIGN 9

Electrostatics: Basic theory, electrostatic instability, gap and finger pull up, electrostatic actuators, Comb generators, electromagnetic actuators, bistable actuators, Actuator modeling.

UNIT IV CIRCUIT AND SYSTEM ISSUES 9

Electronic interfaces, MOSFET, Op-Amp, Charge measuring circuits, Feedback systems, Noise, Capacitive accelerometer, Peizo electric pressure sensor, Modeling of MEMS systems.

UNIT V OPTICAL MEMS 9

Optical MEMS - System design basics, Design examples: Optical Switching fabrics, Variable attenuators, Tunable optical sources.

TOTAL: 45 PERIODS

REFERENCES:

1. Stephen Santeria, “Mirosystems Design”, Kluwer publishers, 2000.
2. P. Rai-Choudhury , "MEMS and MOEMS Technology and Applications", SPIE--the International Society for Optical Engineering, 2000.
3. Chang Liu, “Foundations of MEMS,” Pearson Prentice Hall, 2006.

FI1938 NETWORK CODING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Concept of network coding - Flows and Cuts of Graphs - Admissible coding rate region - Max-flow Min-cut theorem for network information flow - Max-flow bounds – Achievability of the Max-flow Bound for acyclic Networks and Cyclic Networks – Ford and Fulkerson algorithm.

UNIT II DESIGN OF NETWORK CODING (METHODS AND ISSUES) 9

Encoding, Decoding-Simple network codes(Ex-OR) – Linearly combined codes – Random and Deterministic algorithms – Randomized network coding – Linearly dependent and independent Random network coding – Polynomial time algorithms for network coding.

UNIT III MULTI-SOURCE NETWORK CODING 9

Two characteristics – The Max-flow bounds – Superposition Coding – Examples of Application-Multilevel diversity coding – Satellite Communication Network – A Network code for acyclic networks – An inner bound – An outer bound – The LP bound and its Tightness – Achievability of R_{int}

UNIT IV ADVANTAGES 9

Low complexity distributed algorithm for MANET using Network coding – Minimum cost sub graphs for multicast networks – robust multicast with static network coding – efficient distributed file system using Network coding.

UNIT V APPLICATIONS 9

Implementation of networks with Network coding for energy efficient Broadcasting – Simulation of practical Network coding in real-time networks – Study of throughput and decoding delay parameters – Reliable sensor network using Network coding.

TOTAL: 45 PERIODS

REFERENCES:

1. John Clark, Derek Allan Holton's First look at Graph Theory', Allied publishers Ltd.,
2. R. Ahlswede, N.Cai,S.- Y.R.Li and R. W. Yeung, "Network information flow", IEEE Trans. On Information Theory, Vol. 46,pp.1204-1216,2000.
3. http://Personal.ie.cuhk.edu.hk/~Yeung /1.pdf
4. R. W. Yeung,' A First Course in Information Theory', Norewell, MA/Newyork:Kluwer/Plenum,2002.
5. S.-Y. R. Li.W.Yeung, and N.Cai,"Linear Network Coding",IEEE Transactions on Information Theory,February,2003.
6. T. Ho, R. Koetter, M.Muedard, D. R. Karger and M. Eros," The Benefits of Coding over routing in a randomized setting", Proceedings of the 2003 IEEE International Symposium on Information Theory.
7. S. Jaggi, P. Sanders, P. A. Chou, M.Effros, S. Egner, K. Jain and L. Tolhuizen, "Polynomilal Time algorithms for multicast code construction",Ieee Transactions on Information Theory.
8. J. Widmer , C. Fragouliand Jeanyves Le Boudec,"Low complexity energy efficient broadcasting wireless ad hoc networks using Network coding".
9. D. S. Lun, N.Ratnakar, R.Koetter, M. Medard, E. Ahemed,and H. Lee" Achieving Minimum cast Multicast: A Decentralized Approach based on Network Coding",INFOCOM 2005.
10. M. Medard, S. Acedanski, S.Deb and R.Koetter " How good is random linear coding based distributed networked storage?", Netcod-2005.
11. J. Widmer , C. Fragouliand Jeanyves Le Boudec," Energy efficient Broadcasting in Wireless ad-hoc networks", Netcod 2005.
12. P.A.Chou,Y.Wu and K.Jain," Practical Network Coding", Allerton conference on Communication, Control and Computing", Monticello.
13. D. Petrovic, K. Ramachandran and J.Rabey, " Overcoming untuned radios in wireless networks with Network Coding", Netcod-2005.

Faculty of I and C Engg **(Approved in 10th AC 09.06.2007) ITEM NO. FI 10.2(17)**

FI1939 SCHEDULING AND LOAD BALANCING ALGORITHMS FOR GRID COMPUTING **L T P C 3 0 0 3**

UNIT I QUEUINGTHEORY 9

Introduction- Queuing models: Little Theorem – The M/M/I Queuing System – The M/M/m, M/M/1, M/M/m/m, and other Markov Systems – The M/G/I System – Network of Transmission Lines – Burke's Theorem- Jackson's Theorem

UNIT II SCHEDULING 9

Introduction – Requirements- fundamental choices- scheduling best effort connections- scheduling guaranteed services connections- packet dropping, compression- Issues in resource allocation, queuing disciplines TCP congestion control, congestion avoidance mechanisms

UNIT III GRID SCHEDULING ALGORITHMS 10

Basic model, Round-robin -Weighted round robin, Deficit round robin, generalized processor sharing (GPS), Weighted fair queuing (P-GPS) Virtual clock , Self-clocked fair queuing – Introduction to Grid Scheduling Algorithm- Challenges of Scheduling Algorithm in Grid - Adaptive Scheduling – data Scheduling

UNIT IV LOAD BALANCING 8

Introduction – Dynamic Load Balancing Algorithm- RLBVR algorithm, QLBVR algorithm- Randomized Load Balancing.

UNIT V SCHEDULING FOR QOS IN MANET 9

Issues and challenges in providing QoS in Ad Hoc Wireless Networks- Classification of QoS Solutions - MAC Layer Solutions - Network layer solutions - QoS Framework for Ad Hoc Wireless Networks.

TOTAL: 45 PERIODS

REFERENCES:

1. Dimitri Bertsekas and Robert Gallager, “Data Networks”, Second Edition, Prentice –Hall of India Pvt.Ltd-2000.
2. C.Siva Rama Murthy and B.S. Manoj Ad Hoc Wireless Networks Architectures and Protocols Pearson Education, 2005.
3. Petterson Davie, “ Computer Networks – A System Approach”, Elsiver 3 Edition,200
4. Ivan Stojmenovic, “Hand book of wireless Networks and Mobile computing”, John wiley and sons INC 2002.
5. Mohamed Ilyas, “Hand book of Ad hoc Wireless Networks”, CRC Press, 2003.
6. Michael Mitzenmacher, The Power of Two Choices in Randomized Load Balancing, IEEE Transaction on Parallel and Distributed Networks, Vol. 12, No.10,Oct 2001
7. D.Stiliadisand A.Varma, "Latency-Rate Servers: A General Model for Analysis of Traffic Scheduling Algorithms" in IEEE/ACM Transactions on Networking, October 1998.

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.03**

FI1940 MODELING AND SIMULATION OF WIRELESS SYSTEMS L T P M
3 0 0 100

UNIT I SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and multi-variate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND ARMA sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

UNIT II MODELING OF COMMUNICATION SYSTEMS 9

Information Sources, Formatting/Source Coding, Digital Waveforms, Line Coding, Channel Coding, Radio frequency and Optical Modulation, Demodulation and Detection, Filtering, Multiplexing/Multiple Access, Synchronization, Calibration of Simulations.

UNIT III COMMUNICATION CHANNELS & MODELS 9

Fading & Multipath Channels, Almost Free-Space Channels, Finite State Channel Models, Methodology for Simulating Communication Systems Operating over Fading Channels, Reference Models for Mobile Channels: GSM, UMTS-IMT-2000.

UNIT IV ESTIMATION OF PARAMETERS IN SIMULATION 9

Quality of an estimator, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Estimating the Power Spectral Density of a process, Estimating the Delay and Phase.

UNIT V ESTIMATION OF PERFORMANCE MEASURES FROM SIMULATION 9

Estimation of SNR, Performance Measures for Digital Systems, Importance sampling method, Efficient Simulation using Importance Sampling, Quasianalytical Estimation. Case Studies: 16-QAM Equalized Line of Sight Digital Radio Link, CDMA Cellular Radio System.

REFERENCES:

1. M.C. Jeruchim, Philip Balaban and K.Sam Shanmugam, "Simulation of Communication Systems Modeling, Methodology and Techniques", Kluwer Academic/Plenum Publishers, New York, 2000.
2. C. Britton Rorabaugh, "Simulating Wireless Communication Systems: Practical Models In C++", Prentice Hall, 2004.
3. William H. Tranter, K. Sam Shanmugan, Theodore S. Rappaport, Kurt L. Kosbar, "Principles of Communication Systems Simulation with Wireless Applications", Prentice Hall PTR, 2002.
4. John G. Proakis, Masoud Salehi, Gerhard Bauch, Bill Stenquist, Tom Ziolkowski, "Contemporary Communication Systems Using MATLAB" Thomson-Engineering, 2nd Edition, 2002.

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.03**

FI1941 STATISTICAL PATTERN CLASSIFICATION L T P M
3 0 0 100

UNIT I INTRODUCTION 9

Introduction – Bayesian Decision theory – Continuous features – Minimum Error Rate Classification – Discrimant functions for the normal density – Error Probabilities & Integrals – Error Bounds for Normal densities – Bayesian Decision theory – Discrete features – Bayesian Belief Networks.

UNIT II MAXIMUM LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION 9

Maximum likelihood Estimation – Bayesian Estimation – Bayesian Parameter Estimation Gaussian Case – Sufficient Statistics – Component Analysis & Discriminants - HMM.

UNIT III NON PAREMETRIC TECHNIQUES 9

Density Estimation – Parzen Windows – KNN Estimation – The Nearest neighbor rule – Metrics & Nearest neighbor classification.

UNIT IV LINEAR DISCRIMINANT FUNCTIONS 9

Introduction to Linear Discriminant functions – Relaxation procedures – Minimum Squared error procedures – The Ho-Kashyap Procedures.

UNIT V UNSUPERVISED LEARNING & CLUSTERING 9

Mixture densities & Identifiability - Application to Normal mixtures – Unsupervised Bayesian learning – Hierarchical clustering – Online Clustering – Graph theoretic methods.

TOTAL: 45 PERIODS

REFERENCES:

1. R.O. Duda, P.E. Hart and D.GStrok, Pattern Classification, John Wiley, 2nd Edition, 2001.
2. S.Theoridis and k.Koutroumbus, Pattern Recognition and Applications, Prentice Hall, 1982

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.03**

FI1942 ADVANCED ADHOC NETWORKS L T P M
3 0 0 100

UNIT I ADHOC NETWORKING AND ROUTING PROTOCOLS 9

Overview of routing methods – Proactive – Reactive and hybrid routing protocol – Uni-Cast routing protocol (AODV, DSR, DSDV) – Multi-Cast routing protocol (ODMRP) – Multi clustering – Power Issues – ABR.

UNIT II TRANSPORT LAYER ISSUES 9

TCP over Ad Hoc – Recent Issues – Recent Trends – Advanced Topics – Current Trends – Security.

UNIT III SENSOR NETWORKING 9

Unique constraints and challenges – Advantages of Sensor networks – Sensor network applications – Collaborative processing – Key Definitions of sensor networks – A racking Scenario – Problem formulation – Inference of states – Tracking Multiple Objects – Sensor Models – Performance comparison and metrics.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Key Assumptions – Medium Access Control – General Issues – Geographic – Energy Aware Routing – Attribute Base Routing. Topology Control – Clustering – Time Synchronization – Localization and localization services – algorithms.

UNIT V VEHICULAR NETWORKING 9

General Issues – Inter-vehicular networks – Mobility at the application layer – Mobility at the transport layer – Security and privacy in ubiquitous environment – Programming MANET with mobile code.

TOTAL: 45 PERIODS

REFERENCES:

1. C.K.Toh, “Ad Hoc Mobile Wireless Systems”, Prentice Hall, PTR, 2002.Charles E.Perkins, “Ad Hoc Networking”, Addison – Wesley, 2001.
2. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks – An Information Processing Approach”, Eleseivier 2004

FI1943 COMPUTATION METHODS FOR SEQUENCE ANALYSIS **L T P C**
3 0 0 3

UNIT I **9**
Analysis of DNA and protein sequences – Codon distributions, frequency statistics, patterns and motif searches – randomization.

UNIT II **9**
Sequence alignment scoring matrices – PAM and BLOSUM – Local and global alignment concepts – dynamic programming methodology – Needle man and Wunsch algorithm, Smith Waterman algorithm – statistics of alignment score – Multiple sequence alignment – Progressive alignment – Database searches for homologous sequences – BLAST and FASTA.

UNIT III **9**
Evolutionary analysis: distances – clustering methods –rooted and unrooted tree representation – Bootstrapping strategies.

UNIT IV **9**
Fragment assembly – Genome sequence assembly – Gene finding methods: content and signal methods, Gene prediction – Analysis and prediction of regulatory regions.

UNIT V **9**
Neural networks – concepts and secondary structure prediction – probabilistic models: Markov chain–random walk-Hidden Markov models – Gene identification and other applications.

REFERENCES:
1. S.C. Rastogi, Namita Mendiratta, Parag Rastogi Bioinformatics concepts, Skills and Applications.
2. Richard Durbin, Sean Eddy, Krogh, Biological sequence analysis: Probabilistic Models of Protein and Nucleic Acids, Cambridge University Press, 2003.
3. Andrequas D. Baxevanis, B.F. Francis Quallette, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins John Wiley and Sons, New York (1998).

FI1944 SECURITY IN GRID **L T P M**
3 0 0 100

UNIT I NETWORK SECURITY OVERVIEW **9**
Encryption, decryption - Authentication, Authorization – Generic Security Services – PKI, Kerberos, TSL, SSL-Grid Security Requirements-Emerging Security Technologies-Grid Security Infrastructure

UNIT II TAXONOMY OF PACKET CLASSIFICATION TECHNIQUES **9**
Exhaustive search – Linear Search, Ternary Content Addressable Memory(TCAM)-Decision Tree – Grid-of-Tries, Extended GT, HiCuts, Modular Packet Classification, HyperCuts, Extended TCAM, FIS Trees

UNIT III TAXONOMY OF PACKET CLASSIFICATION TECHNIQUES 9

Decomposition – Parallel Bit Vector, Aggregated Bit Vector, Crossproducting, Recursive Flow Classification, Parallel Packet Classification, Distributed Crossproducting of Field Labels(DCFL)-Tuple Space-Tuple Space Search and Tuple Pruning, Rectangle Search, Conflict-free Rectangle Search

UNIT IV DDOS ATTACKS 9

DDoS attacks, Types – Detection Techniques – Global Adaptive DDoS defense-Change Aggregation Tree- Multilayer Defense approach – ALPi- Protecting Grid Data Transfer service with active network interface

UNIT V GRID SIMULATORS 9

Bricks – SimGrid-GridSim-GangSim- OptorSim-Grid Security Services Simulator (G3S) - ns2 for Grid

TOTAL: 45 PERIODS

REFERENCES:

1. Ian Foster, Carl Kesselman, "The GRID 2:Blueprint for a New Computing Infrastructure", 2nd Edition
2. David E.Taylor, "Survey and Taxonomy of Packet Classification Techniques", ACM Computing Surveys, Vol. 37, no. 3, September 2005, pp. 238-275
3. Taieb Znati, James Amadei, Daniel R.Pazehoski, Scott Sweeny, " Design and Analysis of an Adaptive, Global Strategy for Detecting and Mitigating DDoS attacks in Grid Environment", Proceedings of 39th Annual Simulation symposium, 2006
4. Yu Chen, Kai Hwang, "Collaborative Change Detection of DDoS Attacks on Community and ISP Networks", International Symposium on Collaborative Technologies and Systems, May 2006, pp. 401-410
5. Dhinaharan Nagamalai Cynthia Dhinakaran and Jae Kwang Lee*W, "*Multi Layer Approach to Defend DDoS Attacks Caused by Spam", Proceedings of International Conference on Multimedia and Ubiquitous Engineering, 2007.
6. Paulo E.Ayres, Huizhong Sun, H.Jonathan Chao and Wing Cheong Lau, " ALPi, A DDoS Defense System for High Speed Networks", IEEE Journal on selected areas in Communication, Vol 24, No.10, October 2006.
7. Onur Demir, Michael R.Head, Kanad Ghose and Madhusudhan Govindaraju, "Protecting Grid Data Transfer service with active network interface", Grid Computing Workshop 2005.
8. Syed Naqvi, Michel Riguidel, "Grid Security Services Simulator (G3S) – A Simulation Tool for the Design and Analysis of Grid Security Solutions**",** Proceedings of the First International Conference on e-Science and Grid Computing, 2005

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1945 CHECKPOINTING IN GRID AND MULTIOBJECTIVE OPTIMIZATION L T P M 3 0 0 100

UNIT I FAULT TOLERANCE AND DISTRIBUTED FILE SYSTEMS 9

Introduction to Fault Tolerance – Distributed commit protocol – Distributed commit protocol – Distributed File System Architecture – Issues in Distributed File Systems – Sun NFS.

UNIT II CHECKPOINTING AND GRID SIMULATORS 9

Introduction to Checkpointing - System Level Checkpointing & Application Level Checkpointing – Skewed checkpointing – Storage strategies of checkpointing – Checkpointing-based Rollback Recovery on InteGrade- Taxonomy of Computer-based Simulation – Simulation Tools Survey - Bricks - SimGrid - GridSim – GangSim – OptorSim – G3S(Grid Security Service Simulator) – NS2 for grid.

UNIT III MULIOBJECTIVE OPTIMIZATION 9

Multi-Objective optimization problem- principles of Multi-objective optimization difference with Single-Objective Optimization – Dominance and pareto-optimality Classical methods: Weighted Sum Method – ε – Constraint Method – Weighted Metric Methods – Benson's Method – Value Function Method – Goal Programming Methods

UNIT IV NON-ELITIST MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS 9

Vector Evaluated Genetic algorithm – vector – optimized Evolution Strategy – Weighted-based GA - Random weighted GA – Multiple objective Genetic Algorithm – Non-dominated sorting Genetic algorithm - Niched pareto GA

UNIT V ELITIST MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS 9

Rudolph's Elitist Multi-Objective Evolutionary Algorithms – Elitist NSGA – Distance-Based Pareto GA – Strength Pareto EA – constrained Multi-Objective Evolutionary algorithms – Penalty Function approach – Jiménez-Verdegay-Goméz-Sharmeta's Method- Constrained Tournament Method – Ray-Tai-Seow's Method

TOTAL: 45 PERIODS

REFERENCES:

1. Ian Foster, Carl Kesselman, "The GRID 2: Blueprint for a New Computing Infrastructure", 2nd Edition
2. Mukesh Singhal, "Advanced Concepts In Operating Systems", McGraw Hill Series in Computer Science, 1994
3. Kalyanmoy Deb, "Multi-Objective Optimization using Evolutionary Algorithms", John Wiley & Sons, Ltd., 2002.
4. Greg Bronevetsky, Rohit Fernandes, Daniel Marques, Keshav Pingali and Paul Stodghill "Recent Advances in Checkpoint/Recovery Systems"
5. Hiroshi NAKAMURA, Takuro HAYASHIDA. , Masaaki KONDO, Yuya TAJIMA, Masashi IMAI, and Takashi NANYA, "Skewed Checkpointing for Tolerating Multi-Node Failures," Proc. 23rd IEEE In'tl Symp. Reliable · Distributed Systems (SRDS 04).
6. R.Y. de Camargo, R. Cerqueira, and F. Kon, "Strategies for Storage of Checkpointing Data Using Non-Dedicated Repositories on Grid Systems," Proc. 3rd Int'l Workshop Middleware for Grid Computing (MGC 05), ACM Press, 2005, pp.1–6.
7. "Syed Nagvi, Michael Riguided, "Grid Security Services Simulator(G3S) – A Simulation tool for the Design and Analysis of Grid Security Solutions", Proceedings of the First International Conference on e-Science and Grid computing, 2005.
8. David E. Goldberg - Genetic Algorithm in Search, Optimization and Machine Learning, Pearson Education, 1999.
9. CARLOS A. COELLO COELLO, "An Updated Survey of GA-Based Multiobjective Optimization Techniques", ACM Computing Surveys, Vol. 32, No. 2, June 2000 pp. 109-143
10. IY. Kim · O. L. deWeck,"Adaptive weighted sum method for multiobjective optimization: a new method for Pareto front generation", Struct Multidisc Optim (2006) 31: 105–116

11. Anthony Sulistio, Chee Shin Yeo, and Rajkumar Buyya, A Taxonomy of Computer-based Simulations and its Mapping to Parallel and Distributed Systems Simulation Tools, Software: Practice and Experience (SPE), Volume 34, Issue 7, Pages: 653-673, Wiley Press, USA, June 2004.

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1946 LOGIC PROGRAMMING L T P C
3 0 0 3

UNIT I FIRST-ORDER LOGIC 9
Introduction-Syntax-Semantics-Quantifier-free Sentences-Universal Sentences-Prenex and Skolem Forms-Unification-Resolution.

UNIT II PROGRAM-DEFINABILITY 9
Programs-The Least Herbrand Model-Fixed Points-Hierarchies-Definability

UNIT III LINEAR RESOLUTION 9
Preliminaries-Unrestricted Linear Resolution-Ground Completeness-Linear Resolution-SLD-Resolution.

UNIT IV INFINITE DERIVATIONS 9
Negative Information-Non standard Algebras-Resolution over Non standard Algebras-Realization Tree-The InterPlay of SLD-tree and Realization Tree-Well
founded model-stable models.

UNIT V COMPUTABILITY 9
Preliminaries- Computability of Recursive Functions-Complexity.

TOTAL: 45 PERIODS

REFERENCES:
1. Kees Doets, From Logic to Logic Programming, MIT Press, 1994.
2. Lloyd, Foundation of Logic Programming, Cambridge, 1988.
3. Andrews, Logic Programming operational Semantics and Proof theory.
4. Melvin Fitting, Computability Theory, Semantics and Logic Programming.
5. Abramsky, Handbook of Logic in Computer Science, Oxford, 2000.

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1947 BELIEF REVISION L T P C
3 0 0 3

UNIT I BELIEF REVISION 9
The Problems of Belief Revision-Models of Belief States-Rationality Postulates for Belief Revision-Constructive Models.

UNIT II SYNTAX BASED APPROACHES TO BELIEF REVISION 9

Introduction-Formal Preliminaries-Syntax base Revision Approaches-Belief Revision Generated by Epistemic Relevance-Epistemic Relevance and Epistemic Entrenchment-Belief Revision and Default Reasoning-Computational Complexity.

UNIT III A DYADIC REPRESENTATION OF BELIEF 9

Introduction-The Dyadic Model-Operations on the Belief Base-Recovery Properties-Operators of Conclusion.

UNIT IV ON THE LOGIC OF THEORY CHANGE 9

Introduction-Hierarchies and Safe Contraction Functions-Relations of Epistemic Entrenchment and their Associated Contraction Functions- Connecting safe and Epistemic Entrenchment Contractions.

UNIT V BELIEF CHANGE AND POSSIBILITY THEORY 9

Introduction-Epistemic states in Possibility Theory-Belief Dynamics in Possibility Theory-Belief Change in Possibilities Logic-Belief Change with Uncertain Pieces of Evidence.

TOTAL: 45 PERIODS

REFERENCES:

1. Peter Gardenfors, Belief Revision, Cambridge Tracts in TCS 29, 1992.
2. Peter Gardenfors, The Dynamics of Thought, Springer Verlag 2005.
3. D.M Gabbay, Handbook of Philosophical Logic , Kluwer Academic Publishes.

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1948 ULTRA WIDE BAND (UWB) COMMUNICATION L T P C
3 0 0 3

UNIT I INTRODUCTION TO UWB SYSTEMS 9

Overview of UWB - UWB Concept - UWB Signals: Impulse(I) and Multi-Carrier(MC) Signals, Uniqueness of UWB Systems; I-UWB System Model; MC-UWB System Model. Advantages of UWB Systems - Challenges in UWB Systems - Single Band Vs Multi Band - Applications of UWB Systems - Regulatory, Legal & Other Controversial Issues.

UNIT II INTERFERENCE, COEXISTENCE & UWB ANTENNAS 9

Interference of UWB on NB: UWB Pulse Model, Effect of NB Receive Filter, BER Analysis, Time-Hopped Case. Aggregate of UWB Interference Modeling: Received Power, Asymptotic PDF of Aggregate Noise, Amplitudes: Aggregated PDF, Bernoulli and Poisson Models. Interference Analysis: NB on UWB, UWB on UWB. Basic Properties of UWB Antennas.

UNIT III UWB TRANSMITTER DESIGN 9

IUWB Signal Generators: Avalanche Pulse Generators, Step Recovery Diode Pulse Generators, Tunnel Diode Pulsers, Pulse Circuits Suitable for Integrated Circuits. Modulators. I-UWB Transmitters: TH-PPM and TH(A-PAM) UWB Signals, OOC-PPM UWB Signals, DSUWB Signals, TR UWB System. MC-UWB Transmitters: CI-UWB Signals, FH-UWB Systems, OFDM-UWB Systems. Spectral Encoded UWB Communication System.

UNIT IV IUWB RECEIVER DESIGN 9

System Model, Threshold/Leading Edge Detection, Correlation Detection (CD) Receivers, RAKE

Receivers, Multi-User Detection (MUD) UWB Receivers, Hybrid RAKEIMUD Receivers, Auto Correlation TR UWB Receivers, Synchronization and Timing Issues, Digital I-UWB Implementation.

UNIT V MC -UWB RECEIVER DESIGN 9

Icarrier Interferrometry(CI) UWB Receivers, Frequency Hopped(FH) UWB Receivers, OFDM - UWB Receivers, Spectral Encoded UWB Communication System. Methods of Improving Range of UWB using RAKE Receivers. Overview of UWB Simulation techniques.

REFERENCES:

1. Jeffrey H. Reed, "An Introduction to UWB Communication Systems, Prentice Hall, 2005.
2. Robert Aiello and Anuj Batra, "UWB Systems: Technologies and Applications", Newnes-Elsevier, 2006.
3. Faranak Nekoogar, "UWB Communications: Fundamentals and Applications", Prentice Hall, 2005.

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FI1949 3G MOBILE NETWORKS L T P C
3 0 0 3

UNIT I 9

Overview - Principles of CDMA - Radio channel access - Spread spectrum - Power control - Handovers- Wideband CDMA Air interface - Physical layer - FEC encoding / decoding - Error detection - Frequency and time synchronization – Channels - spreading and scrambling codes - Diversity.

UNIT II 9

Modulation techniques and spread spectrum - Spreading techniques – Codes - Channel coding - Wideband CDMA air interface - Protocol stack - Media Access control (MAC) Radio Link control(RLC) - Radio Resource Control(RRC) - User Plane - PDC protocol Data protocols

UNIT III 9

UMTS network structure - Core-network - UMTS Radio access network - GSM Radio access network – Interfaces - Network protocols. New concepts in UMTS Network - Location services – Opportunity - driven Multiple access - Multimedia Messaging services - Gateway location register - Support of localized service area.

UNIT IV 9

UMTS Terrestrial Radio access (UTRA) – Characteristics - Transport channel - Physical channel - Service Multiplexing and channel coding in UTRA - spreading and modulation Random access - Power control - Cell identification – Handover - Inter cell time synchronization in UTRA TDD mode CDMA 2000 Terrestrial Radio access characteristics - Physical channels – spreading and Modulation - Random access – Handover - Performance enhancement features.

UNIT V 9

3G services - Service categories- Tele services - Bearer service- Supplementary services Service capabilities - QoS Classes - 3G Applications. 4G Mobile Design - Introduction - Microwave propagation - Adaptive antennas - Multiple Access schemes - CDMA dynamic cell configuration -

CDMA cellular packet communication - Network Architecture and Teletraffic Evaluation - TCP over 4G Decoding techniques in mobile multimedia communications.

REFERENCES:

1. Juha Korhonen, "Introduction to 3G Mobile Communication", Artech House, 2001.
2. Willie W.Lu,: "Broad Band Wireless Mobile 3G and beyond" John Wiley & Sons Ltd., 2002.
3. L.Hanzo, L.L.Yang, E.L.Kuan, K.Yen, "Single and Multicarrier DS-CDMA" IEEE Communication Society and John Wiley & Sons Ltd., 2003. (Part V – Standards and Networking).
4. Vijay Garg "Wireless Network Evolution: 2G to 3G", 1st Edition Prentice Hall of India, 2001.

UMTS Forum website : http://www.umts-forum.org
The 3GPP1 website : http://www.3gpp.org
The 3GPP2 website : http://www.3gpp2.org

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1950 HF FILTER DESIGN L T P C
3 0 0 3

UNIT I NETWORK FUNDAMENTALS 9

Filters – Types, Networks – Transfer Functions. Scattering Parameters, Modern Filters. Characteristic Function. Synthesis Example. Low pass Prototype. Approximations. Denormalization, Phase and Delay, All-pass Networks, Bounding and Asymptotic Behavior.

UNIT II REACTORS AND RESONATORS 9

Coupled Transmission Lines and Elements, Reentrance, Coax, Loading, Stab lines – Wire over Ground, Substrate Materials, Strip lines, Resonators, Evanescent Mode Wave guide, Superconductors. Modeling Discontinuities.

UNIT III TRANSFORMATIONS AND FILTERS 9

Transformation – Types, Top-C, Top-L and Shunt-C Coupled, Series and Parallel Resonators, Tubular Structure, Elliptic Band pass and Distortion. Arithmetic and Norton Transforms, Blinchikoff Flat-Delay Band pass. Pi/Tee Equivalent Networks, Dipole Equivalent Networks. Invertors. Richard's Transform, Kuroda Identities. Prototype k and q values. Radiations and Losses.

UNIT IV LOW PASS STRUCTURES 9

Stepped – Impedance All-Pole Lo w pass, Response Sensitivity to Element Tolerance, Stub-Line and Elliptic Low pass, Element Collisions.

UNIT V BAND PASS STRUCTURES 9

Direct and Edge-Coupled. Tapped Edge – Coupled and Hairpin Bandpass. Hairpin Resonator Self-Coupling, Combline Band pass. Coupled – Microstrip Combline. Inter digital Band pass. Transmission Zeros in Combline. Stepped – Impedance Band pass. Elliptic Direct – Coupled Band pass. Evanescent Mode Wave guide Filters – Coupling, Reentrance. Filters with Arbitrary Resonator Structure. Hidden – Dielectric Resonator. Band pass Tuning Techniques.

TOTAL: 45 PERIODS

REFERENCES:

1. HF Filter Design and Computer Simulation by Randall W. Rhea. 1994 by Noble Publishing Corporation.
2. G.Mathei.L.Young.E.M.T.Jones – Microwave Filters. Impedance-Matching networks and Coupling structures, 1980 Artech house, inc.,
3. Daniel G.Swanson. Wolfgang.J.R.Hoefer – Microwave circuit modeling using EMF, 2003, Artech house inc.,

Faculty of I and C Engg **(Approved in 11th AC 05.01.2008) ITEM NO. FI 11.04**

FI1951	**OFDM SYSTEMS**	**L T P C**
		3 0 0 3

UNIT I OFDM TRANSMISSION OVER GAUSSIAN AND WIDEBAND CHANNELS **9**

Evolution and Applications of OFDM, Choice of OFDM, Modulation, Performance over AWGN channels, Clipping amplification, AID conversion, Phase noise, Wideband channel models, Effects of time dispersive channels, Channel transfer function estimation, System performance, and Inter subcarrier cancellation.

UNIT II TIME AND FREQUENCY DOMAIN SYNCRONIZATION **9**

Performance with Frequency and Timing errors, Synchronization algorithms, Comparison of frequency acquisition algorithms, BER performance with frequency synchronization, OFDM synchronization performance.

UNIT III ADAPTIVE SINGLE - AND MULTI - USER OFDM **9**

Adaptive modulation, Adaptive OFDM speech system, Pre - equalization, Comparison of adaptive techniques, Power and Bit allocation algorithms, Multi user AOFDM, Block coded AOFDM.

UNIT IV PEAK FACTOR REDUCTION AND ADAPTIVE MODULATION **9**

Sequences for reducing amplitude variations, Crest factor reduction mapping schemes, PMEPR analysis of OFDM systems, Adaptive modulation schemes for OFDM.

UNIT V OPTICAL OFDM **9**

Basic configuration, Spectral efficiency, Transmission over SMF and MMF, IM/DD system, Optical OFDM over wireless channel, PAPR reduction techniques, Power efficient Optical OFDM ~Dispersion compensation.

REFERENCES:

1. Lajos Hanzo, M.Munster, B.J.Choi and T. Keller, OFDM and MC - COMA for Broadband Multi user Communications, WLANs and Broadcasting, John Wiley & sons, IEEE press 2003.
2. Ramjee Prasad, OFDM for wireless Communication Systems, Artech House Publishers, 2004.
3. Ahmed R.S. Bahai, Burton R Saltzberg and Mustafa Ergen, Multi-carrier Digital Communications: Theory and Applications of OFDM, Springer, 2004.
4. Henrik Schulze & Christian Lueders, Theory and Applictions of OFDM and COMA: Wideband Wireless Communications, Wiley Publishers, 2005.
5. Ye Li and Gordon L. Stuber, Orthogonal Frequency Division Multiplexing for Wireless Communications, Springer, 2006
6. Richard D. J.Van Nee, Ramjee Prasad and Richard Van Nee, OFDM for wireless Multimedia

Communications, Artech House Publishers, 2000.
7. Optical OFDM related articles from websites.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.5**

FI1952 RADIO OVER FIBER TECHNOLOGIES L T P C
3 0 0 3

UNIT I INTRODUCTION TO RADIO OVER FIBER (ROF) 9
Radio Over Fiber – applications, advantages, limitations, Microwave properties of optical links, Direct modulated optical links, Direct modulated optical links, external modulators, types, modulation transfer in microwave fiber optic links.

UNIT II ANALOG FIBER OPTIC LINKS 9
Sub carrier Optical fiber transmission systems, Fiber optic transmission of 64-QAM, 256-QAM signals, Capacity of coaxial and fiber optic links, LASER diode and Photodiode nonlinearities.

UNIT III COMPONENTS FOR ROF SYSTEMS 9
Analog modulation of LASER diode, LASER diode fundamentals, Rate equation analysis, Intensity modulation, Frequency modulation Low cost LASER diode driver, LASER diode noise and their influence on link performance.

UNIT IV ROF TECHNOLOGY FOR THE CELLULAR APPLICATIONS 9
3G cellular systems, cellular architecture, UMTS architecture, WCDMA ROF systems, Micro diversity, Macro diversity, Traffic estimation, Spectral efficiency, power level, multiple user interference, ROF for Hiper LAN2, Micro cellular communication networks.

UNIT V FIBER OPTIC RADIO NETWORKS 9
Introduction to radio highway – types of radio highway, Photonic TDMA Highway – Natural sampling of photonic TDMA, Photonic CDMA – Conventional CDMA, DOS-CDMA, Photonic chirp multiple access – architecture and performance, routing networks, chirp multiplexing transform.

TOTAL: 45 PERIODS

REFERENCES:

1. Hameed Al-Raweshidy, Shozo Komaki, “Radio Over fiber technologies for mobile communication networks” Artech House publications, London. 2002.
2. William S.C.Chang, “RF Photonic technology in optical fiber links” Cambridge university press. 2002.

FI1953 EVOLUTIONARY MULTIOBJECTIVE OPTIMIZATION TECHNIQUES **L T P C 3 0 0 3**

UNIT I **9**

Multi objective optimization: Introduction – Multiobjective optimization problem – principles – Difference between single and multiobjective optimization – Dominance and Pareto Optimality, Classical Methods – Weighted Sum – E Constraint method – weighted Metric methods – Benson's method – Value Function – Goal Programming methods – Interactive Methods.

UNIT II **9**

Non Elitist Multiobjective optimization Evolutionary Algorithms: VEGA – VOEA – Random weighted GA – MOGA – NSGA – NPGA – Other Methods.

UNIT III **9**

Elitist Multiobjective optimization Evolutionary Algorithms: Rudolph's Elitist EA – NSGA II DPGA – SPEA – TDGA – PAES – mGAs - Other Methods.

UNIT IV **9**

Constrained Multiobjective optimization Evolutionary Algorithms: penalty Function approach – Jimenez – Verdegay – Gomez – Skarmeta method – Constrained Tournament – Ray – Tai- Seow's Method.

UNIT V **9**

Representations of non-dominated Solutions – Performance Metrics – Test problem Design – Comparison of MOEAs – searching Preferred Solutions sealing, convergence issues – Controlling elitism – MO Scheduling algorithms.Current trend and Applications: Uniform sampling of Local Pareto ptimal Solutions – Decision Maker's Preference – Two-Level of Non-dominated Solutions Approach – Techniques of Highly MOP – Stopping criterion.

REFERENCES:

1. Kalyanmoy Deb, "Multi – Objective Optimization Using Evolutionary Algorithms", JohnWiley, 2002.
2. Ken Harada, Jun Sakuma, Shigenobu Kobayashi, "Uniform Sampling of Local Pareto-Optimal Solution Curves by Pareto Path Following and its Applications in Muilti-objective GA", Proceedings of Genetic and Evolutionary Computation Conference (GECCO'07), ACM, July 2007, pp.813 – 820.
3. Hisao Ishibuchi, Yusuke Nojima, Kaname Narukawa, and Tsutomu Doi, "Incorporation of Decision Maker's Preference into Evolutionary Multiobjective Optimization Algorithms", Proceedings of GECCO'06, ACM, July 2007, pp.741,742.
4. M.A. Abido, "Two-Level of Non-dominated olutions Approach to Multiobjective Particle Swarm Optimization", Proceedings of GECCO'07, ACM, July 2007, pp.726-733.
5. David Corne, Joshua Knowles, "Techniques for Highly Multiobjective Optimisation: Some Nondominated Points are Better than others", Proceedings of GECCO'07, ACM, July, 2007, pp.773-780.
6. Luis Marti, Jesus Garcia, Antonio Berlanga, Jose M.Molina, "A Cumulative Evidential Stopping Criterion for Multiobjective Optimization Evolutionary Algorithms", Proceedings of GECCO'07, ACM, July 2007, pp.2835-2842.

FI1954 SCIENCE OF EMOTIONS AND EMOTIONS IN SPEECH L T P C
3 0 0 3

OBJECTIVES:

- To understand basic science of emotion.
- To understand concepts and theories of emotion.
- To understand the ways in which emotion is expressed both verbally and
- nonverbally.
- To recognize and analyze different emotion cultures in families, ethnic groups, societies, and historical periods.
- To analyze emotions in speech.
- To understand the mathematical models developed for speech.

UNIT I BASICS OF EMOTION 9

Introduction – Emotion definitions – Theories of emotion – Emotions: Thinking, feeling and communicating - communicating emotion: verbally non verbally – managing emotions, managing emotion under pressure – The emotion process – Emotional Expressiveness – Connecting emotionally.

UNIT II VARIETIES OF EMOTION AND ELEMENTS OF EMOTION 9

Study of various emotions: Intimacy jealousy, aggression, Happiness, Fear, Loneliness, Depression, Embarrassment, Guilt & Shame – Gender, Cultural differences and similarities – Elements of emotion: The ommunication of Emotion: Bodily Changes, Brain Mechanisms of Emotion: Appraisal, Knowledge, and Experience – Emotions and Social Life: Development of Emotions in Childhood, Emotions in Social Relationships, Emotion and Cognition.

UNIT III ANALYZING EMOTIONS IN SPEECH 9

Expression in Speech: Natural speech – Production and perception of speech – basic model – Developing a model to expressive content – Perception of waveform's expressive content – Expression in Neutral speech: Influence of emotions in speech. Degrees of Expression, Dynamic nature of expression – Acoustic correlate paradigms for investigating expression – Case Study: HUMAINE Human – Machine Interaction Network on Emotions, ERMIS – Emotionally Rich Man – Machine Interaction Systems.

UNIT IV MATHEMATICAL MODEL FOR SPEECH BAYESIAN DECISION THEORY 9

Bayesian Decision theory – Minimum – Error – Rate classification – Classifier, Discriminant functions and Decision surfaces – Normal density and its discriminant functions, Error probabilities and Integrals – Error bounds for Normal densities – Bayesian Belief Networks.

UNIT V MATHEMATICAL MODEL FOR SPEECH – MAXIMUM – LIKELIHOOD AND BAYESIAN ESTIMATION 9

Maximum – likelihood estimation – Bayesian estimation – Bayesian parameter estimation: Gaussian case – Problems of Dimensionality – Component analysis and Discriminants, Expectation – Maximization – Hidden Markov models.

REFERENCES:

1. Randolph R. Cornelius, "The Science of Emotion: Research and Tradition in the Psychology of Emotions" 1st Edition, Prentice Hall – 2007.
2. Keith Oatley, Dacher Keltner and Jennifer Jenkins, "Understanding Emotions" Blackwell Publication – January 2006.
3. Mark Tatham and Katherine Morton, "Expression in speech Analysis and Synthesis". Oxford University Press – 2007.
4. Thomos Paker "Volition, Rhetoric, Emotions in the work of Pascal studies in Philosophy", Routledge Publication, October 2007.
5. R.O. Duba, P.E. Hart, and D.G.Strok, "Pattern Classification", Wiley – interscience Publication, Second Edition,2002.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(3)**

FI1955 VOICE-OVER-INTERNET PROTOCOL (VOIP) **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Introduction and basic concepts of modern communication and telephony technology: CDMA, WLL, GSM, VoIP, Blue-tooth, Wi-Fi

UNIT II IP NETWORKING REVIEW **9**

Protocol layering, encapsulation – Ethernet, QoS at layer 2 – IP, UDP, TCP – IP Addressing (network, subnet, NAT) – IP Routing (RIP, OSPF)

UNIT III OVERVIEW OF VOIP ARCHITECTURES AND PROTOCOLS **9**

Peer protocols (SIP, H323): signaling, call routing – Master-slave protocols (MGCP/Megaco et.al.): signaling, call routing – SS7 Transport (SIP-T) – RTP and Codecs – RTP and RTCP: real time traffic over ip (rfc 1889) – Codecs (compression, bandwidth, quality): - Waveform codecs (G711, G726) – CLEPcodecs (G729, G723, etc.) – Bandwidth control (VAD, dynamic packing, etc.)

UNIT IV SIP **9**

Signaling Protocol Components (RFC 3261) – SIP language elements, simple call flows (and ladder diagrams) – Network routing: Proxies and Oubound Proxies, Location and Registeration servers – Services, Advanced Routing & Network Elements (redirection,back-to-back user agents, call processing languages) – Presence/Chat, Instant Messaging (SIMPLE) –ENUM, DNS

UNIT V NETWORK QOS **9**

Mixed VoIP and Data on a common network – Impairments: delay, packet loss, jitter – Measurement of Voice Qualiy (PAMS, PSQM) – Traffic Modeling (voice vs, ip data) – Erlang – QoS Mechanisms (DFWQ, MPLS, etc.)

TOTAL: 45 PERIODS

REFERENCES:

1. "Internet Communications Using SIP", Henry Sinnreich and Alan Johnston, Willey (2001).
2. materials on web site. These will be IETF documents, IEEE publications, or papers from other sources such as Cisco, et. al. or International journals.

FI1956 RATELESS CODES L T P C
3 0 0 3

UNIT I INTRODUCTION AND FOUNDATIONS 9

Binary Field Arithmetic – Galois Field – Construction – Representation – Properties – Fourier Transforms for Finite Fields – VectorSpaces – The Chinese Remainder Theorem

UNIT II ERROR CONTROL CODES 9

Introduction to Block and Convolutional Codes – Cyclic Codes – BCH Codes – RS Codes –Multistage Coding – LDPC Codes – Erasure Codes

UNIT III DECODING ALGORITHMS 9

Signal Detection – Duo Binary Decoding – Iterative Decoding – LDPC Decoding – Maximum Likelihood Decoding – Sequential Decoding – Erasure Decoding – Majority Logic Decoding – Burst Error Correction

UNIT IV RATELESS CODES 9

Introduction – The Digital Fountain Paradigm – Dynamic Random Rateless Codes –Fountain Codes – LT Codes – Raptor Codes – Tornado Codes – Rateless Codes on Noisy Channels – Fading Channels – Erasure Channels – Non-Ergodic Channels

UNIT V APPLICATIONS 9

Rateless Codes based Forward Error Correcting Schemes for IEEE 802.16 standard – Optimal Coding Schemes – Rate Compatible Convolutional Codes – Multiple Description Coding – Performance of Hybrid ARQ using Rateless Codes for Wireless Channels – Data Dissemination in Sensor Networks

TOTAL: 45 PERIODS

REFERENCES:

1. Todd K. Moon, “Error Correction Coding: Mathematical Methods and Algorithms”, John Wiley & Sons, Inc., 2005.
2. Shu Lin, Daniel J. Costello, “Error Control Coding: Fundamentals and Applications”, Second Edition, Prentice-Hall, 2004.
3. Peter Sweeney – “Error Control Coding: From Theory to Practice”, John Wiley & Sons, Inc., 2002.
4. Thomas M. Cover, Joy A. Thomas, “Elements of Information Theory”, Second Edition, Wiley-Interscience, 1991.
5. Robrt G. Gallager – “Information Theory and Reliable Communication”, John Wiley & Sons, New York, 1968.

FI1957 WIRELESS MAN L T P C
3 0 0 3

UNIT I 9

Advantages of Wimax Wimax compared to 802. 11 Wi-Fi ,WiMAX Comparted to Mobile, Telephone Data Systems, Data Transmission Rates, WiMAX Service Rates, Radio Coverage Area, Frequency Bands, channel Loading, Spectral Efficiency, Fixed WiMAX, Mobile WiMAX.

UNIT II **9**

WiMAX Standards, WiMAX Broadband Applications, WiMAX VolP, Broadband Data Connections, Digital Television, E1/T1 over WiMAX, Urban WiMAX Hot Zones, Surveillance Services, Multi-tenant Units (MTU) and Multi-Dwelling Unit (MDU) connections, Rural Connections.

UNIT III **9**

Wireless Broadband System Parts, Chassis Based Systems, Pico Based Systems, Subscriber Stations (SS), Indoor Subscriber Stations, Outdoor Subscriber Stations, Base Stations (BS), Indoor Base Stations, Outdoor Base Stations, Packet Switches, Operational Support System (OSS), Gateways.Antennas Orthogonal Frequency Division Multiplexing (OFDM), Orthogonal Frequency Multiple Access (OFDMA), Frequency Reuse, Adaptive Modulation, Diversity,Transmission, Transmission Diversity, Receive Diversity, Frequency Diversity, Temporal (Time) Diversity, Spatial Diversity, Adaptive Antenna System (AAS)

UNIT IV **9**

WiMAX Protocol Layers, MAC Convergence, MAC Layer, MAC Privacy, Physical Layer, Security Sub Layer, Addressing, Medium Access Control Protocol Data Units, (MACPDUs), Radio Packets (Bursts), Channel Descriptors, Channel Coding, Duplex Transmission, Ranging, (Dynamic Time Alignment), Dynamic FrequencySelecton(DFS), RFPowerControl, Channel Measurement Reports, Payload Header Suppression (PHS), Convergence Sublayer (CS), Sub Channelization (Sub-carriers), Retransmission Policy, Selective Repeat (SR) Hybrid Automatic Repeat Request (HARQ), Physical RF Channels, Logical Channels Connections ID (CID), Service Flow ID (SFID).

UNIT V **9**

WiMAX Operation, Channel Acquisition, Initial Ranging, medium Access Control, Radio Link Control (RLC), Quality of Service (QoS), Service Availability, Data Throughput, Delay, Jitter, Error Rate Bit Error Rate (BER), Packet Loss Rate (PLR), Scheduling Services, Unsolicited Grant Service (UGS), Real Time Polling Service (RTPS), Non-Real Time Polling Service (nRTPS), Best Effort Service (BE), Service Flows and Classes, Service Flows, Service Class.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Lawrence Harte, Dr. Kalai Kalaichelvan “WiMAX Explained” -2007,ISBN: 1-932813-54-3.

REFERENCES:

1. “Fundamentals of WiMAX : Understanding Broadband WirelessNetworking” by Jeffrey G.Andrews, Arunabha Ghosh, Rais Muhamed, Prentice Hall, February ‘2007.
2. Jonny SUN, Yanling YAO, Hongfei ZHU, “Quality of Service Scheduling For 802. 16 Broadband Wireless Access Systems”,IEEECommunications Magazine 2006.
3. Fen Hou, Pin-Han Ho, Xuemin (Sherman) Shen, An-Yi Chen,“A Novel Qos Scheduling Scheme in IEEE 802. 16 Networks”, IEEE Communications Society WCNC 2007.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(6)**

FI1958 **SOA FOR TRANSACTION PROCESSING SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

This course focuses on the traditional transaction models, advanced transaction models, transaction processing protocols, basic concepts and technologies that support SOA, and Service oriented Analysis and Design

UNIT I TRADITIONAL TRANSACTION MODELS AND FRAMEWORKS 9

Transaction monitors and distributed 2pc, Nested Transactions, Compensation. Sags, Open Nested transactions, ConTracts, workflows

UNIT II ADVANCED TRANSACTION MODELS 9

Long lived activities, transaction chains Web services based transaction protocols, Transactional workflows, Cross organizational workflows

UNIT III RELAXED TRANSACTION MODELS 9

Relaxation of atomicity. Isolation, consistency and durability of transactions, serializability, causal consistency

UNIT IV BASIC SOA CONCEPTS 9

Evolution of the service concept, loose coupling of systems, elements of a SOA, enterprise service bus, service orientation principles

UNIT V SERVICE ORIENTED ANALYSIS AND DESIGN 9

The foundations of OOAD, EA and BPM, Service Oriented Analysis, service modeling, Service Oriented Design, Service design guidelines, Design principles for engineering service applications with a suitable transaction model

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M.P. Singh, M.N. Huhns, Service Oriented Computing; Semantics, Processes, Agents, john Wiley & Sons Ltd., 2005
2. T. Erl, Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005

REFERENCES:

1. D. Krafzig, K. Banke and D. Slama, Enterprise SOA. Service –oriented Architecture Best Practices, Prentice-Hall Inc., Nov 2007
2. Elmagarmid A. K., Database Transaction Models for advanced Applications, Morgan Kaufmannpublishers, San Mateo, CA, 1992
3. Krithi Ramamritham and Panos Chrysanthis, Advances in Concurrency Control and Transaction Processing, IEEE Computer Society Press, September 1996

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(7)**

FI1959 RECONFIGURABLE ARCHITECTURES L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Domain-specific processors, Application specific processors, Reconfigurable Computing Systems – Evolution of reconfigurable systems – Characteristics of RCS- advantages and issues. Fundamental concepts & Design steps –classification of reconfigurable architecture-fine, coarse grain & hybrid architectures – Examples

UNIT II FPGA TECHNOLOGIES & ARCHITECTURE 9

Technology trends- Programming technology- SRAM programmed FPGAs, antifuse programmed FPGAs, erasable programmable logic devices. Alternative FPGA architectures: Mux Vs LUT based

logic blocks – CLB Vs LAB Vs Slices- Fast carry chains- Embedded RAMs- FPGA Vs ASIC design styles.

UNIT III ROUTING FOR FPGAS 9

General Strategy for Touting in FPGAs- routing for row-based FPGAs – segmented channel routing, definitions- Algorithm for I segment and K segment routing – Routing for symmetrical FPGAs, Flexibility of FPGA Routing Architectures: FPGA architectural assumptions- logic block, connection block, switch block, - Effect of connection block flexibility on Routability- Effect of switch block flexibility on rountability - Tradeoffs in flexibility of S and C blocks

UNIT IV HIGH LEVEL DESIGN 9

FPGA Design style: Technology independent optimization- technology mapping-Placement. High-level synthesis of reconfigurable hardware, high- level languages, Design tools: Simulation (cycle based, event driven based) – Synthesis (logic/HDL vs physically aware) – timing analysis (static vs dynamic)- verification physical design tools.

UNIT V APPLICATION SPECIFICRCS 9

RCS for FFT algorithms-area efficient architectures- power efficient architectures- low energy reconfigurable single chip DSP system- minimizing the memory requirement for continuous flow FFT implementation- memory reduction methods for FFT implementation RCS for Embedded cores, image processing.

TOTAL: 45 PERIODS

REFERENCES:

1. Stephen M. Trimberger, “field – programmable Gate Array Technology” Springer, 2007
2. Clive “Max” Maxfield, “The Design Warrior’s Guide to FPGAs: Devices, Tools And Flows”, Newnes, Elsevier, 2006.
3. Jorgen Staunstrup, Wayne Wlf, “Hardware/Software Co- Design: Priciples and practice”, Kluwer Academic Pub, 1997.
4. Stephen D. broen, Robert J. Francis, Jonathan Rose, Zvonko G. Vranesic,” Field- programmable Gate Arrays”, Kluwer Academic Pubnlishers, 1992.
5. Yuke Wang, Yiyan Tang, yingtao Jiang, Jin-Gyun Chung “Novel Memory Reference Reduction Methods for FFT Implementations on DSP processors” IEEE transaction on signal processing, vol,55,NO.5, May 2007, p2338-2349
6. Russell tessier and Wayne Burleson “Reconfigurable Computing for Digital Signal Processing: A Survey” Journal of VLSI Signal processing 28,p7-27,2001
7. Bevan M Bass “A Low Power High Performance 1024 Point FFT processor”j
   IEEE Journal of Solod state Circuits Vol 34, No3, March 1999, p380-387

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(8)**

FI1960 EVOLVABLE HARDWARE L T P C
3 0 0 3

UNIT I INTRODUCTION 7

Raditional hardware systems- Limitations- Evolvable hardware – Characteristics of evolvable circuits and systems-Tjechnology-Extrinsic and intrinsic evolution Offline and online evolution-Applications and scope of EHW.

UNIT II EVOLUTIONARY COMPUTATION 10

Fundamentals – Evolutionary algorithms – Components of EA – Variants of EA – Genetic algorithms – Genetic Programming – Evolutionary strategies – Evolutionary programming – Implementations – Evolutionary design and optimizations – EHW – Current problems and potential solutions.

UNIT III RECONFIGURABLE DIGITAL DEVICES 9

Basic architectures – Programmable ligic devices – Field programmable Gate Arrays (FPGAs) – Using reconfigurable hardware – Design phase – Execution phase – Evolution of digital circuits.

UNIT IV RECONFIGURABLE ANALOG DEVICES 9

Basic architectures – Field Programmable Transistor arrays (FPTAs)- Analog arrays –MWMs- Using reconfigurable hardware – Design phase – Execution phase-Evolution of analog circuits.

UNIT V PUTTING EHW TO USE 10

Synthesis vs adaptation- Designing self-adaptive systems-Fault-tolerant systems-Real-time systems-Intrinsic reconfiguration for online systems-EHW based fault recovery- future work.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Garrison W. Greenwood and Andrew M. Tyhrrell, “Introduction to Evolvable Hardware: A Practical Guide for Designing Self- Adaptive Systems”, wiley-IEEE Press, 2006.
2. Tetsuya Higuchi, Xin Yao and Yong Liu, “Evolvable Hardware”, Springer-Verlag, 2004.

REFERECNES:

1. Lukas Sekanina, “Evolvable Components: From Theory to Hardware Implementations”, Springer, 2004.
2. Latest publications in conferences and journals.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(9)**

FI1961 WEB DATA MINING L T P C

3 0 0 3

UNIT I DATA WAREHOUSING AND DATA MINING 9

Definition – Components – Multidimensional Data Model – Data Cube – Dimension Modeling – OLAP Operations – Data Warehouse Architecture Meta Data – Types of Meta Data – Data Warehouse Implementation – Data warehouse Backend

Process – Development Life Cycle – data Mining process – Association Rules and Sequential Patterns – Apriori Algorithm – Data Formals – Mining with multiple Minimum supports – Mining Class Association Rules – GSP – Prefix Span – Generating Rules from Sequential Patterns.

UNIT II CLASSIFICATION 9

Supervised Learning – Decision Tree Induction–Classifier Evaluation – Rule Induction Classification Based on Association–Types of Classification – **Unsupervised learning** - **K** – means Clustering – Representation of Clusters – Hierarchical Clustering-Distance Function-Data Standardization-Handling of Mixed Attributes – Cluster Evaluation-Discovering Holes and Data Regions – **Partially Supervised Learning** – Learning from Labeled and unlabeled Examples-EM Algorithm – Learning from Positive and Unlabeled Examples.

UNIT III WEB MINING – RETRIEVAL, SEARCH AND LINK ANALYSIS 9

Information Retrieval- Information Retrieval Models-Relevance Feedback- Evaluation Measures – Text and Web Page pre-Processing-Inverted Index and its Compression-Latent Semantic Indexing – Web search – Meta Search: combining Multiple Rankings-Combination Using Similarity Scores – Web Spamming – **Link Analysis** – Social Network Analysis Co-Citation and Bibliographic coupling-Page Rank HITS- Community

UNIT IV WEB CRAWLING AND WRAPPER GENERATION 9

Web Crawling – Algorithm – Implementation Issues – Types – Crawler Ethics and Conflicts – **Structured data Extraction: Wrapper Generation** – Wrapper Induction – Instance – Based Wrapper Learning – Automatic wrapper Generation: Problems – String Matching and Type Matching Multiple Alignment – Building DOM Trees – Extraction Based on Multiple Pages – Using Techniques in Previous Sections- **Information Integration** –Schema Matching – Pre-Processing for Schema Matching-Combining similarities-Integration of Web Query Interfaces-Constructing a Unified Global Query
Interface.

UNIT V OPINION AND WEB USAGE MINING 9

Opinion Mining –Sentiment Classification-Feature-Based Opinion Mining and Summarization – Comparative Sentence and Relation Mining-Opinion Search-Opinion Spam –**Web Usage Mining**-Data Collection and Pre-Processing-Data Modeling for Web
Usage Mining-Discovery and Analysis of Web Usage Patterns -Discussion and Outlook - Current Trends.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data Mining,& OLAP”, Tata Mcgraw- Hill, 2004.
2. Liu. B, “Web Data Mining, Exploring Hyperlinks, Contents and Usage Data”, Springer, 2007.

REFERENCES:

1. Reference Jiawei Han, Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, 2000.
2. Sean Kelly, “Data Warehousing in Action”, John Wiley & Sons Inc., 1997.
3. Paulraj Ponnaiah, “Data Warehousing Fundamentals”, Wiley Publishers, 2001.
4. Usama M.Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth, Ramasamy Uthurusamy, “Advances in Knowledge Discover and Data Mining”, The M.I.T Press, 1996

FI1962 CURRENT TRENDS IN WEB SECURITY L T P C
3 0 0 3

UNIT I WEB SECURITY AND PRIVACY 9

Web Security Problem – Cryptography and the Web – SSL – TLS – Digital Identifications-Privacy – Privacy Techniques – Technologies – Backups and Antitheft – Mobile codes – Web server Security – Physical – Host Security – Securing Web Application – SSL Server Web service – Computer Crime.

UNIT II SECURITY FOR CONTENT PROVIDERS 9

Controlling Access to Your Web content – Client Side Digital Certificates Code Signing and Microsoft's Authenticode – Pornography, filtering software, and Censorship – Privacy Policies Legislations, and P3P – Digital Payments – Intellectual Property and Actionable Content.

UNIT III WEB ATTACKS 9

Authentication-Authorization-Session state Management – Input Validation Attacks – Attacking Web Data Stores – Attacking web Services – Hacking Web Application Management – Web Client Hacking – Case Studies.

UNIT IV PHISHING 9

Introduction – Spam Classification – Antiphishing – Impersonation attack – Setting up the Phishing server – Forwarding and Popup attack – Anonymous E-Mail – Sending Spam – Misplaced Trust.

UNIT V ANTIPHISHING AND IMPLEMENTATION 9

PHP Basics-Web Techniques – Databases – xml – Security – PHP on Windows – PHP on Linux – antiphishing Vendors – solutions – Patterns – Testing Alternative UIs – Case Studies – Current trends.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Simson Garfinkel and Gene spafford, Web security, Privacy&Coomerce, 11 Edition, o' REILLY, 2002.
2. Joel Scambray and Mike Shema, Hacking Exposed Web applications Tata McGrawHill, 2002.
   Lance James, Phishing Exposed, first Edition: SHIROFF 2006.

REFERENCES:

1. Rasmus Lerdorf, Kevin tatroe and peter Macintyre, Programming PHP, II Edition, O' REILLY 2007.
2. Jack D. Herrington, PHP Hacks, First Edition, O' REILLY 2006.
3. Mike Shema, Hack Notes: Web security Portable Reference, Tata McGrawHill, 2003.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(11)**

FI1963 SEMANTIC WEB SERVICES L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background – Knowledge Representation Ontologies – Top Level
Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic web – Need – foundation – Layers – Architecture.

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 10

Web Documents in XML – RDF – Schema – Web Resource Description using RDF-RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional ontology Languages – LOOM- OKBC – OCML – Flogic Ontology Markup Languages - SHOE – OIL – DAML + OIL – OWL.

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB 10

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and processing Ontologies and Documents – Ontology Learning Algorithms – Evaluation.

UNIT IV ONTOLOGY MANAGEMENT AND TOOLS 9

Overview – Need for Management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. Evolution – Development of Tools suites – Ontology Merge Tools - Ontology based Annotation Tools.

UNIT V APPLICATIONS 7

Web services – Semantic Web Services – Case study for Specific domain – Security issues – current trends.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez – Lopez, "Ontological Engineering: with examples from the areas of knowledge Management, e-Commerce and the Semantic Web" Springer, 2004.
2. Grigoris Antoniou Frank Van Harmelen, "A Semantic Web Primer (cooperative Information Systems)", The MIT Press 2004.

REFERENCES:

1. Alexander Maedche, "ontology Learning for the Semantic Web", Springer, 1 edition, 2002.
2. John Davies, Dieter Fensel Frank Van Harmelen, "Towards the Semantic Web: Ontology – Driven knowledge Management", John Wiley & sons Ltd., 2003.
3. Dieter Fensel (Editor), Wolfgand Wahlster, Henry Lieberman, James Hendler, "spinning the Semantic Web: Bringing the World Wide web to its Full potential", The MIT Press 2002.
4. Michael C. Daconta, Leo J. Obrist Kevin T.Smith, "The Semantic Web: A Guide to the future of XML, Web services, and Knowledge Management", Wiley 2003.
5. Steffen Staab (Editor) Rudi, Studer, "Handbook on Ontologies (International Handbooks on Information Systems)", Springer 1st edition, 2004.

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(12)**

FI1964 BIO INSPIRED COMPUTING L T P C
3 0 0 3

UNIT I GENETIC ALGORITHMS AND NEURAL COMPUTING

Fundamentals of Artificial neural networks – Architecture – Learning Paradigms – Activation Functions – Training Fundamentals of Evolutionary computation – Standard Algorithm and its process – Genetic Algorithm – Programming.

UNIT II CELLULAR AUTOMATA AND SYSTEMS

Fundamentals – Different Types – Applications – Programming L systems – Structures – Types – Examples.

UNIT III DNA COMPUTING AND MEMBRANE COMPUTING

DNA Computing – Fundamentals – Limitations – Applications – Membrane Computing – Introduction – Variants – Properties - Computational and Modeling – Applications

UNIT IV OTHER COMPUTING PARADIGMS

Quantum computing – Fundamentals – Issues – Power – Different Types – Application – Programming Swarm Systems – Swarm Intelligence – Applications
Artificial Immune Systems

UNIT V HARDWARE ARE REALIZATION OF UNCONVENTIONAL PARADIGMS

Bio-Inspired Hardware – Novel Hardware Architectures – Implementation Issues – reconfigurable Hardware – Evolvable Hardware

Faculty of I and C Engg **(Approved in 12th BOS 19.04.2008) ITEM NO. FI 12.6(13)**

FI1965 INFORMATION ECOSHERE L T P C
3 0 0 3

UNIT I INFORMATION IS MORE THAN REPRESENTATION

The roots of In-Formation, Measures, Abstraction, Reductionism, Emergence, Classical Information Theory, Quantum Information, Going beyond Shannon's Theory

UNIT II INFORMATION TRIPOD

Making Data Speak, Classification, Accessibility and Assurance

UNIT III FACTORS FOR DURABILITY OF INFORMATION

File Formats, Archival Strategies, Unreadable digitised information, Scientometrics, Webometrics, People Skills

UNIT IV INFOMETRIES

Vast amounts of data gathered from diverse systems, information continuously collected over long periods, Expert data review and analysis, Dynamic and static data mined for value, Transactional Content Management, Unbiased recommendations, ROI on these activities

UNIT V INTANGIBLE INFORMATION RESOURCES

Ftp, telnet, mailing lists, Relay Chats, Gopher, Software Agents and Print Vs Web

TOTAL: 45 PERIODS

REFERENCES:

1. Eugene Garfield, "Concept of Citation Indexing", The Science, 1997
2. Hans Christian von Baeyar, "Information – The New Language of Science", Phoenix, UK, 2003
3. John Jacob, "Encyclopedia of Computer Science – Introduction to Computer Science Volume 1", Commonwealth, New Delhi, 2004.
4. Lennart Bjorneborn and Peter Ingwersen, "Toward a basic framework for Webometrics" , Journal of the American Society for Information Science and Technology, Volume 55, Issue 14, pp 1216 – 1227, December 2004.
5. Ranganthan S R, "Choice of Scheme for Classification", Based on Library Science with a Slant to Documentation, Vol. 5 (1), pp – 69, March 1968
6. Stephen Few, "Show Me the Numbers", Analytics Press, US, 2004.

Web Resources.

FI1966 **GRID SCHEDULING** **L T P C**
3 0 0 3

OBJECTIVE:

This course aims to equip the participants with the necessary knowledge and skills to master Grid Computing the latest distributed computing paradigm in leveraging shared computing resources using standard and open technologies. The course introduces Grid Computing and the underlying technologies, including Web Services, with focus on four major areas: Grid scheduling, Resource Management and Grid Workflow Management and Queuing theory.

UNIT I

Grid Computing – Web services – Anatomy of Grid, Physiology of Grid, Applications of Grid – Next Generation Grid.

UNIT II

Parallel job scheduling – Space sharing, Time sharing, Global scheduling, Economic Scheduling Algorithms.

UNIT III

Grid Resource Management and Grid Economy, Glonus Middleware, Nimrod-G Grid Resource Broker – Gridway metaschedular.

UNIT IV

Distributed simulated annealing algorithms for job scheduling, Parallel simulated annealing algorithms.

UNIT V

Characteristics of Queuing systems, Long run measures of performance of Queuing systems, Markovian queuing models, Queuing networks, Queuing decision models.

TOTAL: 45 PERIODS

REFERENCES:

1. 'The Grid – Blueprint for a New Computing Infrastructure', Ian Foster and Car Kesselman, Morgan Kaufman, Second Edition, 2003.
2. Grid Resource Management ' Edited by Jarek Nabrzyski, Jennifer Schopf and Jan Weglarz, Kluwer Publishing, 2003
3. Grid Computing' by Joshy Joseph, Craig Fellenstein, Pearson Education, 2005.
4. Grid Computing – A Research Monograph' by D.Janakiram, Tata McGraw Hill, 2005.
5. Probability & Statistics with Realiability ', Queuing and Computer Science applications by K.S.Trivedi, PH India, 2001.
6. Operations Research – An Introduction' by Handy A. Taha, 3rd Edition, Macmill Publishing Co.Inc., 1982.

FI1967 **CONTEXT MODELING** **L T P C**
3 0 0 3

UNIT I INTRODUCTION

Ubiquitous computing – Define context – Types of context – Enumeration based – Role Based Context aware computing and applications – Core capabilities for context awareness – Types of context ware applications – Developing context aware applications – Middleware support Contextual services – Actuator service - Example – Context toolkit – Providing location context.

UNIT II ONTOLOGY

Basic concepts – Ontology Engineering – Advanced topics – Standard upper ontology – Ontology level – Semantic web – Semantic web languages - XML & XML schema, RDF & RDF schema – DAML + OIL – OWL – SPARQL – Role of ontology – Semantic markup Semantic web services – Open issues.

UNIT III CONTEXT MODEL APPROACHES

Requirements for context model – Key Value Models – Markup Scheme Models – Graphical Models – Object Oriented Models – Logic Based Models.

UNIT IV CONTEXT MODEL ARCHITECTURES

Context Broker Architecture CoBrA – Service – Oriented Context – Aware Middleware SOCAM Standard Ontology for ubiquitous and pervasive applications SOUPA – Ontology based Generic context management model GCoM.

UNIT V APPLICATIONS

Office and Meeting Tools – The Active Badge System – The Pare Tab System – Applications from Georgia Institute of Technology – (Tourist) Guides – Cyberguide - GUIDE – Smart Sight Tourist Assistant – Frameworks supporting Context – Aware Applications – Stick –e Notes framework.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Frank Adestein Sandeep K.S.Gupta, Golden G. Richard III, Loren Schwiebert.
2. Fundamentals of Mobile and Pervasive Computing, Tata MCGraw-Hill
3. Publishing Company Limited, Edition 2005.
4. Dragan Gasevic, Dragan Djuric, Vladan Devedzic, Bran Selic, Model Driven
5. Architecture and ontology development, Springer – Verlag Berlin Heidelberg 2006.

REFERENCES:

1. F.Van Harmelen et al, “Owl Web Ontology Language Reference”,
2. http://www.w3.org/TR/owl-ref/
3. Philip Moore, Bin Hu and Jizheng Wan, Smart-Context: Acontext Ontology for Pervasive Mobile Computing, 2007.
4. http://www.it.kth.se/edu/Ph.D/LocationAware/aware.vt98.html

FI1968 BASICS OF CEREBRAL INFORMATION PROCESSING AND ITS RELATIONSHIP WITH NIRS. **L T P C 3 0 0 3**

UNIT I **9**

Introduction to the Brain and physical demonstration, Communication in the Central Nervous System, Cognitive Functions, Blood Supply to the Brain, Basic principles of Imaging the Brain, Functional Imaging of the Brain including Clinical Applications, Applications of Near Infra red Spectroscopy, Information Processing in the Brain The future.

UNIT II **9**

Organisation of Movement, Motor unit and Muscle action, Spinal reflexes, Voluntary movement, Role of Cerebellum in posture, Diseases with motor unit, Basal ganglia disorders.

UNIT III **9**

Organization of functional systems, Role of Modulatory systems, Functional organization of Perception and Movement, Thalamus the essential link in Information processing, Neuro physiological correlates of awareness and consciousness, Interaction between cognition, consciousness and comprehension, Cortical and sub cortical loops.

UNIT IV **9**

Spectral methods of analyzers, Transmission spectroscopy, Reflectance spectroscopy, Near Infrared spectroscopy (NIRS), Types of NIRS, Continuous Wave spectroscopy, Time resolved Spectroscopy, Frequency domain spectroscopy, Non – quantitative measurements- Cerebral oximetry, Quantitative concentration measurements, Comparison of NIRS with pulse oximeter.

UNIT V **9**

Functional brain study- Motor and sensorimotor stimulation, Visual stimulation, Language study, Mental Health study, Cognitive test study, Event related tasks.

Measurement of cerebral oxygenation, Cerebral haemodynamics- Cerebral blood fiow, Blood volume, Changes in CO oxidation, Neuronal activity, Pulse oximeter, Regional oxidative metabolism in muscle, Neo-natal brain metabolism.

TOTAL: 45 PERIODS

REFERENCES:

1. Eric R. Kandal, “Principles of Neuro Sciences”, McGraw Hall, 4th Edition, 2000.
2. Jim Byrnes, ‘Advances in sensing with security applications’ Springer Netherlands Volume 2/2006,341-372.
3. Richard N.Aslin, Jacques Mehler, “Near infrared spectroscopy for functional studies of brain activity in human infants: Promise, Prospects and challenges“- Journal of Biomedical optics 10(1), 011009.
4. Arno villringer, Britton Chance, “Non invasive optical spectroscopy and imaging of human brain function”, Trends Neurosci (1997) 20,435-442.
5. R.Maniewski, A.Liebert, M.Kacprzak, A.Zbiec, “Selected applications of near infrared optical methods in medical diagnosis”, Opto electronics, Review 1293), 255-262.
6. H.Owen Reece, M.Smith, C.E.Elwell, J.C.Goldstone, “Near infrared Spectroscopy”, Br J Anaesh 1999, 82; 418-26.
7. Maria Angela Franceschini, David A. Boss, “Non invasive measurement of neuronal activity with near infrared optical imaging”, Neuro Image 21(2004) 372-386.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(4)**

FI1969 TYPE SYSTEMS L T P C
3 0 0 3

UNIT I **5**

Introduction to Types, type systems and language design, Mathematical Preliminaries: sets, relations and functions, ordered sets, sequences, and inductions.

UNIT II **12**

Untyped Arithmetic Expressions, ML implementation of Arithmetic Expression, Untyped Lambda Calculus, Nameless Representation of terms, ML implementation of Lambda Calculus.

UNIT III **12**

Typed Arithmetic Expression, Typed Lambda Calculus, ML implementation of simple types, simple extensions, Normalization, References, Exceptions.

UNIT IV **8**

Sub Typing, Recursive Types and Meta theory of Recursive types.

UNIT V **8**

Polymorphism, High Order Systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Benjamin C. Pierce, “Types and Programming Languages”, MIT Press, 2002.
2. Carl A. Gunter, “ Semantics of programming Languages”, MIT Press, 1992.
3. Ravi Sethi, “Programming Languages – Concepts and Constructs”, AT&T Bell Laboratories, Addison Wesley.
4. Frank G. Pagan, “Formal Specification of Programming Languages - A Panoramic Primer", Southern Illinois University, Prentice Hall Inc.
5. ACM and IEEE Transaction Papers on Programming Languages and Strongly
6. Typed Mechanisms.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(5)**

FI1970 ADVANCED SECURITY MECHANISM L T P C
3 0 0 3

UNIT I **9**

Basics – Language based Approach to security, Aliasing Problem, Encapsulation in Object – Oriented Programming Language, Ownership Types and Permission – Based Protection Object Relationship Based on Subsumption, Issues on Software Protection, Mathematical Approach To Prove Safety.

UNIT II **9**

Kernel Embedded Handlers – Software Based Fault Isolation, Address Based Mechanism for safety, Inline Reference Monitor, SASI (Security Automata SFI Implementation). Trusted Compiler, Kernel Embedded Interpreter, Code Inspection.

UNIT III **9**

Typed Assembly Language (TAL) – core and Implementation, Type Invariant, Proof Carrying Code (PCC) – Defining Safety Policy, Certifying the Safety Programs, Validating the Safety Proofs, Approach Towards Efficiency, Foundational Proof Carrying Code (FPCC): mechanism.

UNIT IV **9**

JVM Internals – Java stack Inspection and General theory, Garbage Collection, Beyond Type Safety, Sandboxing Mechanism in Java, Lifetime of Types, JVM Memory Management, JVM Working and Operating System Interaction.

UNIT V **9**

Case Study – language based Extensible Operating System – J-Kernel and SPIN, Cyclone Programming Language, Ownership Types, Island Types, Balloon Types, External Uniqueness Class-Based Programming Language and Prototype-Based Programming Language.

TOTAL: 45 PERIODS

REFERENCES:

1. Securing Java, by Gary McGraw and EdFalten, published by John Wiley and sons Inc.
2. Inside Java Virtual Machine, second Edition, by Bill Venuers, published by McGraw-Hill 2000.
3. Cornel TAL group – (www.cs.cornel.edu/talc/)
4. Peter Lee (PCC) – (www.2.cs.cmu.edu/petel/papers/pccp)

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(6)**

FI1971 **LEXICAL SEMANTICS** **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Lexical Semantics – Word Meaning – Constraints and Representation – Context and Disambiguation – Collocations – Discourse Understanding – Anaphora Resolution.

UNIT II STATISTICAL METHODS IN NLP **9**

Parameterized Models – Maximum Likelihood Estimation – Smoothing – Markov Models N gram language Models – Singular Value Decomposition

UNIT III SEMANTIC SIMILARITY **9**

Lexicon – based Similarity Computation – WordNet Relations – Path-based Similarity – Corpus-based Similarity Computation – Vector Space Model – Similarity Measures – Clustering

UNIT IV LEXICAL SEMANTICS RESOURCES **9**

WordNet – Thematic Roles and Selectional Restrictions – Frame Semantics and FrameNet – ProbBank – Levin's Verb Classes – Ontologies

UNIT V CASE STUDIES **9**

Evaluations of Systems – Performance Metrics – Word Sense Disambiguation – Senseval – Question Answering – Document Summarization

TOTAL: 45 PERIODS

REFERENCES:

1. Christopher D. Manning and Hinrich Schutze, 1999 “Foundations of Statistical Natural language Processing”, MIT Press.
2. C.Fellbaum. 1998. WordNet: An Electronic Lexical Database. MIT Press. Beth Levi. 1993. English Verb Classes and Alternations: A Preliminary Investigation. University of Chicago Press.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(7)**

FI1972	**ULTRASONIC PRINCIPLES AND APPLICATIONS IN MEDICINE**	**L T P C 3 0 0 3**

UNIT I PRINCIPLES OF ULTRASONICS 9

Introduction, Piezo Electric Devices, The Fields of ‘simple’, CW excited sources, The Pulsed Acoustic field, Effects of human body on Beam Propagation, Beam formation by transducer arrays, Magnitudes of Acoustic Field variables, Displacement detectors Thermal mechanisms, Cavitation, Radiation Pressure.

UNIT II TISSUE-ULTRASOUND INTERACTION 9

Introduction, Absorption in biological tissues, Tissue-Ultrasound interaction cross sections, Theory of mechanisms for the absorption of ultrasonic longitudinal waves, Measurement of attenuation and Absorption Coefficients in tissues, Acoustic properties reflecting different levels of tissue organization, Molecular aspects of soft tissue mechanics, Structural contribution to bulk and shear acoustic properties of tissues. Relevanceto tissue characterization, Ultrasound quantitation and tissue characterization.

UNIT III SCANNING TECHNIQUES 9

Ultrasound transducers, Construction of ultrasonic probe, Measurement of ultrasonic energy, pulse echo imaging, Pulse echo equation, Transducer motion, Transmit steering and focusing, Beam forming and Dynamic focusing, Transmitter, Receiver, Positional information, Scan converter-Analog, Digital. Image display, Image position, Transducer output, signal processing, adjustment of controls. Scanning Techniques-Acoustic windows, Scanning motion, Transducer Selection, Scan Indexing. Basic Image Interpretation-Contour, Internal Echo pattern, Attenuation, Classification, Artifacts.

UNIT IV REAL TIME ULTRASONIC SCANNERS 9

Different modes of display-A mode, B mode, M mode, B-scan System, The Principles of Ultrasound Motion Detection, Techniques for Measuring Target Velocity, Phase Fluctuation (Doppler Methods), Envelope Fluctuation Methods, Phase Tracking Methods, Envelope Tracking Techniques, Ultrasound Imaging Systems, Considerations Specific To Color Flow Imaging, Angle Independent Velocity Motion Imaging, Tissue Elasticity & Echo Strain Imaging, Performance Criteria, Use of Contrast Media, Real Time Echo, 2-D and 3-D Scanners, Color Doppler.

UNIT V ULTRASONIC APPLICATIONS 9

Ultrasonic diagnosis in Abdomen, Breast, Thyroid, Heart, Chest, Eye, Kidney, Skull, Pregnant and Non Pregnant uterus, 3-Dimensional Ultrasonic Imaging of The Fetus, Advantages And Limitations of 3-Dimensional Ultrasound.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Shirley Blackwell Cusick, Farman and Vicary, A User's Guide to Diagnostic Ultrasound; Pitman Medical Publishing Co Ltd; Kent, England. (1978).
2. C.R.Hill, Jeff C.Bamber, Gail Haa, Physical Principles of medical Ultrasonics; John Wiley & Sons Ltd; 2nd Edition, 2004.
3. W.N.McDicken, Churchill Livingstone, Diagnostic Ultrasonics – Principles and use instruments – New York, 3rd Edition, 1991.

REFERENCES:

1. Timothy J.Hall, AAPM/RSNA, "Physics Tutorial For Residents: Elasticity Imaging With Ultrasound", Radio Graphics, Vol.23, No.6, Nov-Dec 2003. (RSNA 2003)
2. T.Rago, F.Santini, M.Scutari, A. Pinchera and P.Vitti, "Elastography: New developments in Ultrasound for Predicting Malignancy in Thyroid Nodules", Journal of Clinical Endocrinology and Metabolism, August 2007, 92(8) : 2917 – 2922.
3. James Revell, Majid Mirmehdi and Donal McNally, "Computer Vision Elastography: Speckle Adaptive Motion Estimation for Elastography using Ultrasound Sequences", IEEE Transactions on Medical Imaging, Vol.24, No.6, June 2005.
4. Hassan Rivaz, Emad Boctor, Pezhman Foroughi, Richard Zellars, Gabor and Gregory Hager, "Ultrasound Elastography: A Dynamic Programming Approach", IEEE Transactions on Medical Imaging, 2008.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(8)**

FI1973 DISCOURSE ANALYSIS – WESTERN AND EASTERN PERSPECTIVE L T P C
3 0 0 3

UNIT I TEXT SEGMENTATION

Introduction – Agreement – Evaluation – Automatic text segmentation – Hierarchial - Text Segmentation – Meeting Segmentation

UNIT II COHESION AND LOCAL COHERENCE

Lexical Chains – Centering Theory – Automatic Reference resolution – Reference Generation – Generation of Referring Expressions

UNIT III INTENTION AND TEXT STRUCTURE

Domain Dependent models of Text structure – Rhetorical Structure theory – Discourse Structure in Text summarization – Temporal Ordering in Discourse – Intentions and structure of Discourse – Automatic interpretation of Dialog Acts

UNIT IV CLASSIFICATION OF PROVISIONS ACCORDING TO MIMAMSA

Classification of Simple Sentence – Types of Vedic Injunctions – Obligatory and Non Obligatory statements – Procedural Concepts – Prakriti – Vikriti – Uha – Badha – Atidesa – Punarvacana – Sentence Requirement – Akanksa – Sannidhi – Yogyata

UNIT V MIMAMSA PRINCIPLES OF INTERPRETATION

Six tests of a subsidiary – Sruthi – Linga – Vakya – Prakarna – Sthana – Samakhya – Conflict between Primary Rules and Rules of Procedure – Mimamsa Rules of Interpretation – Mimamsa Maxims – Sangathi – Case Studies

TOTAL: 45 PERIODS

REFERENCES:

1. http://ocw.mit.edu/Ocw Web/Electrical-Engineering- and-Computer-Science/6-892Spring-2004/CourseHome/index.htm
2. http://www.cis.upenn.edu/~bonnie/cis630.html
3. Swami Madhavananda, "Mimamsa Paribhasha of Krishna Yajvan", Advaita Ashrama, 1996
4. "History of Science, Philosophy and Culture in Indian Civilization, Vol II, Part 6, Purvamimamsa from an Interdisciplinary Point of View", Edited by K.T.Pandurangi, 2006

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(9)**

FI1974 SEMANTIC WEB AND E –LEARNING L T P C
3 0 0 3

UNIT I INTRODUCTION 8

Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background – Sample – Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need Foundation – Layers – Architecture.

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 12

Web Documents in XML –RDF – Schema –Web Resource Description using RDF –RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics Pragmatics – Traditional Ontology Language – LOOM – OKBC – OCML – Flogic Ontology Markup Languages – SHOE – OIL – DAML + OIL –OWL

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB 12

Taxonomy for Ontology Learning – Layered Approach – Phases pf Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms – Evaluation

UNIT IV E-LEARNING FUNDAMENTALS 8

Defining terms – new learning landscape – ROI, metrics and evaluation – e-learning cycle – Business Drivers – E-Learning strategy – Role of semantic web in E-Learning Educational Semantic web

UNIT V DELIVERY AND ROLE OF SEMANTIC WEB 5

Project team – Infrastructure – Vendor relationships – Learning Management systems – Testing – Multi – Channel delivery – Learner support – Developing curricula – E –Learning standards

TOTAL: 45 PERIODS

REFERENCES:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez, "Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web" Springer, 2004
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic web Primer (Cooperative Information Systems)", The MIT Press, 2004.
3. Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002
4. John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology – Driven Knowledge Management", John Wiley & Sons Ltd., 2003.
5. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler," Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential", The MIT Press, 2002

6. Michael C.Daconta, Leo J.Obrst, Kevin T.Smith, “The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management”, Wiley, 2003
7. Steffen Staab (Editor), Rudi Studer,”Handbook on Ontologies (International Handbooks on Information Systems)”, Springer 1st edition, 2004
8. Don Morrison, “E-Learning Strategies, Wiley, 2003

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.01(10)**

FI1975 **QUANTUM COMPUTING** **L T P C**
3 0 0 3

UNIT I

Fundamental Concepts-Introduction and Overview-global Perspectives-Quantum Bits-Quantum Computation-Quantum Algorithms-Experimental Quantum Information Processing-Quantum Information.

UNIT II

Quantum Mechanics-Linear Algebra-The Postulates of Quantum Mechanics- Application-The Density Operator-The Schmidt decomposition & Purifications-EPR and the Bell Inequality

UNIT III

Quantum Model of Computation-Quantum Circuits-Quantum Gates-Super dense Coding-Quantum Teleportation-An Application of quantum Teleportation

UNIT IV

Quantum Fourier Transform and its applications-The Quantum Fourier Transform-Phase Estimation-Applications: Order finding and factoring-Finding Discrete Logarithms Hidden Subgroups-Related Algorithms and Techniques

UNIT V

Quantum Search Algorithms and Error Correction-Quantum Search Algorithm-Quantum Search as a Quantum Simulation-Quantum Counting-Speeding up the solution of NP-Complete Problems-Quantum Search of an unstructured Database-Optimality of the search Algorithm-Black Box Algorithm Limits-Quantum Error Correction

TOTAL: 45 PERIODS

TEXT BOOK:

1. Michael A. Nielsen, Isaac L.Chuang,”Quantum Computation and Quantum Information” Cambridge University Press-2002.

REFERENCE:

1. Philip Kaye, Raymond Laflamme and Michele Mosca, “An Introduction to Quantum Computing” – Oxford University Press-1996.

FI1976 CROSS-LAYER OPTIMIZATION AND VIDEO TRANSMISSION L T P C
3 0 0 3

UNIT I

Principles of cross-layer design-Cross-layer approach-Cross-layer protocols-Algorithms at physical layer, link layer, network layer, transport layer and application layer-Cross-layer optimization-Cross-layer optimization issues related to network efficiency

UNIT II

Cross Layer Activity Management-Optimization Issues in QoS-Route Optimization in IP Networks-Optimization in Wireless Networks-Channel-Adaptive Technologies-Network architecture supporting wireless applications-Routing protocols in mobile and wireless networks

UNIT III

Cross layer Techniques-Adaptive techniques-Diversity techniques-Scheduling-Key issues in cross-layer design-Wireless multicasting-Examples of cross-layer design for wireless networks-The application's requirements to optimize the performance-Cross-layer Simulation Methodologies

UNIT IV

Network layer capacity-optimal control of wireless and ad-hoc mobile networks-opportunistic resource allocation, routing, and flow control-minimum energy networking-general utilities and constraints-queue stability – energy-delay and utility-delay tradeoffs

UNIT V

Introduction to image and video coding-Image coding systems-The JPEG standard –Video coding systems-The H.263 and H.264 standards-The MPEG 1 and MPEG 2 standards-The MPEG 4 standard- Videoconferencing-Video coding standards-Setting Standards-Video compression systems-timing and synchronization using transport streams – Applications of compression – Video conferencing – Video Quality Assessment-Optimized Video Transmission Framework

TOTAL: 45 PERIODS

TEXT BOOKS:

1. J.Kurose & K.Ross: Computer Networking: 3rd (or 4th) Edition. A Top-Down Approach Featuring the Internet, Publisher: Addison-Wesley, 2007.
2. Handbook of optimization in telecommunications/ edited by Mauricio G.C. Resende, Panos M.Pardalos.
3. Theodoere S.Rappaport, Wireless Communications: Principles and Practice, Second Edition, Prentice Hall: Upper Saddle River, NJ,2002,ISBN 0-13-042232-0

REFERENCES:

1. K. Pahlavan & P.Krishnamurthy, Principles of Wireless Networks, Prentice Hall: Upper Saddle River, NJ, 2002, ISBN 0-13-093003-2
2. Research and tutorial papers in journals and conference proceedings.

FI1977 NEXT GENERATION IP NETWORKS L T P C
3 0 0 3

UNIT I IP V6 ADRESSING 9

Next Generation Networks-Overview-IP V6 Specification-Addressing Architecture-Address Allocation Management-Unicast Address Allocation-Global Unicast Address Format-Testing Address Allocation-Multicast Addressing-Reversed IP V6 Subnet any cast addresses.

UNIT II IP V6 TRANSMISSION AND SECURITY 9

Internet Control Message Protocol-Hop-by-Hop Options-Header Compression-Packet Tunneling-Domain Name System-Transition Mechanisms-Routing-Renumbering-IP Privacy-Security Architecture for the Internet Protocol-IP Authentication Header-IP Encapsulation Security Payload-IP Authentication using Keyed MD5-The ESP DES-CBC Transform.

UNIT III IP V6 OVER DIFFERENT NETWORKS 9

IP V6 over Ethernet Networks-IP V6 over FDDI Networks-IP V6 over Token ring Networks- IP V6 over ARCnet Networks- IP V6 over PPP- IP V6 over NBMA Networks- IP V6 over ATM Networks.

UNIT IV WIRELESS IP NETWORK ARCHITECTURES 9

3GPP Packet Data Networks, Network architecture, Protocol Reference Model, Packet Data Protocols, Bearers, and connections for Packet Services, Packet Data Protocol (PDP) Context, Steps for a Mobile to Access 3GPP Packet-Switched Services, User Packet Routing and Transport, Configuring PDP Addresses on Mobile Stations, GPRS Attach Procedure, Access to MWIF Networks, Session Management.

UNIT V NETWORK CONGESTION CONTROL AND AVOIDANCE 9

Introduction-Queue Management-Scheduling-Types of flows-Queue Management Techniques: RED-FRED-SRED-PI Controller-REM- E-RED Scheduling Algorithms: Fair Queing-CFS.

TOTAL: 45 PERIODS

REFERENCES:

1. RFC 2373, -IP V6 Addressing Architecture, RFC 1881-IPv6 Address Allocation Management, (Unit I)
2. RFC 2463-Internet Control Message Protocol, RFC 2402-IP Authentication Header (Unit II)
3. RFC 2497-Transmission of IPv6 Packets over ARCnet Networks, RFC-2492-IPv6 over ATM Networks (Unit III)
4. http://www.faqs.org/rfcs/(Unit I, II, III)
5. JYH-CHENG CHEN, TAO ZHANG,"IP-Based Next Generation Wireless Networks (Systems, Architectures and Protocols)", by John Wiley & Sons, Published by John Wiley & Sons, Inc., Hoboken, New Jersey.2004. (Unit IV)
6. http://www.icir.org/floyd/red.html (Unit V)

FI1978 3D IMAGING AND IMAGE SET RETRIEVAL L T P C
3 0 0 3

UNIT I BIOMEDICAL IMAGING MODALITIES AND IMAGE FORMATION 9

Introduction to Medical Imaging, Medical imaging modalities, Medical imaging from physiology to information processing, general performance Measure, Bio Medical Image processing and Analysis, Image formation- image co-ordinate system, Linear systems and impulse response, Principle of image formation.

UNIT II IMAGE REPRSENTATIONS, DISPLAYS AND COMMUNICATION DATABASES 9

Representation of Two-Dimensional Geometric structures, Representation of Three-Dimensional structures, Image Acquisition systems, Image representations, displays communications and databases, Analysis of shape and texture of bio medical images.

UNIT III 3D IMAGING PRINCIPLES AND APPROACHES 9

3D Imaging principle and approaches, Preprocessing of 3D Imaging, Image Visualization-Visualization methods, Three- Dimensional image generation and Display.

UNIT IV QUANTIFICATION AND EVALUATION OF 3D IMAGING 9

Quantification using 3D imaging- Introduction,methods-3Dsurface image generation, point location, Distance calculation, volume Calculation Evaluation of 3D imaging- 3D imaging systems, Measurements, Evaluation 3D Anthropometry, Craniofacial Deformities

UNIT V IMAGE SET REPRESENTATION AND RETRIEVAL 9

3D ultrasound imaging of the fetus, conventional ultrasound imaging of the fetus, The development of 3D ultrasound, clinical applications of 3d ultrasound in obstetrics, the future development of 3D ultrasound, Image sets-Recognition of Image set classes using calonical correlations, image set retrieval based on texture and shape features.

TOTAL: 45 PERIODS

REFERENCES:

1. Dana A.Ballard, Christopher M.Brown,"Computer Vision R", 1st Edition,Prentice Hall.
2. Richard A.Robb, Ph.D, "Biomedical Imaging Visualization and Analysis"1st Edition,Wiley-Liss.
3. Rangayyan," Biomedical Image Analysis", 1st Edition, CRC.
4. Jayaram K.Udupa, Gabor T.Herman, "3D Imaging in Medcine", 2nd Edition,CRC Press.
5. T.Furukawa,"Biological Imaging and Sensing", 1st Edition, Spinger.
6. Tae-Kyun Kim, Josef Kittler and Roberto Cipolla, "Discriminative Learning and Recognition of Image Set Classes Using Canonical Correlations", Ieee Transactions On Pattern Analysis And Machine Intelligence,June- 2007.
7. Jiann-Der Lee, Li-Peng Lou, "Using Texture and Shape Features to Retrieve sets of similar Medical Images", Bio Medical Engineering Applications, Basis & communications.

FI1979 DATA MINING ALGORITHMS, ANALYSIS AND PARALLELIZATION **L T P C 3 0 0 3**

UNIT I MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS **9**

Introduction to data mining algorithms, Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint Based Association Mining.

UNIT II CLASSIFICATION AND PREDICTION **9**

Classification & Prediction – Definitions, Issues Regarding Classification & Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Backpropagation, Support Vector Machines, Classification by Association Rule Analysis, Lazy Learners, Genetic Algorithms, Rough Set & Fuzzy Set Approaches, Prediction Techniques, Evaluating the Accuracy of a Classifier or Predictor.

UNIT III CLUSTER ANALYSIS **9**

Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis.

UNIT IV MINING STREAM, TIME-SERIES AND SEQUENCE DATA **9**

Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining : Methods for Mining Frequent Subgraphs, Mining Variant and Constrained Substructure Patterns, Applications.

UNIT V PARALLELIZATION OF DATA MINING ALGORITHMS **9**

Parallelization of Association Rule Mining : Eclat, Maxclat, Clique, Maxclique, MLFPT. Parallel K Means Clustering, Parallel Hierarchical Clustering, Parallel Formulations of decision tree algorithms.

TOTAL: 45 PERIODS

REFERENCES:

1. Han J and Kamber M, “Data Mining : Concepts and Techniques” (Morgan Kaufmann Publishers, 2nd Edition 2006).
2. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, Pearson Education 2004.
3. Timothy J.Ross,”Fuzzy Logic with Engineering Application “, McGraw Hill, 1977.
4. Davis E.Goldberg,”Genetic Algorithms:Search, Optimization and Machine Learning” Addison Wesley, N.Y.,1989.
5. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Prentice Hall, 2002.
6. Laurene V. Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms And Applications”, Prentice Hall, 1994.
7. Srivastava, E. Han, V. Kumar, and V. Singh. “Parallel formulations of decision- tree classification algorithms.” Data Mining and Knowledge Discovery,Vol. 3, no3, pp 237-261, September 1999.
8. Bundit et al.,”Parallel Association Rule Mining based on FI Growth Algorithm”, icpads,pp.1-8, 13th International Conference on Parallel and Distributed Systems - Volume 1 (ICPADS'07), 2007.

9. Li et al.,"Parallel Data Mining Algorithms for Association Rules and Clustering", CRC Press, LLC pp1-1 1-25, 2006.
10. Mohammed J. Zaki, "Scalable Algorithms for Association Mining," IEEE Transactions on Knowledge and Data Engineering, Vol. 12, No. 3, pp 372-390 May/June 2000.
11. Osmar R. Zaiane, Mohammad El-Hajj, and Paul Lu. "Fast parallel association rule mining without candidacy generation." In Proc. of the IEEE Int'l Conf. on Data Mining, pp 665 – 668 November 2001.
12. Richard et al., "ParaKMeans: Implementation of a Parallelized KMeans Algorithm Suitable for general Laborartory use", *BMC Bioinformatics.*2008;9**:200.** Published online 2008 April 16.
13. Sanguthevar Rajasekaran, "Efficient Parallel Hierarchical Clustering Algorithms", IEEE Transactions On Parallel And Distributed Systems, Vol. 16, No. 6, pp 497 – 502 June 2005.
14. Z. Li et al. "An Adaptive Parallel Hierarchical Clustering Algorithm", HPCC 2007, LNCS 4782, pp. 97–107, 2007. Springer-Verlag Berlin Heidelberg 2007.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.06(3)**

FI1980	**SOFTWARE DEFINED RADIO AND COGNITIVE RADIOTECHNOLOGIES**	**L T P C 3 0 0 3**

UNITI INTRODUCTION TO SDR 9

Definitions and potential benefits, software radio architecture evolution – foundations, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, architecture goals, quantifying degrees of programmability, top level component topology, computational properties of functional components, interface topologies among plug and play modules, architecture partitions.

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, the cognition cycle, organization of congnition tasks, structuring knowledge for congnition tasks, Enabling location and environment awareness in cognitive radios – concepts, architecture, design considerations.

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Primary Cognitive Radio functions, Behaviors, Components, A–Priori Knowledge taxonomy, observe – phase data structures, Radio procedure knowledge encapsulation, components of orient, plan, decide phases, act phase knowledge representation, design rules.

UNIT V NEXT GENERATION WIRELESS NETWORKS 9

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL: 45 PERIODS

REFERENCES:

1. J. Mitola, " The Software Radio Architecture", IEEE Communications Magazine, May 1995.
2. Joseph Mitola III and Gerald Q. Maquire, " Cognitive radio: making software radios more personal", IEEE Personal Communications, August 1999.

3. J. Mitola, " Cognitive Radio: An Integrated Agent Architecture for software defined radio", Doctor of Technology thesis, Royal Inst. Technology, Sweden 2000.
4. Simon Haykin, "Cognitive Radio: Brain –empowered wireless communications", IEEE Journal on selected areas in communications, Feb 2005.
5. Hasari Celebi, Huseyin Arslan , " Enabling location and environment awareness in cognitive radios", Elsevier Computer Communications , Jan 2008.
6. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, " NeXt generation / dynamic spectrum access / cognitive radio wireless networks: A Survey Elsevier Computer Networks, May 2006.

Faculty of I and C Engg (**Approved in 13th AC 20.12.2008) ITEM NO. FI 13.06(4)**

FI1981 ADAPTIVE ANTENNA ARRAYS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction to Adaptive arrays, switched beam arrays, Dynamically phased array- Wireless communications demand - Adaptive antennas and MIMO systems for Mobile communications, Multiple Input Multiple Output Antenna systems

UNIT II BEAMFORMATION 9

Adaptive Beamformer structure-Adaptive beamforming, optimum beam forming, Fully adaptive arrays, Adaptive antenna algorithms, Beamforming with genetic algorithms, Sidelobe control using optimization methods in adaptive beamforming, Multichannel adaptive beamforming

UNIT III SPATIAL CHANNEL MODELLING 9

Geometric based statistical channel modeling, Spatio temporal radio channel modeling for microcells, Wideband directional channel model for Mobile communication systems, MIMO channel characterization for Indoor WLAN application, Spatially spread sources in Antenna Array Processing

UNIT IV APPLICATIONS 9

Adaptive Beamforming performance in Micro and Macro cell Propagation scenarios, High Performance path searcher for CDMA adaptive antenna systems, Optical beamforming for phased array antennas, Mirroring properties of sub-band adaptive beamforming arrays using Quadrature mirror filter banks

UNIT V PERFORMANCE AND IMPLEMENTATION ISSUES 9

Implementation issues for fully adaptive DOA – based smart antennas, diversity versus beamforming, Implementation of smart antennas for wireless LAN systems, Media access control for adhoc networks with adaptive antenna arrays, Chip-level beamforming and symbol – level beamforming

TOTAL: 45 PERIODS

REFERENCES:

1. Introduction to Adaptive arrays' by Robert A.Monzingo and Thomas W.Miller, SciTech publisher
2. Adaptive antenna arrays:Trends and applications' by Sathish Chandran, SciTech publisher
3. Smart antennas' by Thomas Kaiser, SciTech Publisher

FI1982 ELECTROMAGNETIC AND PHOTONIC BAND GAP STRUCTURES FOR ANTENNA ENGINEERING **L T P C 3 0 0 3**

UNIT I MATHEMATICAL TOOLS FOR EM **9**

Finite difference method – Finite element method – Moment method – Transmission line matrix method - Finite difference time domain method.

UNIT II BANDGAP STRUCTURES AND CLASSIFICATIONS **9**

Introduction of electromagnetic band gap structures –configuration – photonic band gap structures – configuration – Band gap characterization – classifications of EBG & PBG.

UNIT III MATERIALS AND APPLICATIONS **10**

EBG & PBG materials – uses in EMC – uses in micro strip antennas – uses in wave guides – limitations of EBG & PBG - applications of EBG & PBG .

UNIT IV PHOTONIC CRYSTALS **10**

The traditional multilayer film - A one dimensional photonic crystal – physical origin of photonic band gaps – evanesant modes – off axis propagation – localized modes of defects – surface states.

UNIT V DESIGN OF PHOTONIC CRYSTALS **7**

Design of photonic crystals for various applications – a reflecting dielectric – a resonant cavity – a wave guide.

TOTAL: 45 PERIODS

REFERENCES:

1. Mathew N. O. Sadiku, Numerical Techniques in Electromagnetics, CRC Press, II edition, 2001.
2. Fanyang & Yahya Rahmat- Samii, “Electromagnetic Band gap structures in Antenna Engineering” (The Cambridge RF & microwave Engineering series)
3. Joannopoulos .J, Meade .R.D and Winn .J.N, “Photonic crystals: molding the flow of lights”, Princeton Univ. press, 1995.
4. Inoue, Ohtaka, “Photonic crystals: Physics, fabrication & application” (Springer series in optical sciences).

FI1983 CROSS LAYER DESIGN **L T P C 3 0 0 3**

UNIT I INTRODUCTION **9**

Review of OSI network model – Various layer functionalities – Conventional protocols- Need for cross layer design – Cross layer adaptability- Challenges to cross layer optimization.

UNIT II IMPACT OF SIGNAL PROCESSING TECHNIQUES **9**

Adaptive modulation- Optimal coding – Diversity- Multi-user detection –Channel estimation- Impact on throughput, delay and design and performance of upper layer protocol stack.

UNIT III CROSS LAYER TECHNIQUES 9

Adaptive QoS – Adaptive resource allocation – Access prioritization- Joint link power and rate adaptation- Joint link power and admission control –Energy efficient transmission

UNIT IV INTERFERENCE MANAGEMENT IN MULTI ACCESS COMMUNICATION 9

Adaptive cross layer design in CDMA mobile neworks and opportunistic communication systems- Multimedia bursty traffic- Multi Access Interference temporal structure- MAI prediction- Adaptive rate and admission control- Join Shortest Queue Scheduling – Perfetching protocol-Loss probabilities.

UNIT V DATA ACCESSIBILITY IN MANET 9

Cross layer design for multimedia information access- Middleware data accessibility- Advertising, lookup and replication services – Predictive location based QoS routing protocol – Optimization of Update protocol- Energy efficient scheduling and protocol design.

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, " Data and Computer Communication " 5th Edition, PHI, 1997.
2. T.S.Rappaport, " Wireless Communications: Principles and practice" PHI, NJ 1996.
3. T.S.Rappaport, et.al." Wireless Communication: Past Events and a Future Perspective", IEEE commn. Magazine, May 2002.
4. L.Tong, et, al.," Multipacket Reception in random Access Wireless Networks: from Signal Processing to Optimal MAC", IEEE communication magazine,Nov,2002.
5. Junshan Zhang, 'Tutorial on Cross Layer Design in CDMA Cellular Networks", ISCAS 2002,ASU.
6. Junshan Zhang,"Bursty Traffic Meets Fading: A Cross Layer Design Perspective", in the proceedings of IEEE infocom'02. NY.
7. Junshan Zhang, et.al., " MAI-JSQ: Cross layer Design for real-time Video Streaming in Wireless Networks".
8. Klara Nahrstedt,et.al., " Cross Layer Design for Data Accessibility in MANET" Wireless personal Communication, Kluwer Academic Publishers, 2002.

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08-IV(1)**

FI1984 4G WIRELESS NETWORKS L T P C

3 0 0 100

UNIT I WIRELESS SYSTEMS 9

Cellular concept – cellular architecture. Cellular systems – 1G, 2G, 3G. Wireless in Local Loop, Wireless ATM. Broadband Wireless Access – UWB, IEEE802.11a/b(Wi-Fi), IEEE802.16(WiMax) – HIPERACCESS, IEEE802.20(MobileFi), IEEE802.21(MIHS) and IEEE802.22(WRAN). Optical wireless networks.

UNIT II 4G – MAC 9

Introduction – 4G systems. Hybrid 4G network protocols, Channel modeling for 4G-MIMO and UWB. Adaptive and Reconfigurable Link layer, adaptive MAC-AMC, HARQ, CDMA, TDMA/OFDMA. Software radio-DAB, DVB.

UNIT III 4G – ROUTING 9

Network overlay in 4G, Network synchronization and Power optimal routing. Adaptive network layer-routing with topology aggregation. Adaptive resource management, Network deployment and management.

UNIT IV 4G – MOBILITY MANAGEMENT 9

Mobility management – Concept, requirements and operations. Mobility support for LAN/MAN. Mobility management models – Macro mobility and Micro mobility. Mobile IP-MIPv6, HMIP, cellular IP, HAWAII and IDMP. Context-aware mobility management.

UNIT V 4G – TCP AND QoS 9

Adaptive TCP and cross layer optimization. Positioning in wireless networks. QoS – Issues. Classifications of QoS approaches – MAC and Network layer solutions. QoS framework – QoS models, QoS Resource reservation signaling, INSIGNIA, INORA, SWAN and proactive RTMAC.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Savo G.Glisic, "Advanced Wireless Networks: 4G Technologies", Kindle Editions, 2006.
2. Savo G.Glisic, "Advanced Wireless Communications: 4G Technologies", Kindle Editions, 2006.
3. C.Siva Ram Murthy and B.S.manoj, "Ad-Hoc Wireless Networks-Architectures and Protocols", Pearson Education, 2004.

REFERENCES:

1. Hendrik Bernt, "Towards 4G Technologies: Services with Initiate", Kindle Editions, 2006.
2. www.3gpp.org

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08-IV(2)**

FI1985 GRID RESOURCE MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction to grid resource management – ten actions when grid scheduling Application Requirements for Resource Brokering in a Grid Environment – Attributes for Communication between Grid Scheduling Instances.

UNIT II STATE OF THE ART GRID RESOURCE MANAGEMENT 9

Grid Service Level Agreements – Condor and Preemptive Resume Scheduling – Grid Resource Management in Legion – PBS Pro: Grid Computing and Scheduling Attributes Improving Resource Selection and Scheduling using Predictions – Multicriteria Aspects of Grid Resource Management.

UNIT III DATA-CENTRIC APPROACHES FOR GRID RESOURCE MANAGEMENT 9

Storage Resource Managers – A Grid Enabled Storage Appliance – Computation Scheduling and Data Replication Algorithms for Data Grids.

UNIT IV RESOURCE MANAGEMENT IN PEER-TO-PEER ENVIRONMENTS 9

A Peer-to-Peer Approach to Resource Location in Grid Environments – Grid Resource Commercialization – Quality Of Service – A Uniform Quality Of Service Architecture QOS – Aware Service Composition for Large-Scale Peer-to-Peer Systems.

UNIT V GRID RESOURCE MANAGEMENT 9

Economic approaches and Grid Resource Management grid Resource Commercialization Applying Economic Scheduling Methods to Grid Environments.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Jarek Nabrzyski, Jennifer M.Schopf, Jan We Glarz "Grid Resource Management State of art and future trends" Kluwer Academic Publishers

REFERENCE:

1. Ian Foster and Carl Kesselman, editors, The Grid: Blueprint for a New Computing Infrastructure (Second Edition), Morgan Kaufmann.

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 3)**

FI1986	**INDUSTRIAL AND SYSTEMS ENGINEERING IN HEALTHCARE**	**L T P C 3 0 0 3**

UNIT I INTRODUCTION TO HEALTH CARE OPERATIONS 9

A systems look at health care – opportunities and challenges – Integrated framework for operations management – Evidence Based Medicine and Pay for Performance – Hospital business operations

UNIT II PROCESS ENGINEERING AND OPTIMIZATION 9

Process and Quality Improvement - Optimizing patient and process flows – project and change management - Tools for problem solving and decision making - statistical tools for operations improvement – Six sigma in health care - Quality management and strategies for Process redesign – Workload analysis – Scheduling and capacity management in health care.

UNIT III PERFORMANCE MEASURES, TOOLS AND TECHNIQUES 9

Productivity metrics in healthcare - Mapping techniques – Value Stream mapping Analytical and statistical tools – Balanced score card in Healthcare – Optimization and simulation in healthcare.

UNIT IV LOGISTICS AND SUPPLY CHAIN MANAGEMENT 9

Supply chain management strategy – Purchasing and materials management – Inventory management and Accounting – Classifying and managing products - Pharmaceutical supply chain.

UNIT V RECENT DEVELOPMENTS 9

Healthcare Finance – Return on Investment Models – Project Management – ERP – Healthcare policy – Human factors in Healthcare – Telemedicine and emerging technologies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Healthcare Operations Management, Daniel B.McLaughlin and Julie M.Hays, HAP, 2008, (ISBN 978-1-56793-288-1)
2. Healthcare Operations Management: A Quantitative Approach to Business and Logistics, James R.Langabeer, Jones & Bartlett Publishers, 2007
3. (ISBN 0763750514, 9780763750510)

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 4)**

FI1987 METHODS FOR SELFISH/MALICIOUS NODE DETECTION L T P C
3 0 0 3

UNIT I INTRODUCTION TO NETWORK SECURITY 9

Security Trends – OSI Security Architecture – Security Services – Security Mechanisms security Requirements – Model for Network Security – Overview of Symmetric and Public Key Encryption – Authentication and Integrity Mechanism – Key Distribution.

UNIT II ATTACK TAXONOMY 9

Attack Classification : Passive and Active Attacks – Attackers and their Motivation – Characteristics of Attack Taxonomy – List of Categories – Results Categories – Empirical Lists – Matrices – Process Based Taxonomy – Wormhole – Byzantine – Black hole – DoS – Flooding – Resource Consumption – Location Disclosure – Impersonation Attack Trees – STRIDE

UNIT III TRUST AND REPUTATION SYSTEMS 9

Notion of Trust – security and Trust – Collaborative Filtering and Sanctioning – Trust Classes – Trust and Reputation Network Architectures – Reputation Computation Engines – Commercial and Live Reputation System – Trust management in P2P systems – Trust management in Ad hoc networks – Issues with Reputation Systems

UNIT IV COOPERATION ENFORCEMENT AND DETECTION MECHANISMS 9

Cooperation Enforcement Techniques: Nuglets – Sprite – Detection Mechanisms: Mitigating Routing Misbehavior – OCEAN – CORE – CONFIDENT – PACKET LEASHES

UNIT V SIMULATION STUDY 9

GloMoSim: General Architecture of the simulator – Configuring a Network – Mobility Models – Routing Protocols. Network Simulator 2: Nodes – Packet Forwarding – Agents Mobile Networking – Trace Monitoring Support – Visualization.

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, Cryptography and Network Security Principles and Practices, Fourth Edition, Prentice Hall, 2006.
2. B. Wu, J.Chen, and J.Wu, M.Cardei, “A Survey of Attacks and Countermeasures In Mobile Ad Hoc Networks,” Wireless Network Security, Springer – Verlag 2007.
3. A.Josang, R.Ismail, and C.Boyd, “A Survey of Trust and Reputation Systems for Online Service Provision,” Decision Support System, vol. 43, no. 2. pp. 618-644, March 2007.

4. H.Li, and M.Singhal, “Trust management in Distributed Systems, “IEEE Computers, vol 40, pp. 45-53, February 2007.
5. http://www.schneier.com/paper-attacktrees-ddj-ft.html
6. http://www.cert.org/research/JHThesis/Chapter6.htmls\

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 5)**

FI1988 ADVANCED JAVA L T P C
3 0 0 3

UNIT I JAVA FUNDAMENTALS
Java Virtual Machine – Reflection – I/O Streaming – Filter and Pipe Streams – Byte Codes – Byte Code Interpretation – Dynamic Reflexive Classes – Threading – Java Native Interfaces – GUI Applications.

UNIT II NETWORK PROGRAMMING IN JAVA
Stream Customization – Sockets – Secure Sockets – Custom Sockets – UDP Datagrams – Multicast Sockets – URL Classes – Reading Data From The Server – Writing Data.

UNIT III IMAGE PROGRAMMING
Introduction – image warping, wavelengths, motion blur – Digital images – voxel, pixel, Java – Images in Java – Java2D, Java Advanced Imaging, image processing.

UNIT IV IMAGE MANIPULATION
Grey level and colour enhancement – cumulative frequency – Java2D – deflation algorithm – image compression.

UNIT V CRYPTOGRAPHIC LIBRARY IN JAVA
Introduction – Secure systems – Cryptography – Platform security – Key management – Encryption – Streams and blocks.

TOTAL: 45 PERIODS

REFERENCES:
1. Elliotte Rusty Harold, “Java Network Programming”, O’Reilly Publishers, 2000.
2. Jonathan Knudsen, “Java Cryptography”, O’Reilly Publishers, 1998.
3. Douglas A. lyon, “Image Processing in Java”, Prentice Hall PTR, 1999.
4. Nick Efford “Digital Image Processing: A Practical Introduction Using Java”, Addison-Wesley, 2000.

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 6)**

FI1989 APPLIED CRYPTOGRAPHY L T P C
3 0 0 3

UNIT I OVERVIEW OF CRYPTOGRAPHY 9
Introduction – Information security and cryptography – Background on functions – Basic terminology and concepts – Symmetric-key encryption – Digital signatures – Authentication and identification – Public-key cryptography – Hash functions – Protocols and mechanisms – Key establishment,

management, and certification – Pseudorandom numbers and sequences – Classes of attacks and security models.

UNIT II KEY PARAMETERS 9

Key length – Symmetric key length – Key management – Probabilistic primality tests – (True) Primality tests – Prime number generation – Irreducible polynomials over Zp – Generators and elements of high order.

UNIT III CIPHERS 9

Stream ciphers – Feedback shift registers – Stream ciphers based on LFSRs – Other stream ciphers – Block ciphers – Background and general concepts – Classical ciphers and historical development – DES, FEAL, IDEA, SAFER, RC5.

UNIT IV CRYPTOGRAPHIC PROTOCOLS 9

Zero Knowledge Protocols – Basic definitions – Zero knowledge properties – Proof or Argument – Protocols with Two sided error – Round Efficiency – Non interactive Zero knowledge.

UNIT V IMPLEMENTATION 9

SEAL, RC5, IDEA, FEAL,SAFER – using API's.

TOTAL: 45 PERIODS

REFERENCES:

1. Wenbo Mao, "Modern Cryptography", Pearson Education, 2007.
2. Matt Bishop, "Computer Security – Art and Science", First Edition, Pearson Education, 2003.
3. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Hand book of Applied Cryptography" 5th Edition, 2001.
4. Bruce Schneier, "Applied Cryptography", Second Edition, 1996.

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 7)**

FI1990 MULTI-SENSOR DATA AND IMAGE FUSION L T P C
3 0 0 3

UNIT I PROBABILISTIC DATA FUSION 9

Baye's Theorem, Data Fusion using Baye's Theorem, Recursive Baye's updating, Data Dependency and Baye's Networks, Distributed Data Fusion with Baye's Theorem.

UNIT II MULTI-SENSOR ESTIMATION 9

State and Sensor Models - Kalman Algorithm - Extended Kalman Filter – Multi - Sensor Kalman Filter - Observation Models, Distributed Multi Sensor Kalman Filter,Track-to-Track Fusion - Non-Linear Data Fusion Method - Likelihood Estimation Method, Particle Filter, Sum-of-Gaussians Method, Distribution Approximation Filter(DAF).

UNIT III MULTI –SENSOR MULTI TARGET ESTIMATION 9

Data Association – Nearest-Neighbor standard Filter, Probabilistic Data Association Filter, Track Splitting Filter, Multiple–Hypothesis Filter.

Multi sensor Data Association - Single to multiple sensor Associations, Deterministic Track-to-Track Assignment, Probabilistic Track-to-Track Assignment, Decentralized Data Association.

UNIT IV DATA FUSION ARCHITECTURES 9

Hierarchical Data Fusion Architectures, Distributed Data Fusion Architectures, Centralized Data Fusion Architectures, Decentralized Estimation –information Filter, Decentralized Information Filter, Decentralized multi-Target Tracking, Decentralized Identification, Decentralized Management – Sensor Management, Communications Management and System Design.

UNIT V MULTISENSOR IMAGE FUSION 9

An overview of image fusion, Image fusion levels, Image fusion using Laplacian pyramid, Gradient pyramid, Bayesian approach, Wavelet transforms, Neural network and Fuzzy logic, Gradient based multiresolution image fusion, Fusion using Independent Component Analysis.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Y. Bar-Shalom and X. Li, Multitarget-Multisensor Tracking: Principle and Techniques, YBS Publishing, 1995.
2. D.D. Blackman, Multiple Target Tracking with Radar applications, Artech House, 1986.

REFERENCES:

1. Y. Bar-Shalom and X. Li, Estimation with Application to Tracking and Navigation, John Wiley, 2001.
2. E. Waltz and J. Linas, Multisensor Data Fusion, Artech House, 1990.
3. Y. Bar-Shalom and X. li, Multitarget multisensor tacking: Applications and advances Vol. I and II, Academic Press, 1990, 1992.
4. Y. Bar-Shalom and Dale Blair, Multitarget multisensor: Applications and advances, Vol III, Artech House, 2000.
5. Rick S Blum & Zheng Liu, Multisensor Image Fusion and its Applications, CRC press 2006.

RESEARCH PAPERS:

1. Cvejic, N.; Bull, D.; Canagarajah,N., "Region-Based Multimodal Image Fusion Using ICA Bases", IEEE Sensors Journal, Volume 7, Issue 5, May 2007 Page(s):743 – 751
2. Hui Li Manjunath, B.S. Mitra, S.K., "Multi-sensor image fusion using the wavelet transform", Proceedings of IEEE International Conference in Image Processing, 1994. ICIP-94.;
3. Nunez, J.; Otazu, X.; Fors, O.; Prades, A.;Pala, V.; Arbiol, R., „Multiresolution-based image fusion with additive wavelet decomposition", IEEE Transactions on Geoscience and Remote Sensing, Volume 37, Issue 3, May 1999 Page(s):1204 – 1211
4. Valdimir S. Petrovic, Costas S.Xydeas, "Gradient based multiresolution Image Fusion", IEEE transactions on Image Processing, Volk.13, No. 2., February 2004.
5. Mallat, (1989). "A Theory for Multiresolution Signal Decomposition: the Wavelet Representation", IEEE Transactions on Pattern Analysis and Machine Intelligence, 11:674- -693.

Faculty of I and C Engg (**Approved in 14th AC 29.08.2009) ITEM NO. VC 14.08(IV - 8)**

FI1991 ELECTRONIC NOSE L T P C
3 0 0 3

UNIT I ANATOMY AND PHYSIOLOGY OF NOSE 7

Introduction to Olfaction, Basic Anatomy, Sense of smell, Stimulation of the olfactory cells, and Transmission of smell signals into the Central Neverous System.

UNIT II ODORS **10**

Odor Classification Schemes Based on Adjective Descriptors, Odor Classification Based on Chemical Properties, Human Chemosensory Perception of Airborne Chemicals, Nasal Chemosensory Detection, Olfactory and Nasal Chemesthetic, Detection of Mixtures of Chemicals, Physicochemical Determinants of Odor and Nasal Pungency, Odor Handling and Delivery System, Physics of Evaporations, Sample Flow System, Static System, Preconcentrator.

UNIT III CHEMOSENSORS **9**

Introduction, Survey and Classification of Chemosensors, Chemoresistors, Chemocapacitors (CAP), Potentiometric Odor Sensors, Gravimetric Odor Sensors, Optical Odor Sensors, Thermal (Calorimetric) Sensors, Amperometric Sensors, Summary of Chemical sensors.

UNIT IV SIGNAL CONDITIONING AND PREPROCESSING **9**

Interface Circuits, AC Impedance Spectroscopy, Acoustic Wave Sensors, Field-Effect Gas Sensors, Operational Amplifiers, Buffering, Amplification, Filtering, Compensation, Linearization of Resistance Measurements, Baseline Manipulation, Compression, Normalization, Noise in Sensors Circuits and Temperature Modulation.

UNIT V HUMAN SENSORY ANALYSIS AND OF E-NOSE **10**

Olfactometry, Static Olfactometry, Dynamic Olfactometry, Environmental Chambers, Instruments for Chemical Sensing, Gas Chromatography-Olfactometry, CharmAnalysis, Aroma Extract Dilution Analysis (AEDA), Osme Method. Environmental Monitoring, Medical Diagnostics and Health Monitoring, Recognition of Natural Products, Process Monitoring, Food and Beverage Quality Assurance, Automotive and Aerospace Applications and Detection of Explosives.

TOTAL: 45 PERIODS

REFERENCES:

1. Guyton 'Text book of Medical Physiology – WB Saunder company Philadelphia – 10th edition 2002.
2. Logan Turner's Diseases of the Nose Throat and Ear, Edited by AGD Maran, K.M. Varghese company – 10th edition 2000.
3. T.C. Pearce, S.S.Schiffman, H.T. Nagle, J.W. Gardner Handbook of Machine Olfaction – Electronic Nose Technology – WILEY-VCH Verlag GmbH & Co. KGaA-2003.
4. Julian W.Gardner and Jehuda Yinon Electronic Noses & Sensors for the Detection of Explosives – Kluwer academic publishers-2004.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(1)**

FI9001 SEMANTIC INTERPRETATION **L T P C**
3 0 0 3

UNIT I INTRODUCTION

The Problems-Frames-Artificial Intelligence research -Policy Statements

UNIT II SEMANTIC INTERPRETATION

Introduction- Semantic Interpretation and linguistic theory-Semantic Interpretation and Artificial Intelligence-Psycholinguistic research on semantic Interpretation-Qualities desirable in a semantic interpreter

UNIT III LEXICAL DISAMBIGUATION

Lexical Disambiguation-Research on lexical disambiguation-Marker Parsing-Polaroid Words

UNIT IV STRUCTURAL DISAMBIGUATION

Structural Disambiguation-Types of Structural Ambiguity-Current theories of structural disambiguation-The Semantic Enquiry Desk- PP-attachment – Gap finding in relative clauses-Methods for structural ambiguities - Speculations-Representation of Knowledge-Semantic formalisms-Semantic Interpretation and Discourse pragmatics-Lexical ambiguity-Structural ambiguity.

UNIT V UNL FRAMEWORK

Introduction-Foundations-Issues-Applications-Universal Communication Language-Methodologies

TOTAL: 45 PERIODS

REFERENCES:

1. Graeme Hirst, "Semantic Interpretation and the resolution of ambiguity", Cambridge University Press,1987 Digital Printing 2003.
2. Juan Luis Díaz de León Santiago (Editor), "Universal Networking Language: Advcances in Theory and Applications" , Research on Computing Science 2005.
3. Alexander Franz, "Automatic Ambiguity Resolution in Natural Language Processing, An Empirical Approach" , Springer 1996.
4. Alfio Gliozzo and Cailo Strapparava , " Semantic Domain in Computational Linguistics", Springer 2009.
5. Rodolfo Delmonte, " Computational Linguistics, Text Processing: Logical Form, Semantic Interpretation, Discourse Relations and Question Answering" , Nova Science Publishers Inc,(2007).

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(2)**

FI9002 XML ENCRYPTION TECHNIQUES L T P C
3 0 0 3

UNIT I XML FUNDAMENTALS 9

Overviews of XML Technologies , XML fundamentals - DTD- XML schema Name spaces, Internationalization - Xlink and Xpointer , Xpath, XSL, XSLT, XSL -FO, XML as Document format ,TEJ, DocBook, XML on the Web, XHTML, CSS, RDI and Semantic Web.

UNIT II XML IN ENTERPRISE APPLICATION 9

XML with JSP/Servlet, XML and Messaging service, JMS, XML and database, XSLT Compiler.

UNIT III DYNAMIC WEB SERVICES 9

Modify Machine Config – Asynchronous call, Call back Function , BeginGetPrice, Callback subroutine IDL/WSDL – WSDL specification, Definition, Types Element, Message Element, Bind Web Services, WSDL with COM, Publishing a Web Services.

UNIT IV WEB SERVICES SECURITY 9

Security Web Services – Concept, standards and Requirement, WS – I Security Works, XML signature and encryption, XKMS (XML key Management Specification), XACML (Extensible Access control Mark up Language).

UNIT V XML TOOLS 9

Open source XML projects and Tools -Cocoon, Batik, FOP and XML Tools

TOTAL: 45 PERIODS

REFERENCES:

1. Eric Newcomer, "Understanding Web Services: XML, WSDL, SOAP, and UDDI", Addison-Wesley Professional, 2002.
2. Elliotte Rusty Harold, "XML Bible", 3rd Edition, John Wiley & Sons , 2004.
3. Blake Dournaee, "XML Security", McGraw-Hill, 2002

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(3)**

FI 9003 ELLIPTIC-CURVE CRYPTOGRAPHY L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Basic objectives of cryptography, secret-key and public-key cryptography, one-way and trapdoor one-way functions, cryptanalysis, attack models, classical cryptography. Block ciphers: Modes of operation, DES and its variants, RCS, IDEA, SAFER, FEAL, BlowFish, AES, linear and differential cryptanalysis.

UNIT II STREAM CIPHERS 9

Stream ciphers: Stream ciphers based on linear feedback shift registers, SEAL, unconditional security. Message digest: Properties of hash functions, MD2, MD5 and SHA-1, keyed hash functions, attacks on hash functions. Public-key parameters: Modular arithmetic, gcd, primality testing, Chinese remainder theorem, modular square roots, finite fields.

UNIT III ADVANCED CRYPTOGRAPHY 9

Advanced topics: Elliptic and hyper-elliptic curve cryptography, number field sieve, lattices and their applications in cryptography, hidden monomial cryptosystems, cryptographically secure random number generators.

UNIT IV ELLIPTIC CURVE 9

Introduction to Elliptic Curves, Elliptic Curve Cryptography: ECDH, ECDSA, EC ElGamal, Security questions: security proofs of protocols, Algorithmic number theory questions related to ECC: Discrete log attacks, CDH, DDH, point-counting algorithms, complex multiplication methods for generating elliptic curves, efficient group law implementations.

UNIT V PAIRING-BASED CRYPTOSYSTEMS 9

Weil and Tate pairings: definitions and Efficient implementations, DDH solution in EC-groups/MOV attack, BDH assumption, Generation of suitable/special curves, Additional pairing systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice (4th Edition), Pearson Prentice Hall, 2006, ISBN #: 0131873164
2. Blake, Seroussi, Smart. Elliptic Curves in Cryptography, London Mathematical Society Lecture Note Series, volume 265, Cambridge University Press, 2000.

REFERENCES:

1. Smart, N., Cryptography: An Introduction, McGraw-Hill, ISBN 0077099877
2. Bruce Schneier. Applied Cryptography (2nd edition), John Wiley & Sons, ISBN #: 0471117099

3. Douglas R. Stinson, Cryptography: Theory and Practice, Chapman & Hall/CRC; 2 edition, ISBN #: 1584882069.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(4)**

FI9004 MATHEMATICS FOR COMPUTING RESEARCH L T P C
3 0 0 3

UNIT I PROOF TECHNIQUES 9
Constructive Proof – Equivalence – Negation – Contra positive – Converses – Contradiction – Uniqueness – Multiple Equivalences – Proving identity – Decomposition – Induction.

UNIT II VECTOR ALGEBRA 9
Vector quantities and their graphical representation – vector spaces – Linear Combinations – Spanning sets – Linear Independence and dependence – Standard Bases – Dimension – subspaces – scalar and vector products.

UNIT III LINEAR ALGEBRA 9
Eigen Values and Eigen Vectors – Linear Transformation Orthogonal Diagonalization – Jordan Canonical Form.

UNIT IV PROBABILITY 9
Distributions and Densities – Expected Value and Variance – Central Limit Theorem – Generating Functions – Markov Chains- Random Walks.

UNIT V QUEUEING THEORY 9
Queueing Models and fundamental relations – M/M/1 – M/M/C – M/G/1 –G/M/1.

TOTAL : 45 PERIODS

REFERENCES:
1. I Adan and J. Resing, Queueing Theory – Open Souce.
2. Robert A. Beezer, A first course in Linear Algebra, Open Source.
3. Charles M. Grinsted and J. Laurie Snell, Introduction to Probability, Open Source.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(5)**

FI9005 CROSS LAYERED WIRELESS AD HOC AND SENSOR NETWORKS L T P C
3 0 0 3

UNIT I LAYERED COMMUNICATION APPROACHES 9
Introduction to Ad Hoc and Sensor Networks , Communication Media , Communication Technologies, Optimization Parameters, Channel Separation and Access, Transmission Initiation, Topology, Power, Traffic Load and Scalability, Logical Link Control, Route State Dissemination, Multipath Routing, Power-awareness , Geographical Routing, Quality-of-Service, TCP and UDP, Transport Protocols and Middleware for Ad Hoc and Sensor Networks, Application Layer .

UNIT II CROSS-LAYER APPROACHES 9

Cross-Layer Design: Definition, Cross-Layer Design for Traditional Networks, Ad Hoc and Sensor Networks: An Analogy, Motivating Factors, Design Challenges. Cross-Layer Design Guidelines: Compatibility, Richer Interactions, Flexible and Tunable.

UNIT III CROSS-LAYER ARCHITECTURES 7

Ad Hoc Networks: MobileMan, CrossTalk. Sensor Networks: Sensor Protocol, TinyCubus, Lu. Ad Hoc and Sensor Networks: Jurdak.

UNIT IV APPLIED CROSS-LAYER APPROACHES 10

Design Coupling Approaches, Information Sharing Approaches, Global Performance Goals, Maximize Network Lifetime, Energy Efficiency, Maximize Throughput, Minimize Delay, Promote Fairness, Data Accessibility , Efficiency and Generality. Target Networks: Ad Hoc Networks, Sensor Networks. Input Aspects , Configuration Optimization, Implementation : Unspecified, Centralized, Distributed.

UNIT V CASE STUDIES 10

Optimization of an RF Sensor Network: Introduction, Adaptive Low Power Listening, Qualitative Analysis, Deployment Results. UWB Ad Hoc Network: Introduction, UWB Network Principles, UWB Principle, UMAC Protocol, Simulation and Results.

Acoustic Underwater Sensor Network: Introduction, Network Battery Life Estimation Method, Topology-Dependent Optimizations, Performance Evaluation.

TOTAL : 45 PERIODS

REFERENCES:

1. Raja Jurdak , Wireless Ad Hoc and Sensor Networks: A Cross-Layer Design Perspective, Springer Series, New York, 2007.
2. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufman, Publishers, 2004.
3. Holger Karl and Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons, Ltd. England 2005.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(6)**

FI9006 UNDERWATER ACOUSTIC SIGNAL PROCESSING L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF UNDERWATER ACOUSTICS

The Ocean acoustic environment, measuring sound level, Sources and receivers, relevant units, sound velocity in sea water, typical vertical profiles of sound velocity, Sound propagation in the Ocean- characteristic sound propagation paths-deep water and shallow water, Range dependent environment. Sound attenuation in sea water, Bottom Loss, Surface bottom and volume scattering, Snell’s law for range dependent ocean.

UNIT II AMBIENT NOISE IN THE SEA

Sources of ambient noise-introduction, different frequency bands of ambient noise, process of surface noise generation, shallow water, variability of ambient noise, spatial coherence of ambient noise, directional characteristics of ambient noise, intermittent sources of noise- biological & non biological (rain, earthquakes, explosions and valcanos).

UNIT III SIGNALS, FILTERS AND RANDOM FUNCTIONS

Fourier representations, filters and noise, digital filter design techniques, temporal resolution and bandwidth of signals, signal to noise power ratio, Estimates of auto-covariance, power spectrum, cross covariance and cross spectrum.

UNIT IV CHARACTERISTICS OF SONAR SYSTEMS

Sonar systems, active and passive sonar equations, transducers and their directivities, Sensor array characteristics-array gain, receiving directivity index, beam patterns, shading and super directivity, adaptive beamforming.

UNIT V DSP PROCESSORS:

Architecture of ADSP 218x, architecture of TMS 320C541X.

CASE STUDY:

1. Signal processing of ocean ambient noise data.
2. Beamforming of vertical linear array data.

TOTAL: 45 PERIODS

REFERENCES:

1. Principles of Underwater Sound by Robert J Urick
2. Ambient noise in the sea by Robert J.Urick
3. Acoustical Oceanography : Principles and Applications by Clay & Medwin
4. Fundamental of ocean acoustics by L.M.Brekhovskikh and Yu.P.Lysanov
5. Sonar signal processing by Richard O.Nielsen
6. DAP processor manuals.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(7)**

FI9007 OCEANOGRAPHY AND INSTRUMENTATION L T P C
3 0 0 3

UNIT I PHYSICAL AND CHEMICAL OCEANOGRAPHY

Concept of sea level changes, seismic stratigraphy; sequence stratigraphy, physical and chemical properties of seawater. Marine pollution-pathways, residence time, pollutants in the marine environment.

UNIT II BIOLOGICAL OCEANOGRAPHY

Marine ecosystems – Phytoplankton diversity – Photosynthesis and primary productivity – Limiting nutrients in seawater – Harmful algal blooms – Global primary productivity – Zooplankton – Diel vertical migration – Seasonal vertical migration – Zooplankton and Secondary production – Nekton – Marine microbes.

UNIT III OCEANOGRAPHIC INSTRUMENTATION

Descriptions of research vessels, cruise, position fixing in the sea; sampling devices – Grab samplers, bottom samplers, dredges, sediment traps, boomerang samplers, water samplers, Winches, temperature measurement instruments, tools for studying ocean floor topography. POD, COD, GOD and BOD tools kit.

UNIT IV UNDERWATER NOISES

Basic concept of noises in underwater – Types of noises – natural, man made, ambient noise types – seismic, wind, biological lobsters, dolphin, shipping, turbulence noise, rain etc., Study on location based noises, Comparison between various noises in underwater. Case study on noises.

UNIT V OCEANIC CRUST, SEDIMENTS AND LAW OF THE SEA

Origin of oceanic crust, ocean sediments, classification, digenesis, ocean tectonics. Law of the sea, EEZ. Remote sensing applications to ocean science.

REFERENCES:

1. Bhatt J.J, Oceanography – Exploring the Planet Ocean, D.Van. Nostrand Company, New York, 1994.
2. Gross M.G., Principles of Oceanography, 7th Edition, Prentice-Hall, 1995.
3. Gross M.G., Oceanography: A view of the earth, 3rd Edition, Prentice Hall.
4. Eric C. Bird, Coasts: An Introduction to coastal geomorphology, 3rd Edition, Basil Black Well Pub., 1984.
5. Rober J.Urick, Ambient noise in the sea.
6. Ask T., Handbook of Marine Surveying, Sheridan House, 2007.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(8)**

FI9008 WEB MULTIMEDIA L T P C
3 0 0 3

UNIT I **9**

Introduction to Flash and Flash Media server – Raster and Vector graphics – hierarchy of Flash movie – Drawing and painting tools – Frames, layers and scenes – Flash menus and panels – font and font faces – color theory and color models – color mixing – color relationships – gradient colors – Web safe colors – color to gray scale transformation – Multi lingual information.

UNIT II **9**

Image file formats – graphics and Image editing with Flash – Graphic design – creating and using Movie clip, button, graphic and animated symbols in Flash – Web animation fundamentals – Frame by frame animation – motion and shape tweening – Animations with Inverse kinematics – embedding text, image, and animation in video files using Flash – Cue points for video retrieval.

UNIT III **9**

Action script 3 fundamentals – Data types, Operators and expressions – Events and actions – Program structures – Core classes and methods – Action script for graphics, animation, video and sound – adding sound to animation – editing sound with Flash – UI components. Flash forms and data base integration with Flash and XML – Building Image gallery.

UNIT IV **9**

Audio and video streaming – MJPEG, FLV, MOV, AVI and RM file formats – Server side and client side action script classes and elements – Camera, Microphone, movie Clip, Net connection, Net stream, Shared object and video classes – load, loadvars, log, soapcall and stream classes – web service, XML, XML socket and XML streams classes.

UNIT V **9**

Recording and playing back streaming audio and video in VP6 and H.264 formats – using Flash Media Encoder to stream and record video – Camera and microphone settings – two-way audio-video communications – broadcasting and server-side bandwidth control – server-side streams.

REFERENCES:

1. Robert Reinhardt and snow Dowd, "Flash CS4 Professional", Wiley India, 2009.
2. Thyagharajan and Anbumani, "Flash MX 2004", Tata McGraw Hill, 2005.
3. William B Sanders, "Learning Flash Media Server 3", O'Reilly, 2008.
4. Prabhat K Andleish et.al., "Multimedia Systems Designs", Prentice Hall of India, 2008.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(9)**

FI9009 **IMAGE, AUDIO AND VIDEO PROCESSING** **L T P C**
3 0 0 3

UNIT I **9**

Image representation methods – Image file formats – Image editing with Flash and Photoshop – spatial filtering – Histogram sliding, stretching, shrinking and thresholding – Image averaging and subtraction – Convolution mask – low pass, high pass and laplacian filters – Filtering in frequency domain – Image fusion – stenography – mosaics – morphing and animation with Flash and Photoshop.

UNIT II **9**

Image segmentation – Edge detection – boundary detection – Region growing – Region splitting and merging – Morphological water sheds – motion segmentation – texture analysis using variography for images – automatic lip segmentation from color images – Image indexing – XML-based annotations for image retrieval – Building image gallery.

UNIT III **9**

Sampling sound signals – PCM speech – CD quality audio – Differential Pulse code modulation – Adaptive DPCM – Linear predictive coding – Code excited LPC – perceptual coding – MPEG audio coders – Dolby audio coders – Audio file formats – Bandwidth requirements for streaming the audio signals through Internet.

UNIT IV **9**

Video compression principles – H.261, H.263, MPEG 1,2,3,4-MJPEG- H.264, VP6 streaming video formats – resizing and cropping video clips – video streaming – streaming video encoders – Embedding text, image, animation in video files using multimedia tools – SMIL files and Flash FLV Play back component – Annotations for streaming video on the web.

UNIT V **9**

Overview of Image and video segmentation – Metadata-based video indexing and adaptive streaming – SMIL and MPEG-7 based interactive annotation-video scene detection methods – video summarization techniques – Cue points for video retrieval – Joint space time range mean shift based image and video segmentation – video shot boundary detection and scene segmentation – Objective evaluation of video segmentation for content-based applications.

REFERENCES:
1. Prabhat K Andleish et.al, “Multimedia Systems Designs”, Prentice Hall of India, 2008.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, Pearson Education Inc., 2002.
3. Fred Halsal, “Multimedia Communications Applications, Networks, Protocols and Standards”, Pearson Education, 2001.
4. Thyagharajan and Anbumani, “Flash MX 2004”, Tata McGraw Hill, 2005.
5. Deke Mc Clelland “Photoshop 7” Wiley – dream tech India Pvt.Ltd, 2002.
6. Yu-Jin Zhang et.al, “advances in Image and video segmentation”, IRM Press, 2006.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(10)**

FI9010 HARDWARE VERIFICATION TECHNIQUES L T P C
3 0 0 3

UNIT I HARDWARE VERIFICATION INTRODUCTION

The hardware verification method, Limitations of hardware, abstractness and correctness, abstraction and the accuracy of models, Hardware verification using higher order logic, Types, The syntax of types, Primitive and defined types, Notational abbreviations for types, Terms, The syntax of terms, free and bound variables and substitution, Well-typed terms primitive and defined constants.

UNIT II HIGHER ORDER LOGIC AND THE HOL SYSTEM

Notational abbreviation for terms, constants for the defined types num and α_1 x α_2 Sequent, theorems and interface rules, Constant definitions, Derived constant definitions, Primitive constant-ε, Recursive definitions, Type definitions, The rule for type definitions, Deriving abstract characterizations of defined types, The HOL system, Interactive proof in HOL, Hardware verification using HOL.

UNIT III HARDWARE VERIFICATION USING HIGHER ORDER LOGIC

Specifying Hardware behavior, Abbreviation specifications, Specifying combinational behavior, Specifying sequential behavior, Partial specifications, Deriving behavior from structure, Composition, Hiding, A note on terminology, Formulating correctness, An example correctness proof, The specification of required behavior, Specification of the primitive components, The design model, the proof of correctness.

UNIT IV ABSTRACTION

Abstraction within a model, Data abstraction, Temporal abstraction, Two problems under specification inconsistent models, Abstraction in practice, validity conditions, A notation for correctness, Abstraction and hierarchical verification, putting hierarchical proofs together, hierarchical verification and validity conditions, Abstraction between models, Defining concrete types in logic, concrete types in general, Mechanizations in HOL, An example- a transistor model, inadequacies of the switch model, a three valued logical type.

UNIT V TEMPORAL ABSTRACTION

Temporal Abstraction by sampling, Constructing mappings between time scales, defining the timeof function, using timeof to formulate correctness, An example- abstracting to unit delay, A synchronizing Temporal Abstraction, A case study: T-Ring, Information description on T-Ring, T-Ring timing scheme and TTI primitives, Correctness of delay device, Correctness of receiver, Correctness of transmitter, Correctness of monitor, Specification of T-Ring, Correctness of register transfer design, putting the proof together.

TOTAL : 45 PERIODS

TEXT BOOK:

1. T.F.Melham, Higher Order Logic and Hardware Verification, Cambridge University Press, NewYork, 2009.

REFERENCES:

1. Thomas Kropf, Introduction to Formal Hardware Verification, Springer Verlag New York, Inc. 2005.
2. Valeria Bertacco, Scalable Hardware Verification with Symbolic Simulation, Springer Science+ Bussiness Media, Inc. 2006.
3. Douglas.L.Perry, Harry.D.Foster, Applied Formal Verfication, McGraw-Hill Electronic Engineering, 2005.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(11)**

FI9011 EVOLVABLE HARDWARE L T P C
3 0 0 3

UNIT I RECONFIGURABLE SYSTEMS 9

Reconfigurable computing and reconfigurable hardware – Types of reconfiguration – Logic reconfiguration-static and dynamic reconfiguration -Classification of reconfigurable architectures-based on granularity – based on reconfigurations scheme -coupling RPU to host computer.

UNIT II EVOLVABLE HARDWARE 9

Introduction – Programmable Hardware devices- evolutionary computation- Integration of genetic algorithm and programmable hardware devices – Digital hardware evolution- Analog hardware evolution- perspectives of evolvable hardware research

UNIT III EVOLVABLE FPGAS 9

Artificial evolution- Genome Encoding- Evolvable hardware :a taxonomy – extrinsic evolution – Intrinsic evolution – Complete evolution – Evolvable hardware Digital platforms – Xilinx XC6200 family – Evolution on commercial FPGAs – custom evolvable FPGAs.

UNIT IV IMAGE PROCESSING APPLICATIONS 9

Lossless compression of high resolution graphic art images- Extended GA for template optimization-computational simulations- Implementation of the evolvable hardware- Architecture – Elements of the chip – execution procedure – performance evaluation.

UNIT V DSP APPLICATIONS 9

Evolution of FIR filters - Multiplierless FIR Filter Design - PLA for FIR Filter Evolution - Evaluating Filter Configurations – Evolution of IIR filters – Basic structures – Design using genetic algorithms.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Nikolas S.Voros and Konstantinos Massselos, System Level Design of Reconfigurable Systems – on-Chip, Springer, 2005.
2. Tetsuya Higuchi, Yong Liu and Xin Yao, Evolvable Hardware, Springer, 2006

REFERENCES:

1. Scott Hauck and Andre DeHon, Reconfigurable Computing – The theory and practice of FPGA based computation, Elsevier Inc, 2008.
2. S. P. Harris and E. C. Ifeachor, "Automating IIR filter design by genetic algorithm," in Proc. of the First IEE/IEEE Inter-national Conference on Genetic Algorithms in Engineering Systems: Innovations and Applications (GALESIA'95), no.414. IEE, 1995.
3. Ben I.Hounsell and Tughrul Arslan, "Evolutionary Design and Adaptation Of Digital Filters Within An Embedded Fault Tolerant Hardware Platform" in Proceedings of the the 3rd NASA/DoD Workshop on Evolvable Hardware,2001
4. Nadia Nedjah and Luiza de Macedo Mourelle, Evolvable Machines - Theory & Practice, Springer, 2005.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(12)**

FI9012	**TAMILCOMPUTING**	**L T P C** **3 0 0 3**

UNIT I TAMIL GRAMMAR **9**

Alphabets : Classification & Properties - Words: classification and components - Sentences : Structures and word ordering

UNIT II PROGRAMMING BASICS FOR TAMIL COMPUTING **9**

History of Tamil Computing - Standards & Fonts - UNICODE - Object Oriented Tamil Computing

UNIT III COMPUTATIONAL LINGUISTICS **9**

Phonology – Morphology – lexicography – syntax – semantics – pragmatics

UNIT IV TAMIL COMPUTING TOOLS & RESOURCES **9**

POS Tagger - Morphological Analyser - Morphological Generator - Sentence Parser - Named Entity Recognizer - Word Sense Disambiguator - Ontologies – Universal Networking Language & UNL Enconvertor.

UNIT V TAMIL COMPUTING APPLICATIONS **9**

Machine Translation – Speech : Synthesis & Processing - Information : retrieval & Extraction – Question Answering – Text Summarization – Automatic Indexing – Text Mining – Conceptual Search

REFERENCES:

1. Tholkaappiyam : Phonology & Morphology, Albert, International Institue of Tamil Studies, First Edition, 1985.
2. The Oxford Handbook of Computational Linguistics, Edited by Ruslan Mitkov, Oxford University Press, 2003
3. Translation - Theory and Application, Valarmathi, International Institute of Tamil Studies, First Edition, 2001.
4. Tholkaappiyam - Thodariyal, Shanmugam, International Institute of Tamil Studies, First Edition, 2004.
5. Conference Papers, Tamil Internet, Government of Tamilnadu, 2003.
   Java : The Complete Reference, Herbert Schildt, McGraw-Hill, Seventh Edition, 2005

FI9013 INFORMATION CODING THEORY L T P C
3 0 0 3

UNIT I BCH AND REED-SOLOMON CODES

BCH codes – Reed-Solomon codes – Decoding BCH and RS codes – finding the Error Locator Polynomial – Non-binary BCH and RS Decoding – Erasure decoding for Nonbinary BCH and RS codes – Galois field Fourier Transform method – variations and extensions of Reed-Solomon codes

UNIT II TERATIVELY DECODED CODES

Construction and Notation – Tanner Graphs – Transmission through Gaussian Channel – Decoding LDPC codes – The iterative decoder on General Block Codes – Density Evolution – EXIT charts for LDPC codes – Irregular LDPC codes- LDPC code construction – Encoding LDPC codes – Low-Density Generator Matrix codes – Serial Concatenated codes- Repeat – Accumulate codes – Irregular RA codes

UNIT III LOW DENSITY PARITY CHECK CODES

EG-LDPC codes – PG-LDPC codes – Shortened finite geometry LDPC codes – Gallager LDPC codes – Masked EG-Gallager LDPC codes – Quasi-cyclic codes by circulant decomposition – Random LDPC codes – Graph – Theoretic LDPC codes – Construction of LDPC codes based on Balanced incomplete block designs – Concatenations with LDPC and Turbo codes.

UNIT IV DESIGN OF LDPC DECODERS

An Overview of Trellis - coded Modulation - Capacity of Two-dimensional Signal Sets-Bit-interleaved Trellis Coded Modulation Based on Turbo and -LDPC Codes - Design of Flexible Interleavers and Parity - check Matrices - Puncturing Strategies - Parallel Architectures for High-speed Decoders and Their Implementation

UNIT V SPACE-TIME CODING

Introduction – Fading Channels – Diversity Transmission and Reception : the MIMO channel – Space-time block codes – complex orthogonal Designs – Space-time trellis codes

TOTAL: 45 PERIODS

REFERENCES:

1. Error Correction Coding – Todd K Moon
2. Applied Coding and information theory for Engineers – Richard B.Wells.
3. Error Control Coding, from theory to practice – peter Sweeney.
4. Error control coding – II edition – shu lin, Daniel J Costello Jr.

FI9014 NANOSCALE TRANSISTORS L T P C
3 0 0 3

UNIT I INTRODUCTION TO NOVEL MOSFETS 9

MOSFET scaling, short channel effects-channel engineering - source/drain engineering - high k dielectric - copper interconnects - strain engineering, SOI MOSFET, multigate transistors – single gate – double gate – triple gate – surround gate, quantum effects – volume inversion – mobility – threshold voltage – inter subband scattering, multigate technology – mobility – gate stack

UNIT II PHYSICS OF MULTIGATE MOS SYSTEM 9

MOS Electrostatics – 1D – 2D MOS Electrostatics, MOSFET Current-Voltage Characteristics – CMOS Technology – Ultimate limits, double gate MOS system – gate voltage effect – semiconductor thickness effect – asymmetry effect – oxide thickness effect – electron tunnel current – two dimensional confinement, scattering – mobility

UNIT III NANOWIRE FETS AND TRANSISTORS AT THE MOLECULAR SCALE 9

Silicon nanowire MOSFETs – Evaluvation of I-V characteristics – The I-V characteristics for nondegenerate carrier statistics – The I-V characteristics for degenerate carrier statistics – Carbon nanotubes – Bandstructure of carbon nanotubes – Bandstructure of graphene – Physical structure of nanotubes – Bandstructure of nanotubes – Carbon nanotube FETs – Carbon nanotube MOSFETs – Schottky barrier carbon nanotube FETs – Electronic conduction in molecules – General model for ballistic nanotransistors – MOSFETs with 0D, 1D, and 2D channels – Molecular transistors – Single electron charging – Single electron transistors.

UNIT IV RADIATION EFFECTS 9

Radiation effects in SOI MOSFETs, total ionizing dose effects – single gate SOI – multigate devices, single event effect, scaling effects.

UNIT V CIRCUIT DESIGN USING MULTIGATE DEVICES 9

Digital circuits – impact of device performance on digital circuits – leakage-performance trade off – multi V_T devices and circuits – SRAM design, analog circuit design – transconductance – intrinsic gain – flicker noise – self heating – band gap voltage reference – operational amplifier – comparator designs, mixed signal – successive approximation DAC, RF circuits.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. J P Colinge, FINFETs and other multi-gate transistors, Springer – Series on integrated circuits and systems, 2008
2. Mark Lundstrom Jing Guo, Nanoscale Transistors: Device Physics, Modeling and Simulation, Springer, 2006.

REFERENCE:

1. M S Lundstorm, Fundamentals of Carrier Transport**,** 2nd Ed., Cambridge University Press, Cambridge UK, 2000

FI9015 PROCESS AND DEVICE SIMULATION L T P C
3 0 0 3

UNIT I TECHNOLOGY-ORIENTED CAD 9

Introduction – Process and Device CAD – Process Simulation Techniques – Interfaces in process and Device CAD – CMOS Technology - Introduction – Ion Implantation – Oxidation – Impurity Diffusion.

UNIT II DEVICE CAD 9

Introduction-Semiconductor Device Analysis – Field-Effect Structures – Bipolar Junction Structures - Introduction – Carrier Densities: Equilibrium case – Non-Equilibrium – Carrier Transport and Conversation – The *pn* Junction – Equilibrium Conditions – The *pn* Junction – Non-equilibrium

UNIT III MOS STRUCTURES 9

Introduction – The MOS capacitor – Basic MOSFET I-V Characteristics – Threshold Voltage in Nonuniform Substrate – MOS Device Design by Simulation.

UNIT IV SENATAURUS TCAD 9

Senataurus TCAD: process simulator – sentaurus process, device simulator – sentaurus device-basic device simulation, advanced concepts – drift-diffusion, hydrodynamic model, stress models.

UNIT V SCRIPTING & SIMULATION 9

Sentaurus TCAD: sentaurus structure editor, meshing concepts, sentaurus work bench, Inspect, Tecplot, Tcl scripting, scheme scripting, Monte-carlo simulation, electro-magnetic simulation.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Synopsys Sentaurus TCAD Manual, version 2008.09
2. Robert W.Dutton, Zhiping Yu, " Technology CAD Computer Simulation Of Processes and Devices", Kluwer Academic Publishers, 1993.
3. M S Lundstorm, Fundamentals of Carrier Transport, 2nd Ed., Cambrid University Press, Cambridge UK, 2000

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(16)**

FI9016 MULTIPROCESSOR INTERCONNECTION NETWORKS L T P C
3 0 0 3

UNIT I ICN ARCHITECTURES 9

Introduction – Classification of ICNs - Topologies - Direct Networks - Indirect Networks

UNIT II SWITCHING TECHNIQUES 9

Basic switching techniques - Virtual channels – Hybrid switching techniques Optimizing switching techniques - Comparison of switching techniques - Deadlock, livelock and Starvation Issues

UNIT III ROUTING ALGORITHMS 9

Taxonomy of routing algorithms - deterministic routing algorithms - Partially adaptive algorithms - Fully adaptive algorithms - Routing in MINs - Routing in switch-based networks with irregular topologies - Resource allocation policies

UNIT IV NETWORK-ON-CHIP 9

NoC Architectures - Area, energy and reliability constraints - NoC design alternatives - Quality-of Service (QoS) issues in NoC architectures

UNIT V PERFORMANCE ANALYSIS 9

Performance issues – Analytical and Simulation approaches – Fault-tolerance issues – Case studies

TOTAL: 45 PERIODS

REFERENCES:

1. William J. Dally and Brian Towels, "Principles and Practices of Interconnection Networks", ISBN: 0122007514, Morgan Kaufmann, 2003
2. Giovanni Deicheli, Luca Benini, "Networks on Chips: Technology and Tools", ISBN: 0123705215,, Morgan Kaufmann, 2006
3. J. Duato, S. Yalamanchili, and Li, "Interconnection Networks: An Engineering Approach", Morgan Kaufmann Publishers, 2004.

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(17)**

FI9017 SECURITY IN WIRELESS SENSOR NETWORKS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Communication architecture of WSN – Constraints – security requirements – Threats - evaluation – attacks; Vulnerabilities of physical layer- jamming, tampering; Vulnerabilities of data link layer- collisions, exhaustion, unfairness; Vulnerabilities of network layer - Spoofed, Altered, or Replayed Routing Information, Selective Forwarding, Sinkhole, Sybil, Wormholes, Hello Flood Attacks, Acknowledgment Spoofing; Vulnerabilities of transport layer – Flooding, Desynchronization,

UNIT II KEY MANAGEMENT PROTOCOLS AND BROADCAST AUTHENTICATION 9

Key distribution-classifications:deterministic and probalistic; protocols: LEAP, BROSK, IOS/DMBS, PIKE, SKEW; Broadcast authentication: µTesla, Certificate-Based Authentication Scheme, Basic Merkle Hash Tree Based Authentication Scheme, Enhanced Merkle Hash Tree Based Authentication Scheme, ID-Based Authentication Scheme.

UNIT III SECURE ROUTING PROTOCOLS 9

EAR, PRSA, R-LEACH, S-SPIN, Secure-SPIN, Segment transmission secure routing protocol, SONS, SS-LEACH, INSENS

UNIT IV DATA AGGREGATION, INTRUSION DETECTION AND AUTOCONFIGURATION 9

Data Aggregation- plain text based secure data aggregation- SIA, SINP, ESPDA, SSDA, WDA; cipher based secure data aggregation- CDA, HSC, Secure hierarchical data aggregation; Intrusion Detection: IHOP, SEF, DIDS, Decentralized intrusion detection; Auto Configuration- LEADS, PDAA, Dynamic address allocation.

UNIT V TRUST MANAGEMENT 9

Trust model- Certificate based- Behavior based, Combinational approach; Trust based routing protocols-secure routing based on multiple criteria decision, LEACH -TM, TRANS; Trust based node selection algorithm- cross layer trust model, reliable sensor selection algorithm, novel sensor node selection algorithm.

REFERENCES:

1. Yang Xiao, “Security in distributed, grid, mobile and pervasive computing” Auerbach publications, 2006.

2. Yong Wang et al., “A Survey of security issues in wireless sensor networks” IEEE Communication Surveys & Tutorials, 2nd Quarter 2006.
3. Efthimia Aivaloglou et al., “Trust establishment in sensor networks: behaviour-based, certificate-based and a combinational approach” Int. J. System of Systems Engineering, Vol. 1, Nos. 1/2, 2008 Interscience Enterprises Ltd.
4. Jaydip Sen, “A Survey on wireless sensor network security” IJCNIS, August 2009.
5. Mohsen Sharifi et al., “SKEW: An Efficient Self Key Establishment Protocol for Wireless Sensor Networks”, IEEE 2009.
6. Kui Ren et al., “On Broadcast Authentication in Wireless Sensor Networks”, Proc. First International Conference on Wireless Algorithms, Systems, and Applications, WASA 2006, Springer Publication.
7. Albath Julia et al., “Secure Hierarchical Data Aggregation in Wireless Sensor Networks”, WCNC 2009 proceedings.
8. Hani Alzaid et al., “Secure Data Aggregation in Wireless Sensor Network: a survey”, Australasian Information Security Conference (ACSC2008), Wollongong, Australia, January 2008. Australian Computer Society Inc.
9. Wan Jian et al., “PDAA Mechanism: A Preemptive Distributed Address Assignment Mechanism”, IET Conference on Wireless, Mobile and Sensor Networks, 2007. (CCWMSN07).

Faculty of I and C Engg **(Approved in 15th AC 13.02.2010) ITEM NO. FI 15.06(18)**

FI9018 WIRELESS MESH NETWORKS L T P C
3 0 0 3

UNIT I **9**

Introduction –Network architecture- infrastructure/Backbone WMNs.-Client WMNs-Hybrid WMNs-Characteristics Multi-hop wireless network – Application scenarios – Broadband home networking – Community and neighborhood networking. – Enterprise networking – Metropolitan area networks – transportation systems – Building automation – health and medical systems.

UNIT II **9**

Critical factors influencing network performance – Capacity of WMNs.-Capacity analysis – Physical layer – Advanced physical layer techniques – MAC layer –Single-channel MAC-Multi-channel MAC-Network layer-performance metrics.

UNIT III **9**

Routing protocols with various performance Metrics-Multi-radio routing-Multi-path routing for load balancing and fault Tolerance-Hierarchical routing-Geographic routing transport layer-protocols for reliable data transport-TCP variants-Entirely new transport protocols-protocols for real-time delivery.

UNIT IV **9**

Application layer-Applications supportedby WMNs-Protocols for network management- Mobility management-Power management-Network monitoring-Security-Capacity issues in WMNs-security issues-Timing synchronization-Cross-layer design. Test beds and implementations-Academic research test beds-industrial practice.

UNIT V **9**

Selfish behavior and cooperation Standard activities-Motivation for selfishness and its negative impacts in WMN-negative impacts of selfishness in WMN-MAC layer selfishness-network layer selfishness- link layer selfishness-rethinking collaboration Strategies for WMN-IEEE 802.11 mesh networks-IEEE 802.15 mesh networks-IEEE 802.16 mesh networks.

TOTAL: 45 PERIODS

REFERENCES:

1. Wireless mesh networking: Architecture, protocols and standards by Yan Zhang, Jijun Luo, Honglin Hu – Technology & Engineering – 2006 – 592 pages
2. Wireless mesh networks by Gilbert Held – 168 pages
3. Wireless mesh networks : Architecture and protocols by Ekram Hossain, Kin Leung – Technology & Engineering – 2008 – 333 pages
4. Wireless mesh networks : A surney, Computer Networks xxx (2005) xxx-xxx, Ian F.Akyildiz a, Xudong Wang b,*,Weilin Wang b.
5. Wireless Mesh Networks : Current challenges and Future directions of Web-in-the-Sky, Nagesh nandiraju, Deepti nandiraju, lakshmi santhanam, bing he, Junfangwang, and Dharma P. Agarwal, University of Cincinnati, IEEE Wireless communications · August 2007
6. Selfishness In Mesh Networks : Wired Multihop Manets, IEEE Wireless Communications · August2008, lakshmi Santhanam, Bin Xie, and Dharma P.Agarwal, University of Cincinnati.

Faculty of I and C Engg

FI9019 **3D IMAGE TECHNIQUES** **L T P C**
3 1 0 4

AIM:

To provide an in-dept knowledge of the 3D imaging and Stereo vision.

OBJECTIVIES:

- To understand 3D images modeling.
- To study texture mapping.
- To study depth cues and disparity.
- To study the reconstruction of 3D images.
- To understand stereo correspondence problem.

UNIT I INTRODCUCTION TO 3D IMAGE MODELING **9**

Images model and geomentry-3D rendering pipline, 3D Geomentry primitives –Bezier,B-splines, NURBS, fractals, Particles systems,3D transforms – Deform modifiers, Solid modeling – poly modeling, Surface modeling – tessellation Extruded shapes – Mesh approximations to smoth objects – sphere, cylinder Hierarchical modeling –Physically based modeling .

UNIT II TEXTURE MAPPING **9**

Procedual and Bitmap textures –Texture mapping an image-Bump mapping Environement mapping – Interpolation –magnification and Minification ,Mipmapped texture-Adding texture on to curved surfaces-Animated texture ,Tilling –rendering textures.

UNIT III DEPTH CUES AND DISPARITY **9**

Basics isssues and terns in depth pereception-Recovering 3 dimesntions Monocular and Binocular information –Extra retinal sources of depth inforajktion –Depth analysiss using real aperture camera-

depth from defocused iamges –Depth cues-Disparity Stereograms and other 3D correspondence problem.

UNIT IV 3D OBJECT RECOGNITION 9

3D reconstruction –Epipolar geometry –stereo calibration –Rectification of stereo images –Modeling and Recognizing Classes of Shapes 3D –Object Recognition from stereo images data-3D object recognition from range data.

UNIT V STEREO CORRESPONDENCE ALGORTHIMS 9

Colour SAD window-based technique – disparity renge estimation-pyramid level reduction-Zereo – mean normalized cross correlation(ZNCC) similarity measure- Vergence angle control –Speed issues –Power issues.

REFERENCES:

1. Principles of 3D Images Analysis and Synthesis –Bernd Girod, Gunther Greiner, Heinrich Niemann-2000-488 pages
2. Mark Giambruno,"3D Grpahicsand Animation",2nd Edition, New Riders Presas, 20002.
3. James D.Foley,Andries van Dam,K.Feiner,John F.Huges,"Computer Graphics- principles and practice",Pearson Education,Second Edition, 2003.
4. S.Chanudhuri and A.N. Rajagoplan,"Depth from Defocused images", Spriing Verlag,1999.
5. B.K.P.Horn "Robot Vision", MIT Press.

Faculty of I and C Engg

FI9020 ANATOMY OF LUNG AND IMAGE PROCESSING TECHNIQUES L T P C
3 0 0 3

AIM:

To introduce the basic anatomy of human Lung, image processing techniques applied to Lungs.

OBJECTIVES:

- To study the anatomy and physiology of human Lung.
- To study the various image processing techniques applied to understand the anatomy and physiological aspect of Lung.
- To learn different techniques to diagnose the Lung cancer.

UNIT I ANATOMY OF LUNGS 9

Lungs-External features, fissures and lobes ; Difference between the two lungs, root of the lungs, pulmonary ligament, blood supply of lungs, lymphatic drainage of lungs, nerve supply of lungs.

UNIT II PHYSIOLOGY OF LUNGS 8

Mechanism of breathing-mechanism of inspiration and mechanism of expiration; Pressure changes during ventilation, Transport of Gases - Oxygen transport and Carbon dioxide transport; Pulmonary (Lung) function tests.

UNIT III IMAGE PROCESSINIG TECHNIQUES 9

Discrete, Wavelet Transform (DWT),Watershed Transform ,Morphological Dilation and Erosion operators, Dual Tree Complex wavelet Transform (DT-CWT), Curvelet Transform and Imaging modalities applicable to Lungs.

UNIT IV LUNG LOBE SEGMENTGATION 10

Segmentation of Lungs lobes in isotropic CT images using Wavelet transform- Modified Adaptive fissure sweeping, Wavelet transform; Segmentation of Lung lobes in clinical CT images – Preprocess, fissure sweep and fissure angle detection, fissure checking and interpolation, Watershed transform, Region growing, Bezier curve fitting; Automatic Lung segmentation for accurate quantitation of volumetric X-Ray CT images –Lung extraction, Left and Right Lung separation and smoothing ;An adaptive thresholding method for automatic Lung segmentation in CT images.

UNIT V CANCER DIAGNOSIS 9

Lung cancer diagnosis system based on Genetic Algorithm, BP Neural networks, Fussy Logic, Support Vector Machines(SVM) and Principles Component Analysis(PCA).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Dr. B.K.TANDON, "Text book of Human Anatomy", Volume II, Thorax, Abdomen and pelvis, Ahuja Publishing House, 5th Edition 2005.
2. Dr.A.K. Jain," Text book of Physiology", Volume 1, Avichal Publishing Company, 3rd Edition 2005.
3. Raguveer M.Rao & Ajith S. Bopardikar," Wavelet Transforms-Introduction to theory and applications", Addison Wesley, 1998.

REFERENCES:

1. T.S. Ranganathan, "A text book of Human Anatomy", S.Chand & Company Ltd.3rd Edition 2006.
2. Cortes C., Vapnik V., "Support Vector Networks", Machine Learning, 1995,20: pp.273-297.
3. Q. Wei, Y. Hu, G. Gelfand, "Segmentation of lung Lobes in Isotropic CT images using Wavelet Transformation", Proceedings of the 29th international Conference of the IEEE EMBS Cite Interantionale, Lyon, France, August 23-26, 2007.
4. Li Cen, Mei Wang, "Application of Hybrid Genetic Algorithm-BP Neutral Networks to Diagnosis of Lung Cancer,"2008 International Conference on Computer Science and Software Engineering.
5. Lin-Yu Tseng, Li-Chin Huang, "An Adaptive Thresholding Method for Automatic Lung Segmentation in CT Images", IEEE AFRICON 2009.
6. Xia Kewen, Xu Guan and Xu Naixun, "Lung Cancer Diagnosis System Based on Support Vector Machines and Image Processing Technique" Proceedings of the 2006 International Conference on Intelligent Information Hiding and Multimedia Signal Processing.
7. Qiao Wei, Yaoping Hu, Gray Gelfand and John H. MacGregor, "Segmentation of Lung lobes in High-resolution Isotropic CT images" IEEE transaction on Biomedical Engineering,Vol.56,No.5,May2009.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(1)**

FI 9021 AGILE PROCESSES IN SOFTWARE ENGINEERING L T P C
3 0 0 3

UNIT I AGILE METHODOLOGY 9

Agile software development – traditional model vs agile model - classification of agile methods – agile manifesto and principles – agile project management – agile team interactions - agility in design, testing – agile documentations – agile drivers, capabilities and values.

UNIT II AGILE PROCESSES 9

SCRUM, Crystal, Feature Driven Development, Adaptive Software Development, Extreme Programming : Method overview – lifecycle – work products, roles and practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile information systems – agile decision making - Earl's schools of KM – institutional knowledge evolution cycle – development, acquisition, refinement, distribution, deployment , leveraging – KM in software engineering – managing software knowledge – challenges of migrating to agile methodologies – agile knowledge sharing – role of storycards – Storycard Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of agile processes in RE – current agile practices – variance – overview of RE using agile – managing unstable requirements – requirements elicitation – agile requirements abstraction model – requirements management in agile environment, agile requirements prioritization.

UNIT V AGILITY AND REQUIREMENTS GENERATION 9

Agile requirements modeling - generation – phases – education, feature development, story development, task development – mapping between agile RGM and RGM – concurrency in agile RGM, generalized agile RGM for small scale, large scale systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Craig Larman, Agile and Iterative Development: A manager's Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, Agile information systems: conceptualization, construction, and management, Butterworth-Heinemann, 2007.
3. Shvetha Soundararajan, Agile Requirements Generation Model: A Soft-structured Approach to Agile Requirements Engineering, M.S. thesis , Virginia Polytechnic Institute and State University.
4. Alberto Sillitti, Xiaofeng Wang, Angela Martin, Elizabeth Whitworth, Agile Processes in Software Engineering and Extreme Programming: 11th International Conference, XP 2010, Trondheim, Norway, June 1-4, 2010, Proceedings, Springer 2010.
5. Chetankumar Patel, Muthu Ramachandran, Story Card Maturity Model (SMM): A Process Improvement Framework for Agile Requirements Engineering Practices, *Journal of Software*, Academy Publishers, Vol 4, No 5 (2009), 422-435, Jul 2009.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(2)**

FI 9022 EMOTION RECOGNTION L T P C
3 0 0 3

UNIT I 9

Introduction - Spoken Language Dialogue Systems - Enhancing a Spoken Language Dialogue System - Challenges in Dialogue Management Development - Issues in User Modeling - Evaluation of Dialogue Systems - Human Emotions - Definition of Emotion - Theories of Emotion and Categorization - Emotional Labeling - Emotional Speech Databases/Corpora - Discussion.

UNIT II 9

Adaptive Human - Computer Dialogue - Background and Related Research - User-State and Situation Management - Dialogue Strategies and Control Parameters - Integrating Speech Recognizer Confidence Measures into Adaptive Dialogue Management - Integrating Emotions into Adaptive Dialogue Management - A Semi-Stochastic Dialogue Model - A Semi-Stochastic Combined Emotional

- A Semi-Stochastic Combined Emotional Dialogue Model - Extending the Semi-Stochastic Combined Emotional Dialogue Model - Discussion.

UNIT III **9**

Hybrid Approach to Speech - Emotion Recognition - Signal Processing - Classifiers for Emotion Recognition - Existing Approaches to Emotion Recognition - HMM-based Speech Recognition HMM - based Emotion Recognition - Combined Speech and Emotion Recognition - Emotion Recognition by Linguistic Analysis - Discussion.

UNIT IV **9**

Implementation - Emotion Recognizer Optimizations - Using Multiple (Speech) Emotion Recognizers - Implementation of our Dialogue Manager – Discussion – Evaluation - Description of Dialogue System Evaluation Paradigms - Speech Data Used for the Emotion Recognizer Evaluation - Performance of our Emotion Recognizer - Evaluation of our Dialogue Manager - Discussion.

UNIT V **9**

Music Emotion – Introduction - Music Features - Resolving the Issues of Emotion Description: - The Regression Approach - Reducing the Effort of Emotion Annotation: - The Ranking Approach - Addressing the Subjectivity Issue: - The Fuzzy Approach - Direct Personalization and GroupWise MER - Two-Layer Personalization: - Residual Modeling -Predicting the Probability of Emotion Perception: - Music Emotion Distribution Prediction. Lyrics Analysis and Its Application to MER - Genre Classification and Its Application to MER - Chord Recognition and Its Application to MER - Emotion-based Music Visualization and - Retrieval conclusion.

TOTAL: 45 PERIODS

REFERENCES:

1. Handling Emotions in Human-Computer Dialogues, Johannes Pittermann, Angela Pittermann and Wolfgang Minker, Springer Netherlands. 1st Edition. 2010 X, 276 p., Hardcover.
2. Dimensional Music Emotion Recognition for Content Retrieval Yi-Hsuan Yang; Homer H. Chen, CRC Press, 2011.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(3)**

FI 9023 NETWORK CONGESTION CONTROL AVOIDANCE TECHNIQUE **L T P C**
3 0 0 3

UNIT I CONGESTION CONTROL IN TCP **9**

Internet Congestion Collapse - Ressource Management Solution - Van Jacobson Congestion Control - Eléments of Congestion Control - TCP Variants - Karns algorithme -Issues in TCP - TCP Congestion Control Concepts.

UNIT II CONGESTION CONTROL IN NETWORK LAYER **9**

Network Congestion - Routing algorithm - Packet queuing and service policy -Congestion Control Methods - Choke Packets - Multiprotocol routers – QOS -Concatenated virtual circuits – Tunneling - Packet Fragmentation.

UNIT III CONGESTION CONTROL IN FRAME RELAY **9**

Frame Relay Congestion Technique - Discard control – FECN – BECN - Frame Relay Traffic Shaping - Implicit Congestion Control - QOS in Frame relay - Frame Relay Virtual Circuits - FRAD techniques.

UNIT IV CONGESTION AVOIDANCE FLOW CONTROL 9

End to end flow control in TCP - Slow Start - Fast retransmit, Fast Recovery - Additive Increase/ Multiplicative Decrease.

UNIT V CONGESTION AVOIDANCE MECHANISM 9

RED – REM – PI - Hop by Hop techniques - New Congestion Avoidance in TCP – ECN - Round Trip Time variance estimation - Dynamic window sizing on congestion -Combined Slow start and Congestion Avoidance algorithm

TOTAL: 45 PERIODS

TEXT BOOKS:

1. "Network Congestion Control", Michael Welzl, May 2006, John Wiley & Sons.
2. "TCP/IP Clearly explained" - Pete Loshin, 2003, Morgan Kauffmann Series in Networking, Fourth Edition.
3. Data Networks,IP and the Internet, Martin P.Clark,2003, John Wiley & Sons.

REFERENCES

1. "The Mathematics of Internet Congestion Control" Srikant, Rayadurgam,2004
2. "Scalable Performance Signalling and Congestion Avoidance",Welzl**,** Michael,2003.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(4)**

FI 9024 MULTIMEDIA COMPRESSION TECHNIQUES L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Special features of Multimedia – Graphics and Image Data Representations – Fundamental Concepts in Video and Digital Audio – Storage requirements for multimedia applications -Need for Compression - Taxonomy of compression techniques – Overview of source coding, source models, scalar and vector quantization theory – Evaluation techniques – Error analysis and methodologies

UNIT II TEXT COMPRESSION 9

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmatic coding – Shannon-Fano coding – Dictionary techniques – LZW family algorithms.

UNIT III AUDIO COMPRESSION 9

Audio compression techniques - µ- Law and A- Law companding. Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – Application to audio coding – MPEG audio, progressive encoding for audio – Silence compression, speech compression techniques – Formant and CELP Vocoders

UNIT IV IMAGE COMPRESSION 9

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization – Contour based compression – Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders – JPEG 2000 standards - JBIG, JBIG2 standards.

UNIT V VIDEO COMPRESSION 9

Video compression techniques and standards – MPEG Video Coding I: MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4 and 7 – Motion estimation and compensation techniques – H.261 Standard – DVI technology – PLV performance – DVI real time compression – Packet Video.

TOTAL: 45 PERIODS

REFERENCES:

1. Khalid Sayood : Introduction to Data Compression, Morgan Kauffman Harcourt India, 2nd Edition, 2000.
2. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001.
3. Yun Q.Shi, Huifang Sun : Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards, CRC press, 2003.
4. Peter Symes : Digital Video Compression, McGraw Hill Pub., 2004.
5. Mark Nelson : Data compression, BPB Publishers, New Delhi,1998.
6. Mark S.Drew, Ze-Nian Li : Fundamentals of Multimedia, PHI, 1st Edition, 2003.
7. Watkinson,J : Compression in Video and Audio, Focal press,London.1995
8. Jan Vozer : Video Compression for Multimedia, AP Profes, NewYork, 1995.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(5)**

FI 9025 DESIGN OF ASYNCHRONOUS CIRCUITS USING NULL CONVENTION LOGIC (NCL) **L T P C 3 0 0 3**

UNIT I INTRODUCTION TO ASYNCHRONOUS LOGIC 9

Null Convention Logic system framework and fundamental components, Transistor level NCL design

UNIT II COMBINATIONAL NCL CIRCUIT DESIGN 9

Input completeness and observability, Dual rail NCL design, Quad rail NCL design

UNIT III SEQUENTIAL NCL CIRCUIT DESIGN 9

NCL implementation of Moore and Mealy machines, NCL implementation of algorithmic state machines

UNIT IV NCL THROUGHPUT OPTIMIZATION 9

Pipelining, Embedded registration, Early completion, NULL cycle reduction, VHDL library design for NCL gates, NCL signals, NCL components, NCL functions, NCL libraries

UNIT V LOW POWER NCL DESIGN 9

Wavefront steering, Multithreshold CMOS (MTCMOS) for NCL, MTCMOS for synchronous NCL circuits, Implementing MTCMOS in NCL circuits

TOTAL: 45 PERIODS

REFERENCES:

1. Scott C.Smith and Jia Di, Designing Asynchronous Circuits using NULL Convention Logic (NCL), Synthesis Lectures on Digital Circuits and Systems, Vol.4/1,July 2009, Morgan & Claypool Publishers
2. Logically determined design: Clockless System design with NCL By Karl M. Fant

FI 9026 THREE DIMENSIONAL NETWORK ON CHIP L T P C
3 0 0 3

UNIT I INTRODUCTION TO THREE DIMENSIONAL NOC 9

Three-Dimensional Networks-on-Chips Architectures. – Resource Allocation for QoS On-Chip Communication – Networks-on-Chip Protocols-On-Chip Processor Traffic Modeling for Networks-on-Chip

UNIT II TEST AND FAULT TOLERANCE OF NOC 9

Design-Security in Networks-on-Chips-Formal Verification of Communications in Networks-on-Chips-Test and Fault Tolerance for Networks-on-Chip Infrastructures-Monitoring Services for Networks-on-Chips.

UNIT III ENERGY AND POWER ISSUES OF NOC 9

Energy and Power Issues in Networks-on-Chips-The CHAIN works Tool Suite: A Complete Industrial Design Flow for Networks-on-Chips

UNIT IV MICRO-ARCHITECTURE OF NOC ROUTER 9

Baseline NoC Architecture – MICRO-Architecture Exploration ViChaR: A Dynamic Virtual Channel Regulator for NoC Routers- RoCo: The Row-Column Decoupled Router – A Gracefully Degrading and Energy-Efficient Modular Router Architecture for On-Chip Networks. Exploring Fault Tolerant Networks-on-Chip Architectures.

UNIT V DimDE ROUTER FOR 3D NOC 9

A Novel Dimensionally-Decomposed Router for On-Chip Communication in 3D Architectures-Digest of Additional NoC MACRO-Architectural Research.

TOTAL: 45 PERIODS

REFERENCES:

1. Chrysostomos Nicopoulos, Vijaykrishnan Narayanan, Chita R.Das" Networks-on-Chip Architectures A Holistic Design Exploration", Springer.
2. Fayezgebali, Haythamelmiligi, Hqhahed Watheq E1-Kharashi "Networks-on-Chips theory and practice CRC press.

FI 9027 SOCIAL NETWORKING AND APPLIED GRAPH THEORY L T P C
3 0 0 3

UNIT I NETWORKS, RELATIONS AND STRUCTURES 9

Social network analysis in the social and behavioral sciences, Social Network Data. Mathematical representation of social networks, Graphs and matrices – Graphs, directed graphs, singed graphs, signed directed graphs, valued graphs and valued directed graphs, multidirected graphs, hyper graphs, relations, matrices, properties.

UNIT II STRUCTURAL AND LOCATIONAL PROPERTIES 9

Centrality and prestige – Prominence, non directional relations and directional relations, comparisons and extensions, Structural balance and transitivity, Affiliations and Overlapping Subgroups – Affiliation networks, representing affiliation networks, one – mode networks, properties of affiliation networks, analysis of actors and events.

UNIT III ROLES AND POSITIONS 9

Structural equivalence, Block models, Relational algebras, Network position and roles – Background, structural equivalence revisited, automorphic and isomorphic equivalence, regular equivalence, types of ties, local role equivalence, and ego algebras.

UNIT IV DYADIC AND TRIADIC METHODS 9

Dyads – An overview, definitions and examples, dyads, simple distributions, statistical analysis of the number of arcs, conditional uniform distribution, statistical analysis of the number of mutual, other conditional uniform distribution, Triads – Random models and substantive hypothesis, triads, distribution of triad census, testing structural hypothesis, generalizations and conclusions.

UNIT V STATISTICAL DYADIC INTERACTION MODELS 9

Statistical analysis of single relational networks – single directional relations, attribute variable, related models for further aggregated data, non-directional relations, single relation and two sets of actors, computing for log linear models, stochastic block models and goodness – fit indices – evaluating block models, stochastic block models, future directions.

TOTAL : 45 PERIODS

REFERENCES :

1. Stanley Wasserman and Katherine Faust " Social network analysis: Methods and applications " Cambridge University Press, 1994.
2. Robert A. Hanneman "introduction to Social Network Methods" University of California, Riverside, 1995.
3. Peter J. Carrington, John Scott, Stanley Wasserman "Models and methods in social network analysis" Cambridge University Press, 2005.
4. Narsingh Deo "Graph Theory with Applications to Engineering and Computer Science" Easter Economy, 2004.
5. Fred S. Robert "Graph Theory and its Applications to Problems of Society" CBMS-NSF Regional Conference in Applied Mathematics, held at Colby College, Jun 20-24, 1977. Publisher: Society of industrial mathematics, Edition.1987.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(8)**

FI 9028 KNOWLEDGE MANAGEMENT FOR E-LEARNING L T P C
3 0 0 3

UNIT I 9

Overview of KM – nature of knowledge – KM solutions – factors influencing KM – KM life cycle - technologies to manage knowledge : AI, digital libraries – case based systems – knowledge elicitation – discovering new knowledge- data mining – text KM-text mining fundamentals

UNIT II 9

Knowledge discovery – systems that create knowledge – knowledge capture systems – concept maps – RSS – process modeling – Wikis – Delphi method – knowledge sharing systems – systems that

organize and distribute knowledge – ontology development systems – categorization and classification tools – Bloom's taxonomy – learning objects

UNIT III **9**

E-learning for small groups – E-learning pedagogy – e-content for E-learning – E-learning wave in higher education – Cognitive Learning – online e-learning – challenges – constraints – emergence of blended learning – roles of teacher – roles of learner – online interactivity, engagement and social presence - Communities of Learning/Inquiry – E-learning Alternatives - Mobile, Wireless, and Ubiquitous Learning

UNIT IV **9**

Knowledge representation – ontology – personalization of ontology for KM - knowledge presentation – concept maps – mind maps – other presentation mechanisms – Reasoning – fundamentals – types – reasoning for knowledge sharing – argumentation as knowledge sharing – discourse and argument interpretation

UNIT V **9**

Knowledge organization – principles – seven objects – ten faults – ten beauties – nature of preface – structure – techniques – knowledge evaluation

TOTAL : 45 PERIODS

REFERENCES:

1. Irma Becerra-Fernandez, Avelino Gonzalez, Rajiv Sabherwal (2004). Knowledge Management Challenges, Solutions, and Technologies *(edition with* accompanying CD). Prentice Hall. ISBN: 0-13-109931-0.
2. Curtis J. Bonk, Topical Seminar on The Web 2.0 and Participatory Learning, http://php.indiana.edu/~cjbonk/Syllabus_R685_Fall_of_2007.htm
3. Pavananthi Munivar, An English translation of the Nannul: designed for the use of university students by a Tamil graduate of the Madras University, Hobart Press, 47 pages, 1878
4. Kamil Zvelebil, Companion studies to the history of Tamil literature, Handbook of Oriental Studies, BRILL, 1992.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(9)**

FI 9029 **ADVANCED DIGITAL IMAGE PROCESSING** **L T P C**
3 0 0 3

UNIT I FUNDAMENTALS OF DIGITAL IMAGE PROCESSING **9**

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing

UNIT II SEGMENTATION **9**

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods-Level set method, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

UNIT III FEATURE EXTRACTION **9**

First and second order edge detection operators, Phase congruency, Localized feature extraction-detecting image curvature, shape features Hough transform, shape skeletonization, Boundary

descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features

UNIT IV REGISTRATION AND IMAGE FUSION 9

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching .Transformation functions-Similarity transformationand Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines

Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusion- discrete wavelet transform, Curvelet transform. Region based fusion.

UNIT V 3D IMAGE VISUALIZATION 9

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

TEXT BOOK:

1. John C.Russ, “The Image Processing Handbook”, CRC Press,2007.
2. Mark Nixon, Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press, 2008.
3. Ardeshir Goshtasby, “ 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications”,John Wiley and Sons,2005.
4. H.B.Mitchell, “Image Fusion Theories, Techniques and Applications”, Springer,2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson,Education, Inc., Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson Education,Inc., 2002.
3. Rick S.Blum, Zheng Liu,“ Multisensor image fusion and its Applications“,Taylor& Francis,2006.

Faculty of I and C Engg **(Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(10)**

FI 9030 RETINAL IMAGE ANALYSIS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Anatomy of the eye and its pathologies, Structure of retina- Retinal nerve fiber Layer, Imaging modalities- Fundus image, Optical Coherence Tomography image- types, Challenges in Retinal image analysis

UNIT II SEGMENTATION OF RETINAL LANDMARKS 9

Optic nerve head localization-Hough transform, Morphological filtering, Active contours, Foveal localisation, Vascular segmentation- Matched filters, Vessel tracking, Neural Networks, Morphological processing

UNIT III STATISTICAL STUDY OF RETINAL IMAGES 9

Optical Coherence Tomography Images-Reflectance probability distribution, pixel correlation analysis, Maximum likelihood estimation of distribution parameters, Analysis of Spatial variation of distributed parameters in retinal layers

UNIT IV DETECTION OF PATHOLOGIES 9

Automatic detection of Diabetic retinopathy- Microaneurysms/ haemorrhages, retinal exudates-hard and soft, cotton wool spots, macular edema. Detection of glaucoma, Age related macular degeneration using digital image analysis techniques

UNIT V REGISTRATION 9

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching. Transformation functions-Similarity transformationand Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines

TEXTBOOKS

1. Niall Patton, Tariq.M.Aslam etal, "Retinal image analysis: Concepts application and potential", Progress in retinal and eye esearch,Elsevier,2006.
2. Charles V.Steward, "Computer vision algorithms for retinal image analysis, current results and future directions", Lecture notes in Computer science, 2005
3. Ardeshir Goshtasby, " 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications",John Wiley and Sons,2005.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(1)**

FI9031 PRINCIPLES OF AVIATION ACOUSTICS L T P C
3 0 0 3

UNIT I INTRODUCTION TO ACOUSTICS 5

Introduction-refraction, attenuation and diffraction concepts sound fields, Acoustic power, directionality, Doppler effect, elementary sources-monopole source, dipole source & the quadrupole and the aerodynamic jet noise.

UNIT II DYNAMICS OF SOUND 12

Equation of continuity, wave equation, Euler's equation. Helmholtz equation, Poisson's equation, velocity potential, plane waves, propagation in the atmosphere-temperature effect, Transmission of sound in various layers, transmission of sound through a rigid wall, convergence & divergence, attenuation, Ground reflection, Attenuation in ducts-single order & higher order, Helmholtz resonator

UNIT III SENSORS & NOISE MEASURES 10

Types of Acoustic sensors, measurements, sound in enclosures, Frequency spectra, various noise measures level-loudness, noise contours, power plant noise measures and control, Aircraft noise prediction, noise data acquisition and signal conditioning, practical considerations in signal processing

UNIT IV ACOUSTIC IN FORWARD MOTION 10

Effects in various speeds level-subsonic and supersonic, velocity potential, sound pressure level, selection criteria for sensors, sonic boom, free field noise levels, noise certification, interaction of fluid motion and sound, atmosphere sound propagation

UNIT V AIRCRAFT NOISE SOURCES 8

Introduction, engine source-propeller, piston, turbo engines, Fan and exhaust jet noise and the engine noise characteristics Airframe noise, noise inside aircraft. Case study about Concorde Aircraft.

TOTAL : 45 PERIODS

REFERENCES:

1. "Elements of Aviation acoustrics", G.J.J.Ruijgrok-yesdee publications
2. "Aircraft noise", Michael T.J.Smith, Cambridge Aerospace Series
3. "Handbook of Acoustics", Malcolm J. Crocker

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(2)**

FI 9032 MULTIMEDIA MEDICAL DATA L T P C
3 0 0 3

AIM:

To introduce the basic principles of Multimedia medical data, image processing techniques applied to medical data for security purpose.

OBJECTIVES:

- To study the Fundamentals and principles of Multimedia
- To study the various image processing techniques applied to understand the Multimedia medical data.
- To learn neural network techniques to provide security for the Medical data.

UNIT I PRINCIPLES OF MULTIMEDIA 9

Basic concepts of Multimedia, Design of Multimedia information systems, components of virtual reality, virtual reality applications in medicine, Multimedia System: An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards. i.e. RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG, compression standards, compression through spatial and temporal redundancy.

UNIT II MEDICAL IMAGING PRINCIPLES 8

Digital Medical image fundamentals, Two – dimensional medical imaging, Three – dimensional medical imaging, Four dimensionality, Multi modality and fusion of Medical imaging.

UNIT III IMAGE PROCESSING TECHNIQUES 9

Discrete Wavelet Transform (DWT), Watershed Transform, Morphological Dilation and Erosion operators, Dual Tree Complex wavelet Transform (DT-CWT), Curvelet Transform and Imaging modalities applicable to various types of medical data.

UNIT IV PACS AND DICOM-BASED IMAGING INFORMATICS 10

Picture Archiving and communication system components and workflow, Industrial standards (HL7 and DICOM) and integrating the healthcare enterprise(IHE), Image acquisition gateway, Integration of

HIS, RIS, PACS and ePR, Telemedicine and Tele radiology, Image / data security, PACS clinical implementation, evalutation and acceptance, PACS clinical experience, pitfalls and bottlenecks, DICOM – based medical imaging informatics, Data grid for medical imaging and informatics, Multimedia electronic patient record (ePR) system.

UNIT V NEURAL NETWORKS IN MEDICAL DATA SECURITY 9

Introduction to Neural networks, An Engineering approach, Architecture of Neural networks, The Learning process, Medical information security ratings classification method using neural network. Applications of Neural networks: Modelling and Diagnosing the Cardiovascular System, Electronic noses – detection and reconstruction of odours by ANNs, Instant Physician – a commercial neural net diagnostic program

L=45, TOTAL=45 PERIODS

TEXT BOOKS:

1. Ranjan **Parekh, "Principles of Multimedia", Tata McgrawHill**, 2006.
2. Tay Vaughan, "Multimedia making it work", Tata McGraw Hill, New Delhi, 1997.
3. Raguveer M. Rao & Ajith S. Bopardikar," Wavelet Transforms – Introduction to Theory and applications", Addison Wesley, 1998.
4. H.K. Huang "PACS and Imaging informatics: Basic Principles and Applications", second edition, Wiley-Blackwell, 2010.

REFERENCES:

1. Artificial Neural networks in medicine http://www.emsl.pnl.gov:2080/docs/cie/techbrief/NN.techbrief.ht
2. Advances in Neural networks-ISNN 2007: 4th International symposium by Derong Liu, ZengguangHou.
3. Jane Bozarth :"Nuts and Bolts: Principles of Multimedia Learning".

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(3)**

FI 9033	**LOCATION BASED SERVICES**	**L T P C**
		3 0 0 3

UNIT I INTRODUCTION AND FUNDAMENTALS OF LOCATION BASED SERVICES

Introduction-Application Scenarios-LBS actors-Standardization –Fundamentals-Location-Location categories-Spatial location- Spatial databases and GIS

UNIT II LOCATION MANAGEMENT

Mobility management-Common concept of location management-Location management in CS networks-Location management in PS networks.

UNIT III OUTDOOR AND INDOOR POSITIONING

Fundamentals of positioning- classification of positioning infrastructures- Basic positioning methods-Satellite positioning-Global positioning system-Differential GPS- Cellular positioning-Positioning in GSM networks-Assisted GPS in GSM-WLAN Positioning- RFID positioning.

UNIT IV LBS OPERATION

Architectures and Protocols for Location Services -GSM and UMTS location services- Enhanced emergency services-Mobile location protocol-WAP location framework-Conceptual view of an LBS middle ware- Location API for J2ME-OpenGIS location services-Information model-core services.

UNIT V LBS APPLICATIONS AND SERVICES

General Aspects of Location-Based Services- Case Study: Development of the Find Friend Application- Navigation Systems: A Spatial Database Perspective.

TOTAL : 45 PERIODS

REFERENCES:

1. Axel Kuper, "Location-Based Services : Fundamentals and Operation", Wiley & Sons, 2005
2. Jochen Schiller and Agnes, "Location-Based Services", Morgan Kaufmann, 2004.
3. Andrew Jagoe, "Mobile Location Services", The definitive guide, 2003 Pearson Education,Inc.
4. Krzysztof W.Kolodziej and Johan Hjelm, "Local Positioning Systems", LBS applications and services, CRC Press, Taylor & Francis Group 2006.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(4)**

FI 9034 PARALLEL PROGRAMMING MODELS L T P C
3 0 0 3

UNIT I PROGRAMMING MODELS CLASSIFICATION

Flynn's Architecture, revisiting sequential models for multicore, Survey on Parallel and Multicore Programming Models, Homogeneous and Heterogeneous architectures, Implicit and explicit parallelism, Data Parallel Processing Models, Task Parallel Processing Models.

UNIT II PROGRAMMING MODELS FOR HOMOGENEOUS AND HETEROGENEOUS MULTICORE

Support for communication flow between processors, Runtime libraries, tools for race detection, scalability and performance analysis, Master-slave programming, Pipelined programming, Loop parallelization, Mutual Exclusion, Task scheduler. Language constructs, Memory Model, Case studies: Cilk, OpenMP, Thread Building Blocks, CUDA, Cells.

UNIT III CONCURRENT PROGRAMMING MODELS

Concurrent interaction and communication, Coordinating access to resources, Concurrent programming languages, Models of concurrency, Memory Model for Concurrent Programming Languages, shared address space, data/thread locality. Case studies : Habanero Multicore Software for Concurrent programming Models, DRFx, X10, CnC

UNIT IV PROGRAMMING MODELS FOR IMPLICIT AND EXPLICIT PARALLELISM

Special-purpose directives to process synchronization, communication or task partitioning, Hierarchical Parallelism and NonUniform Data Access-x10, A Flexible Parallel Programming Model for Tera-scale Architectures, Implicitly parallel programming models for thousand core. Case studies : Ct

UNIT V PROGRAMMING MODELS FOR RECONFIGURABILITY

Parallel Programming Model for a Multi-FPGA Multiprocessor Machine, Structural Object Programming Model, Productivity and interoperability of programming models, Programming models for scalability, Scalable Programming Models for Massively Multicore Processors, Comparison of

Programming Models for Multiprocessors, MPI vs PRAM, Cilk vs MPI, Abstraction of Programming Models Across Multi-Core and GPGPU Architectures, Evaluation of Multi-Core Programming Models

TOTAL:45 PERIODS

REFERENCES:

1. Parallel and Distributed Computing: A Survey of Models, Paradigms and Approaches, Claudia Leopold, A Wiley-Interscience Publication, John Wiley & sons Inc, 2001
2. X10 Programming Language: Programming Language, Thomas J. Watson Research Center, PERCS, DARPA, High Productivity Computing Systems, Parallel Programming, Lambert M. Surhone, Miriam T. Timpledon , Susan F. Marseken, Betascript Publishing (March 14, 2010)
3. http://supertech.csail.mit.edu/cilk/
4. http://www.threadingbuildingblocks.org/
5. http://www.pgas.org/
6. http://software.intel.com/en-us/data-parallel/
7. Relevant recent conference/journal publications

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(5)**

FI 9035 **DIGITAL VIDEO PROCESSING** **L T P C**
3 0 0 3

UNIT I VIDEO ACQUISITION AND REPRESENTATION & MOTION ANALYSIS 12

Spatio Temporal Sampling – Sampling Structure Conversion – Interpolation – Color spaces – Video formats. 2D and 3D Motion Estimation and Compensation – Optical Flow methods – Block based – point correspondences – Gradient based – Intensity matching – Feature matching – Frequency domain motion estimation – Depth from motion - Structure from stereo – 3D Reconstruction – Motion analysis Applications: Video Summarization, Video Surveillance, Video Watermarking, Video Mosaicing.

UNIT II VIDEO OBJECT TRACKING AND SEGMENTATION 9

2D and 3D motion tracking – blob tracking – kernel based – Contour tracking – Feature matching – Filtering – mosaicing – Video Segmentation – Mean Shift based – Active shape model – Video shot boundary detection.

UNIT III VIDEO FILTERING 7

Motion Compensation – Noise Filtering – Enhancement and Restoration – Video Stabilization and Super Resolution.

UNIT IV VIDEO CODING, REPRESENTATION 7

Video Standards: MPEG 1,2, MPEG-4, MPEG-7, H.261, H.263, H.264. Video compression – Interframe Compression – 3D Waveform based – Motion Compensation.

UNIT V CONTENT BASED VIDEO RETRIEVAL AND VIDEO BASED RENDERING 10

Object based coding – Content based representation – Feature extraction – MPEG 7 Visual descriptors – Low to high level representation (CSS, Poly, B-Splines etc.) – Video Indexing and retrieval – search engines.

Generation of mosaics from video; Detection of Video object alpha-matte and Video cut & paste for Virtual Reality applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Digital Image Sequence Processing, Compression and Analysis – Todd R. Reed, CRC Press, 2004.
2. H.264 and MPEG-4 Video Compression: Video Coding for Next Generation Multimedia – Iain E.G. Richardson, Wiley, 2003
3. Digital Video Processing – A. Murat Tekalp, Prentice Hall, 1995.

REFERENCES:

1. Video Processing and Communications by Yao wang, Joern Ostermann and Ya-Qin Zhang, Prentice Hall, 2002, ISBN 0-13-017547-1.
2. Handbook of Image and Video processing – Al Bovik (Alan C Bovik), Academic Press, Second Edition, 2005.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(6)**

FI 9036 WIRELESS BODY AREA NETWORKS L T P C
3 0 0 3

AIM:

To introduce the basic principles of Wireless Body Area Networks

OBJECTIVES:

- To study the overview of wireless sensor networks and their applications in Healthcare and issues related specific to Healthcare applications.
- To study the fundamentals and principles of wireless Body Area Networks.
- To study the standards related to Wireless Body Area Networks.

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 9

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Enabling Technologies for Wireless Sensor Networks – Operating Systems – Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

UNIT II WIRELESS SENSOR NETWORKS FORHEALTHCARE APPLICATIONS 9

General approach to WSN in Healthcare – Key Principles, Methodology – Architecting WSN solutions for Healthcare – Hardware, Firmware and Software Choices.

UNIT III FREQUENCY REGULATIONS 9

Frequency regulations on candidate frequency bands in different countries and regions, Ultra wideband (UWB), industrial, scientific, and medical (ISM), medical implant communication service (MICS), and wireless medical telemetry system (WMTS).

UNIT IV ANTENNA, PROPAGATION AND CHANNEL MODELING 9

Antenna, propagation, and channel modeling related to WBAN – Effects of radio frequency on tissues and organs and effects of human tissues on RF propagations.

UNIT V NETWORKING OF SENSORS 9

Physical (PHY) layer technologies – Narrow band and UWB – Medium access control (MAC) technologies for WBAN – Unified MAC design independent of underlying PHY technologies; Standardization with IEEE802.15.6, IEEE 11073, and ETSI eHealth Project.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education, 2003.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. C.K. Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
4. Burkhardt, " Pervasive Computing", First Edition, Pearson Education, 2003.
5. Terrance J. Dishongh and Michael Mcgrath, "Wireless Sensor Networks for Healthcare Applications", Artech House; First edition, October 30, 2009, ISBN – 978-1596933057.
6. Huan-Bang Li, Kamya Yekeh Yazdandoost, and Bin Zhen, "Wireless Body Area Network", River Publishers' Series in Information Science and Technology, Oct 29, 2010, ISBN : 978-87-92329-46-2.

REFERENCES:

1. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge Press, 2005.
2. Mohammed llyas And Imad Mahgaob, "Handbook Of Sensor Networks: Compact Wireless And Wired Sensing Systems", CRC Press, 2005.
3. Wayne Tomasi, "Introduction To Data Communication And Networking", Pearson Education, 2007.
4. Guang-Zhong Yang (Editor), and M. Yacoub (Foreword), "Body Sensor Networks", Springer; First Edition, March 28, 2006, ISBN-13: 978-1846282720.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(7)**

FI 9037 MOLECULAR FUNDAMENTALS IN BIOLOGY L T P C
3 0 0 3

UNIT I BIOMOLECULES 9

Carbon Chemistry, Types of bio molecules, Molecular structure and function of Biological Macromolecules – Proteins, Nucleic acids, Carbohydrates, Lipids

UNIT II GENES TO METABOLIC END-PRODUCTS 9

DNA replication, transcription, translation, bio catalysis, pathways and metabolism

UNIT III MOLECULAR CELL BIOLOGY AND ENERGETICS 9

Functional organization of cell at molecular level; membranes, molecular communication across membranes, energetics – proton motive force, ATP synthesis, respiration; photosynthesis.

UNIT IV MOLECULAR BASIS OF MICROBIAL FORMS AND THEIR DIVERSITY 9

Structural differences between microbial cell types; Primary and secondary metabolism of microbes, antibiotics, vitamins.

UNIT V MOLECULAR BASIS OF HIGHER LIFE FORMS 9

Molecular differences between various eukaryotic cell types, tissue proteins, blood, molecular components of blood, albumin, antibodies, hormones and their actions.

TOTAL : 45 PERIODS

TEXTS / REFERENCES

1. Biochemistry by Lubert Stryer, 5th Edition W.H. Freeman and Company, New York.
2. Lehninger's Principles of Biochemistry, 4th Edn, by David L. Nelson and Michael M. Cox.
3. Introduction to General, Organic and Biochemistry, 8th Edition Morris Hein, Leo R. Best, Scott Pattison, Susan Arena 2004, John Wiley & Sons Publishers, Inc.
4. An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in Modern Biotechnology Michael Wink (Editor) 2006 John Wiley & Sons Publishers, Inc.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(8)**

FI 9038 OPTICAL SWITCHING TECHNIQUES L T P C
3 0 0 3

UNIT I OPTICAL SWITCHING 9

Free-space optical switching – multistage optical interconnection networks- back plane optical interconnects, optical memory for switching – logic functionality – nonlinear fiber couplers, photonic switch architectures based on TDM, WDM, OCX, ATM.

UNIT II OPTICAL PACKET SWITCHING 9

Optical Packet Switching Basics: Header and Packet Format, Typical Contention Resolution in OPS networks, Hybrid Contention Resolution for OPS, Priority based Routing, TCP Performance with OPS, Experimental OPS Networks.

UNIT III PHOTONIC PACKET SWITCHING 9

Optical Time Division Multiplexing, Synchronization, Header Processing, Buffering, Burst Switching, OTDM Test beds: KEOPS, NTTs Optical Packet Switches, BT Labs Testbeds, AON, CORD

UNIT IV OPTICAL BURST SWITCHING 9

Optical Burst Switching Basics: Properties, OBS node, OBS network architecture, Ingress node, OBS reservation policies: Tell- And Wait, Tell And –Go: Just in Time and Just Enough Time, Performance Analysis of JIT and JET

UNIT V BURST ASSEMBLY IN OPTICAL BURST SWITCHING 9

Burst Assembly Algorithms: Timer based, Burst Length based, Mixed Timer and Burst Length based. Contention Resolution, Comparison of OBS with OPS, Edge and Core nodes in OBS and Test beds, New Challenges in OBS, Trends in OBS

REFERENCES:

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004.
2. C. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks : Concept, Design and Algorithms", Prentice Hall of India, Ist Edition, 2002.
3. Biswanath Mukherjee, "Optical WDM Networks" Springer, 2006.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(9)**

FI 9039 SINGLE ELECTRON DEVICES L T P C
3 0 0 3

UNIT I INTODUCTION:CMOS SCALING AND SINGLE ELECTRONICS 9

CMOS Scaling Limits, Emerging Nanotechnologies: Life After CMOS, Single-Electron Transistors—An Overview: principle of single electronic transistor – the coulomb blockade, theoretical quantum dot transistor, energy of quantum dot system, conductance oscillation and potential fluctuation, transport under finite temperature and finite bias, single electron effect, modeling of transport: tunneling-tunneling in oxide, quantum kinetic equation, carrier statistics and charge fluctuations, performance of single- electron transistor, technology.

UNIT II BASIC SINGLE- ELECTRON DEVICES 9

Single electron box, single electron transistor, single electron trap, single electron turnsile and pump, SET oscillators, superconductor systems; device structure and fabrication-experimental results and analysis-single-electron quantum-dot transistor, single hole, quantum dot transistor, transport characteristics under finite bias, transport through exited states, artificial atom, single charge trapping, SET circuit design- wiring and drivers, logic memory circuits, SET adder as an example of a distributed circuit, comparison between FET and SET circuit designs.

UNIT III ANALOG AND DIGITAL APPLICATIONS 9

Voltage state logics, charge state logics, problems, background-charge-insensitive memory, crested tunnel barriers, nonvolatile random access memory (NOVORAM), other single electron and few electron devices and memories, electrostatic data storage (ESTOR).

UNIT IV HYBRIDIZATION OF CMOS AND SET 9

Comparison Between SET and CMOS Logic, Motivation for CMOS-SET Hybridization, Challenges for CMOS-SET Hybridization, CMOS-SET Cosimulation and Codesign, Case Studies of Different Hybrid CMOS-SET Architectures , SETMOS—Coulomb Blockade Oscillations in the Microampere Range.

UNIT V SIMULATION METHODS 9

Monte-carlo in oxide, tunneling in silicon; SESO transistor- history, single electron devices to SESO, method, solution of the master equation, coupling with SPICE, free energy, tunnel transmission coefficient, energy levels, evaluation schemes for co tunneling, rate calculation including electromagnetic environment, numerical integration of tunnel rates, time dependent node voltages and node charges, stability diagram and stable states, capacitance calculations, SIMON single-electron software package.

TOTAL:45 PERIODS

REFERENCES:

1. Shunri oda, David ferry, "Silicon Nanoelectronics", CRC press, Taylor and Francis group,2006
2. Hybrid CMOS Single-Electron-Transistor Device and Circuit Design Santanu Mahapatra and Adrian Mihai Ionescu.
3. Christoph Wasshubler." Computational single- electronics", springer,2001

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(10)**

FI 9040 **SPEECH TECHNOLOGY** **L T P C**
3 0 0 3

UNIT I PRODUCTION AND PERCEPTION OF SPEECH 8

Speech production mechanism – Articulatory phonetics – Acoustic phonetics – Discrete time modelling of Speech production –coarticulation - prosody. Auditory perception – Human auditory system - perception of sound - psychoacoustics.

UNIT II SPEECH SIGNAL ANALYSIS IN TIME DOMAIN 8

Speech signal analysis – segmental, sub-segmental and suprasegmental levels - Time domain parameters of speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

UNIT III SPEECH SIGNAL ANALYSIS IN FREQUENCY DOMAIN 9

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Homomorphic speech analysis - Cepstral analysis of Speech – Formant and Pitch Estimation. Linear Prective analysis of speech - Autocorrelation method – Covariance method – Solution of LPC equations – Durbin's Recursive algorithm –Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis.

UNIT IV AUTOMATIC SPEECH RECOGNITION 10

Speech segmentation – parametric representation – Dynamic time warping – Hidden Markov Models – Language Models.

UNIT V SPEAKER RECOGNITION 10

Speaker identification and verification – Features for speaker recognition – Signal Enhancement for mismatched conditions – speaker recognition from coded speech.

TOTAL: 45 PERIODS

REFERENCES

1. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals –Prentice Hall -1978
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. Singapore, 2004
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 1972
5. I.H.Witten – – Principles of Computer Speech – Academic Press – 1982.

FI 9041 MEDICAL IMAGE REGISTRATION L T P C
3 0 0 3

AIM:
To introduce the basic principles of Medical image registration, image registration techniques applied to medical data for security purpose.

OBJECTIVES:
- To study the Fundamentals and principles of Image Registration.
- To study the various image registration techniques applied to understand the medical data for diagnosis and therapy procedures.
- To learn software tool technique to provide Medical image registration setup.

UNIT I REGISTRATION METHODOLOGY 9
Introduction. Concepts and algorithms – notation and terminology, Types of transformation, Registration algorithms, Image transformation. Correcting for scanner errors in CT, MRI, SPECT and 3D Ultrasound – geometric distortion in CT, spatial inaccuracies in MRI, SPECT and 3D US. Detecting failure, Assessing success – measure and alignment of errors, methods for estimating error, gold standards and Registration circuits, accounting for error in the standard, independent validation.

UNIT II TECHNIQUES AND APPLILCATIONS OF RIGID BODY REGISTRATION 9
Registration and subtraction of serial MRI of the Brain: Image interpretation and clinical applications - Regional and tissue-specific appearances on different images, artifacts and failed registration, physiological changes, contrast enhancement, pediatrics, adult infarction, multiple sclerosis, tumors, schizophrenia, alzheimer's disease, postoperative changes, bone marrow transplantation, quantization of brain change. Role of registration in fMRI- motion correction, geometric distortion. Structural registration- Registration of MRI and PET images, Registration of MR and CT images, Image registration in nuclear medicine. Guiding therapeutic procedures.

UNIT III TECHNIQUES AND APPLILCATIONS OF NON-RIGID BODY REGISTRATION 9
Non rigid registration: concepts, algorithms and applications – registration using splines, FEM and mechnical models, optical flow, elastic registration, fluid registration, intra subject and inter subject registration. Analysis of motion and deformation using non rigid registration. Registration based analysis of normal brain anatomy and metabolism in multiple sclerosis. Biomechanical modeling for image registration: Application in image guided neuro surgery. Future applications of image registration.

UNIT IV OPTIMIZATION METHODS FOR MEDICAL IMAGE REGISTRATION 9
Optimization methods – Gradient descent (GDD & GDL)method, Non linear conjugate (NCG) method , stochastic gradient descent (SGD) method, Preconditioned SGD method and Adaptive SGD method. Quasi newtion (QN) method, Evolution strategy (ES) method, Preconditioned Monomodal registration method. Label image fusion in detail.

UNIT V ELASTIX - TOOL 9
Image registration with elastix, Registration frame work, software characteristics, Registration components, Registration set up. Transformation models. Sampling strategies and Multiresolution strategies. Atificial motions. Rigid registration of fMRI series and Non rigid registration of CT chest scans. Adaptive vs Nonadaptive. Maximum voxel displacement. Evaluation measures.

TOTAL : 45 PERIODS

REFERENCES:

1. Joseph. V. Hajnal, Derek L.G. Hill, David J. Hawkes, " Medical image registration", The Biomedical engineering series, CRC Press, 2001.
2. Stefan Klein, " Optimization Methods for Medical image registration", Uitgeverij BOX press, the Netherlands, 2008.
3. Isaac N. Bankman, "Handbook of Medical Imaging processing and analysis", Academic Press, 2000.
4. Steve Webb, "The Physics of Medical Imaging", Taylor & Francis, New York.1988.
5. Stefan Klein, Marius Staring, Keelin Murphy, Max A. Viergever and Josien P. W. Pluim," elastix: A Toolbox for Intensity-Based Medical Image Registration, IEEE Transactions on Medical Imaging, VOL. 29, NO. 1, January 2010.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(12)**

FI 9042 **PHASE LOCK LOOPS** **L T P C**
3 0 0 3

UNIT I **11**

Introduction to PLL,Operating principle of PLL,Classification Of PLL Types,Building Blocks of PLL-Phase detectors-Loop Filters-Controlled Oscillators and Down scalers-PLL Performance in the Locked State and Unlocked State-Nonideal effects in PLL-.

UNIT II **9**

VCO Mathematical Description,Phase Detector Mathematical Relationship,Analog PLL Transfer Function and Control-Systems Theory,Error Tracking.Second Order PLL-Noise properties,Effect of Additive noise -Effect of phase noise.

UNIT III **8**

Introduction to PLL Frequency Synthesizer,Synthesizer Configurations,Frequency Dividers,Fractional-N Counters-Integer-N frequency synthesizers,Noise Propagation in a PLL.

UNIT IV **8**

Digital Phase Lock loops, Time Delay Digital Tanlock Loops (TDTLS),Hilbert Transformer and time delay,FPGA Reconfigurable TDTL.Delay lock Loop-Delay Elements-VCDL.

UNIT V **9**

Introduction and basics of clock and data recovery circuits, Clock recovery architectures and issue, Phase and frequency detectors for random data, CDR architecture, Jitter in CDR circuit, VCOs for CDR application, Examples of CDR circuit.

TOTAL: 45 PERIODS

REFERENCES:

1. F. Gardner, Phaselock Techniques, John Wiley & Sons, 2005.
2. D. Wolaver, Phase-Locked Loop Circuit Design, Prentice-Hall, 1991.
3. W. Egan, Phase-Lock Basics, John Wiley & Sons, 1998.
4. R. Best, Phase-Locked Loops : Design, Simulation, and Applications, McGraw Hill, 2003
5. Behzad Razavi,Monolithic Phase-Locked Loops and Clock Recovery Circuits: Theory and Design, Wiley-IEEE Press,1996.

6. Ulrich L. Rohde, Digital PLL Frequency Synthesizers: Theory and Design, Prentice Hall.1982

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(13)**

FI 9043 FAULT TOLERANT COMPUTING SYSTEM L T P C
3 0 0 3

UNIT I INTRODUCTION

Faults, Errors Failure Model Error Models, Error type Error Duration Number of Simultaneous errors. Fault tolerant Metrics Availability, Reliability (MTTR, MTBR, and MTTF). AVF, PVF and HVF analysis

UNIT II ERROR DETECTING AND CORRECTING CODES

Error Coding Techniques Fault detection and ECC for state bits. Basics of Error coding Multiple Error Detecting codes Residue codes and cyclic codes. Error correcting codes Self checking Combinational Logic design Self checking checkers self checking sequential circuit design. Fault tolerant design Hardware redundancy, Information redundancy Time redundancy and software redundancy.

UNIT III FAULT TOLERANCE IN MICROPROCESSOR

Microprocessor cores Tightly lock-stepped Redundant cores Redundant Multithreading without lock-stepping Dynamic verification of invariants Cache and memory Detecting errors in content addressable memories and addressing. Dynamic Verification of cache memory and memory consistency. Interconnection networks. Error Recovery FER BER. FER and BER for cores, caches and memory Issues Unique to Multiprocessors. Self repair in cores.

UNIT IV ARCHITECTURAL VULNERABILITY ANALYSIS

AVF basics SDC and DUE Equations ACE Principles Micro architectural Un-ACE bits Architectural Un-ACE bits Computing AVF with Little's Law. Advanced AVF Analysis Lifetime analysis of RAM Arrays Lifetime analysis of CAM arrays AVF results for RAM arrays and CAM arrays. Case Studies

UNIT V FAULT DETECTION VIA REDUVNDANT EXECUTION

Sphere of replication fault detection via Cycle by Cycle Lock stepping
Fault detection via RMT. RMT within a single Processor core RMT in a Multi-core architecture.

TOTAL : 45 PERIODS

REFERENCES:

1. Fault-Tolerant Systems, Israel Koren and Mani Krishna, Morgan Kaufmann 2007.
2. Architecture Design for soft errors, Shubu Mukherjee Morgan Kaufmann 2008.
3. Fault Tolerant Computer Architecture, Daniel J sorin Morgan and claypool 2009.
4. Self checking and fault tolerant digital design , Parag lala ,Morgan Kaufmann 2000.
5. Fault-tolerant Computer system design, D.K. Pradhan, PH PTR 1996

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(14)**

FI9044 SCHEDULING AND LOAD BALANCING ALGORITHMS FOR CLOUD L T P C
3 0 0 3

UNIT I INTRODUCTION 6

Introduction - Grid computing, Cloud computing - Differences - General issues in Cloud Systems.

UNIT II QUEUING THEORY 10

Introduction - Queuing models : Little Theorem - The M/M/I Queuing System - The M/M/m, M/M/1, M/M/m/m, and other Markov Systems - The M/G/I System.

UNIT III REAL TIME SCHEDULING 10

Introduction - Requirements - Overview of Real Time Scheduling - Clock Driven Scheduling - Weighted Round Robin Scheduling - Priority Scheduling - Earliest Deadline First (EDF) - Response Time Analysis - EDF with Shared Resources and Precedence Constrains.

UNIT IV CLOUD SCHEDULING 10

Challenges of Scheduling in Cloud - VM Scheduling-BVT Scheduler - SEDF Scheduler - Credit Scheduler - HAIZEA Schedulers - Job Scheduling - FCFS - Round Robin - Simple Heuristic-based Algorithms - Greedy Algorithms - Preemptive Algorithms - Load Balancing in Cloud - Dynamic Load Balancing Algorithm - RLBVR Algorithm - QLBVR Algorithm - Randomized Load Balancing.

UNIT V CASE STUDY 9

Scheduling Algorithms in CloudSim - Scheduling Algorithms in Eucalyptus - Scheduling Algorithms in Open Nebula - Scheduling Algorithms in Nimbus.

TOTAL: 45 PERIODS

REFERENCES:

1. Anthony T.Velte,Toby J.Velte, Robert Elsenper, “Cloud Computing –A Practical Approach”, Fourth Edition, Tata McGraw Hill , 2010.
2. D. Gross, C. M. Harris, “Fundamentals of Queuing Theory”, Third Edition, John Wiley and Sons, 2002.
3. Francis Cottet,Joelle Delacroix,Claude Kaiser,Zoubir Mammeri, “Scheduling in Real Time Systems”, John Wiley and Sons, 2002.
4. Rajkumar Buyya, James Broberg,Andrzej Goscinski, “Cloud Computing – Principles and Paradigms”, John Wiley and Sons, 2011 .
5. www.open.eucalyptus.com/
6. http//opennebula.org
7. www.nimbusproject.org
8. http://www.cloudbus.org/cloudsim/

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(15)**

FI 9045 SOCIAL NETWORK MINING L T P C
3 0 0 3

UNIT I INTRODUCTION TO SOCIAL NETWORK ANALYSIS 9

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web - Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT II MODELLING AND VISUALIZING SOCIAL NETWORKS 9

Visualizing Online Social Networks, Graph Representation - Centrality- Clustering - Node-Edge Diagrams, Visualizing Social Networks with Matrix-Based Representations- Matrix + Node-Link Diagrams, Hybrid Representations - Modelling and aggregating social network data - Ontological representation of social individuals, Ontological representation of social relationships.

UNIT III MINING COMMUNITITES IN WEB SOCIAL NETWROKS 9

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities - Methods for Community Detection & Mining - Applications of Community Mining Algorithms.

UNIT IV TRUST BASED USER MODELING AND PERSONALIZATION IN SOCIAL MEDIA 10

Understanding and Predicting Human Behaviour for Social Communities - User Data Management, Inference and Distribution – User Modelling and Personalization in Social Media - Reality Mining - Context-Awareness - Privacy in Online Social Networks - Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation for recommendation.

UNIT V OPINION MINING IN SOCIAL NETWORKS 8

Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

TEXT BOOKS

1. Peter Mika, "Social networks and the Semantic Web", Springer, 1st edition 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.
3. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.
4. Dion Goh and Schubert Foo, "Social information retrieval systems: emerging technologies and applications for searching the Web effectively", IGI Global snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and social information retrieval and access: techniques for improved user modelling", IGI Global snippet, 2009.
6. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer, 2011.

REFERENCES

1. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.
2. Lee Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
3. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.

Faculty of I and C Engg (Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(16)

FI 9046 WEB MINING L T P C
3 0 0 3

UNIT I WEB DATA MINING

Introduction – information retrieval and web search – IR methods – Relevance Feedback – similarity search – Evaluation Measures – Text and Web Page pre-processing – inverted index and its compression – LSI – web search – web spamming

Semantic web – technologies – structured web documents – describing web resources – web ontology language.

UNIT II LINK ANALYSIS

Social network analysis – co-citation and bibliographic coupling – page rank – HITS – community discovery – enhanced models – resource discouvery.

Web crawling – basics – implementation issues – universal crawlers – focused crawlers – evaluation – crawler ethics and conflicts – clustering and classification methods – visualization – collaborative filtering – supervised and unsupervised learning.

UNIT III WRAPPER GENERATION

Wrapper extraction – induction – wrapper learning – automated wrapper generation – issues string matching and tree matching – multiple alignment – DOM trees – advanced wrapper extraction mechanisms.

UNIT IV INFORMATION INTEGRATION

Introduction to schema matching – pre-processing – other matching mechanisms – combining similarities – integration of web query interfaces – unified interface.

UNIT V OPINION AND USAGE MINING

Sentiment analysis – feature based methods – summarization – relation mining –opinion search – opinion spam.

Web usage mining – date collection – pre-processing – data modeling – web usage pattern discovery.

TOTAL: 45 PERIODS

REFERENCES:

1. Bing Liu, Web Data Mining – Exploring hyper links, contents and usage data, Springer 2007.
2. Soumen chakrabarti, Mining the web – discovering knowledge from hypertext data, Elsevier, 2003.
3. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, MIT Press, Cambridge, 2004.
4. Min Song, Yi Fang and Brook Wu, Handbook of research on Text and Web mining technologies, IGI global, Information Science Reference – Imprint of: IGI Publishing 2008.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(17)**

FI 9047 RFID TECHNOLOGY AND APPLICATIONS L T P C
3 0 0 3

UNIT I RFID HISTORY AND TECHNOLOGY 9

Introduction to RFID history and markets - Historical background Adoption of the Auto-ID system for the Electronic Product Code (EPC) - RFID technology and its applications ,Automatic Identification Systems ,Barcode systems . Optical character recognition, Biometric procedures , Voice identification .Fingerprinting procedures , Smart cards . Memory cards . Microprocessor cards ,Comparison of Different RF ID Systems

UNIT II RADIO BASICS FOR UHF RFID 10

Information, Modulation, and Multiplexing, Backscatter Radio Links , Link Budgets , Reader Transmit Power ,Path Loss , Tag Power , Reader Antennas -substrates,,Effect of Antenna Gain and Polarization on Range

UNIT III INTEGRATING SENSORS AND ACTUATORS INTO RFID TAGS 10

RFID Fundamental Operating Principles ,RFID systems,Smart" transducers, RFID tags with sensors, Performance evaluation of WiFi, RFID localization technologies

UNIT IV RFID TAG PERFORMANCE OPTIMIZATION 10

Operating frequency, Security requirements , Memory capacity ,Metrics of tag performance, Performance enhancement of RFID tags , Sensors for RFID; integrating temperature sensors into RFID tags, Fundamentals of orientation , Antennas and materials , An analogy to network layering

UNIT V STANDARDS AND APPLICATIONS 6

Standardization,Contactless Smart Cards , Access Control , Animal Identification , Industrial Automation , Medical Applications

TOTAL: 45 PERIODS

REFERENCES:

1. Design and Development of Radio Frequency Identification (RFID) and RFID-Enabled Sensors on Flexible Low Cost Substrates-,Li Yang, Amin Rida, and Manos M.Tentzeris 2009
2. The RF in RFID,Passive UHF RFID in Practice,-Daniel M. Dobkin
3. RFID Handbook,Fundamentals and Applications in Contactless Smart Cards and Identification,-Klaus Finkenzeller .Second Edition
4. RFID Technology and Applications,- STEPHEN B. MILES,SANJAY E. SARMA JOHN R. WILLIAMS

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(18)**

FI 9048 NUMERICAL TECHNIQUES IN ELECTROMAGNETICS L T P C
3 0 0 3

UNIT I REVIEW OF EM THEORY 8

Electrostatic fields,magnetoststic fields,Time varying fields,boundary conditions,wave equations,Classification of EM problems

UNIT II ANALYTICAL METHODS 8

Separation of variables in Cartesian,cylindrical,spherical coordinates-Laplace equation and wave equation.Series expansion-Practical application

UNIT III FINITE DIFFERENCE METHOD 9

Finite difference schemeas, Finite differenceing of parabolic,hyperbolic and elliptic PDE's.Accuracy and stability of FD solutions,Applications

UNIT IV VARIATIONAL METHODS 10

Construction of functional from PDE's,Weighted residual method,Eigen value problems,applications,Deterministic numerical techniques-method of moments,FEM,FDTD-Applications and numerical examples. Non Deterministic numerical techniques-Montecarlo method-Simulation of EMC behavior-Computational models

UNIT V OPTIMIZATION 10

Problem Statement , Line Searches ,Newton's Method , Equality Constraints and Lagrange Multipliers,.Particle swarm optimization

REFERENCES

1. Numerical Techniques in Electromagnetics,:Mathew.N.O.Sadiku,CRC press,Second Edition,2001
2. Global Optimization Algorithms– Theory and Application –' Thomas Weise-second edition-2009
3. Handbook of Numerical Analysis-*General Editor:*P.G. Ciarlet,Elsevier,2005
4. An Introduction to Numerical Analysis for Electrical and Computer Engineers,Christopher j. Zarowski, John wiley & sons,2005.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(19)**

FI 9049 SECURITY ISSUES IN WIRELESS BODY AREA NETWORKS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

BAN communication architecture, Hardware and Devices ,Physical layer :- RF and non-RF communication, movement of the body; MAC layer :- WBAN specific protocols, IEEE 802.15.4,IEEE 802.15.6; Network layer :- cluster Based Routing ,Temperature Routing; Cross layer protocol ,Quality of service, taxonomy and requirements, Positioning of WBAN issues and challenges of WBNs – Security and power management , security Threats , Radio technologies , interoperability .

UNIT II CRYPTOSYSTEMS 9

Block Cipher:- RC4, SPINS, AES- CTR, AES- CCM, AES-CBC-MAC; Public key Cryptography:- RSA Certification, PKI Certificates; Pair wise Symmetric key:- ECDH, ECDSA, and ECIES (Public-Private Key); Data storage Attacks: -Catch me Algorithm, Dynamic Data Integrity.

UNIT III LIGHT WEIGHT CRYPTOGRAPHIC ALGORITHM 9

Ultra-Light weight algorithm:- Hamming Bird -2, PRESENT;Block cipher for low resource device:- HIGHT, Skipjack, RC5, RC6, Rijndael, Twofish , Camellia;
Symmetric key block cipher:- Serpent, CLEFIA, Crypt on;Synchronous eStream cipher:- Trivium 5, Grain 5, Mickey;Energy Efficient Symmetric key Cryptographic Algorithm:- Salsa 20, LEX, SEA, TEA, and IDEA.

UNIT IV AUTHENTICATION PROTOCOL 9

Authentication protocol principles- SSH Remote logic Protocol – Kerberos Protocol-SSL and TLS, Authentication frame for public key cryptography, Secure Network Encryption Protocol.(SNEP),Light Weight Encryption Key Exchange protocol, Lightweight Extensible Authentication Protocol (LEAP).

UNIT V SOFTWARE and PROCESSORS 9

C, NesC, Software Package for ECC, NS2, TOSSIM, MSP 430(kickstart), ATAM 893 – D.

TOTAL: 45 PERIODS

REFERENCES
1. Hamid R. Nemati and Li Yang ,'Applied Cryptography for Cyber Security and Defense: Information Encryption and Cyphering' , Premier Reference Source , 2011.
2. Niels Ferguson and Bruce Schneier 'Practical Cryptography', John Wiley & Sons, 2003.
3. Kui Ren and Wenjing Lou , 'Communication Security in Wireless Sensor Networks', VDM Verlag , 2008.
4. Min Chen, Sergio Gonzalez, Athanasios Vasilakos, Huasong Cao, Victor C and M. Leung, "Body Area Networks: A Survey," Mobile Network Application, Springer, 2011, page no .2- 25.
5. Beno Latre, Bart Braem , Ingrid Moerman ,Chris Blondia and Piet Demeester, "A Survey on Wireless Body Area Networks,"Wireless Networks, Springer, 2010, Volume: 17, Issue: 1,Pages:1-18.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(20)**

FI9050 RESOURCE SCHEDULING IN VIRTUAL MACHINES L T P C
3 0 0 3

UNIT I INTRODUCTION TO RESOURCE SCHEDULING

Types of operating system schedulers -Long-term scheduler - Mid-term scheduler – Short term scheduler - Scheduling criteria – Scheduling Algorithms: FCFS, SJF, SRTF, Priority based scheduling, Multi level queue scheduling - Disk Scheduling.

UNIT II VIRTUAL MACHINE

Introduction to Virtual Machines (VM) – Object Oriented VMs –– Dynamic Class Loading –Garbage Collection Emulation: Interpretation and Binary Translation– Instruction Set Issues – Process Virtual Machines –– Migration

UNIT III RESOURCE SCHEDULING IN GRID

Scheduling Virtual Grids - Scheduling Virtualized Grid Environment using Hybrid Approach - Optimizing Grid Site Manager Performance with Virtual Machines – CARE Resource Broker- Virtual Resource Management Protocol- Virtual Resource creator - VRMP services - Virtual Resource Aggregation Service- Virtual Machine Service-Virtual Cluster Service.

UNIT IV RESOURCE SCHEDULING IN CLOUD ENVIRONMENT

Virtual Machine Scheduler for cloud environment - Cloud Computing Resource Management - Grid Middleware Storage Management in Virtualized Cloud Environment

UNIT V RESOURCE SCHEDULING MANAGEMENT SYSTEM

Resource management with VMware- Distributed Resource Scheduler (DRS) – DRS Architecture and conceptual overview – VMware clusters and Resource Pools

TOTAL: 45 PERIODS

REFERENCES

1. Silberschatz, Galvin and Gagne, "Operating System Concepts", Sixth Edition, John Wiley & Sons Inc 2003.
2. James E. Smith, Ravi Nair, Virtual Machines Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
3. Scheduling in Virtualized Grid Environment Using Hybrid Approaches International Journal of Grid Computing and Applications (IJGCA) Vol.1, No.1, September 2010

4. CARE Resource Broker: A framework for scheduling and supporting virtual resource management
5. VMware Infrastructure Resource Management with VMware DRS- vmware best practices
6. Cloud Computing Resource Management through a Grid Middleware: A Case Study with DIET and Eucalyptus, INRIA, version1.

Faculty of I and C Engg **(Approved in 17th AC(Ad hoc) 27.04.2012) ITEM NO. FI 17.01(21)**

FI9051 HETEROGENEOUS COMPUTING L T P C
3 0 0 3

UNIT I PROCESSOR FUNDAMENTALS 9

Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture - Chip Multiprocessing, Homogeneous Vs Heterogeneous design - SMP - Multicore Vs Multithreading

UNIT II MULTICORE PROGRAMMING 9

Shared memory architectures - Cache Memory - Cache Coherency Protocols - Design of Levels of Caches - Programming for Multicore architecture - Multicore programming model - Messaging passing model - OpenMP and MPI Programming

UNIT III OPENCL FUNDAMENTALS 9

C Programming for Linux - Graphic Processing Units - GPU Vs CPU - Accelerated Processing Unit - OpenCL Overview - Parallel programming - Code template - Interoperability - Parallel algorithms - Task and data decomposition - CPU to GPU communication

UNIT IV OPENCL ARCHITECTURAL MODELS 9

OpenCL Architecture - Platform model - Execution model - Memory model - Programming model - Dual core processors - Fermi and Fusion - Broadband engine

UNIT V OPENCL ADVANCED FEATURES 9

GPU Memory - Coalescing - Conflicts - Event timing and profiling - Threading and Scheduling - Programming multi devices - Applications

TOTAL: 45 PERIODS

TEXT BOOKS

1. Hennessey & Pateterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999.
2. David B. Kirk, Wen-mei W. Hwu, “Programming Massively Parallel Processors: A Hands-on Approach” Morgan Kaufmann, 2010.

REFERENCE BOOKS

1. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill, 1993.
2. Richard Y. Kain, “Advanced Computer Architecture: A System DesignApproach”, PHI, 1999.
3. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, Parallel Programming in OpenMP, Morgan Kaufmann, 2000.

FI 9052 TAMIL TEXT AND SIGN LANGUAGE TECHNOLOGIES L T P C
3 0 0 3

UNIT I INTRODUCTION 9

About Sign Language - History – Basic Signs – Emergency Signs

UNIT II COMPUTATIONAL LINGUISTICS 9

Phonology – Morphology – lexicography – syntax – semantics – pragmatics

UNIT III TAMIL COMPUTING TOOLS 9

POS Tagger - Morphological Analyser - Morphological Generator - Sentence Parser - Named Entity Recognizer - Word Sense Disambiguator - Ontologies – Universal Networking Language & UNL Enconvertor

UNIT IV THEORETICAL ISSUES 9

Nativization, Variability, and style shifting in Tamil Sign Language – Manual Communation and Autism

UNIT V LANGUAGE ACQUISITION AND PSYCHOLINGUISTICS 9

Sociolinguistics – Instructional Input – Lexical Acquisition – Psycholinguistic Approach

TOTAL: 45 PERIODS

REFERENCES

1. Edward Mulwa, "Sign Language for Emergency Situations", Create Space Publishers, 2011.
2. Ceil Lucas, "Sign Language Research: Theoretical Issues", Gallaudet University Press, 1990.
3. Patricia Siple, Susan D.Fischer, " Theoretical Issues in Sign Language Research, Vol-2", University Of Chicago Press, 1999.
4. Tholkaappiyam : Phonology & Morphology, Albert, International Institute of Tamil Studies, First Edition, 1985.
5. The Oxford Handbook of Computational Linguistics, Edited by Ruslan Mitkov, Oxford University Press, 2003
6. Translation - Theory and Application, Valarmathi, International Institute of Tamil Studies, First Edition, 2001.
7. Tholkaappiyam - Thodariyal, Shanmugam, International Institute of Tamil Studies, First Edition, 2004.
8. Conference Papers, Tamil Internet, Government of Tamilnadu, 2003.
9. Java : The Complete Reference, Herbert Schildt, McGraw-Hill, Seventh Edition,

FI 9053 MACHINE TRANSLATION L T P C
3 0 0 3

UNIT I INTRODUCTION

Aim of MT -Translation Process - Approaches – Rule-based, Transfer-based machine translation, Interlingual, Dictionary-based – Statistical – Example based – Hybrid MT

UNIT II LINGUISTIC COMPUTATIONAL ASPECTS

Study of Language –Grammar – Phonology and Orthography – Morphology and Lexicon – Syntax – Syntactic features and functions – Semantic - Text relations. –Lexical databases – Parsing – Backtracking - Major issues – Disambiguation - Named Entities –

UNIT III UNIVERSAL NETWORKING LANGUAGE

Generation Architecture – Interlingua based system, Machine translation system , Transfer systems , Translation systems , Fusion – UNL approach – Characteristic of UNL – Generation in the UNL framework – Direct Generation , Combined Generation – Universal words – UNL Knowledgebase – Interlingua models of semantic roles , Hybrid models of roles – Linguistic Aspects – Restrictions – Semantic categories – UNL based MT – Multi-lingual support in UNL

UNIT IV STATISTICAL APPROACHES TO MT

Statistical measures –Background and context – Formal Description – Finite-state Transducer Models – Word based Models , Phrase based Models – Synchronous Context-Free Grammar Models - Bracketing Grammar - Syntax Based , Hierarchical and phrase based Translation – Parameterization – Generative models – Language models, Translation model – Discriminative models, Parameter Estimation – Parameter estimation in Generative models

Learning word Translation Probabilities - phrase Translation Probabilities – Word Alignment – Asymmetric Models , Symmetric Alignment models , Supervised Learning for Alignment – Estimation in Log –Linear Models – Minimum Error Rate Training , Purely Discriminative Training – Decoding – FST decoding , Optimality and Pruning , Greedy Decoding, SCFG Decoding - Re-ranking – Data Structures for Model Representation

UNIT V MT APPLICATIONS

Practical use of MT – Applications in government, markets, interchange, social networking– Online MT - Evaluation of MT

Statistical MT and poetry – Line length Constrained Poetry – Rhythmic poetry – Rhythmic and Rhyming poetry – Stress Pattern – stress pattern for a phrase based system , Stress Pattern for a Hierarchical system – General poetic form feature function – Poem recognition- Types of Poetry – Poem Characteristics – Bayesian approach to poem recognition.

TOTAL: 45 PERIODS

REFERENCES:

1. Hutchins, W. John; and Harold L Somers (1992). An Introduction to Machine Translation. London: Academic Press ISBN 0-12-362830-X.
2. Jesus Cardnosu, Alexandar Gelbukh, Universal Networking Language Advances in Theory and Application. ISBN: 970-36-0226-6, ISSN: 1665-9899.
3. Dmitriy Genzel , Jakob Uszkoreit, Franz Och , “Poetic” Statistical Machine Translation: Rhyme and Meter ,Proceedings of the 2010 Conference on Empirical Methods in Natural Language Processing, pages 158–166,MIT, Massachusetts, USA, 9-11 October 2010. Association for Computational Linguistics
4. Erica Greene , Tugba Bodrumlu , Kevin Knight , Automatic Analysis of Rhythmic Poetry with Applications to Generation and Translation , Proceedings of the 2010 Conference on Empirical Methods in Natural Language Processing, pages 524–533, MIT, Massachusetts, USA, 9-11 October 2010.Association for Computational Linguistics
5. Lopez, A. 2008. Statistical machine translation. ACM Comput. Surv., 40, 3, Article 8 (August 2008), 49 pages
6. H.R .Tizhooh , R.A. Dara , On Poem Recognition , Pattern and Application(2006) 9:325-338 , DOI 10.1007/s/10044-006044-8.
7. Roy J. Byrd and Martin S. Chodorow. 1985. Using an on-line dictionary to find rhyming words and pronunciations for unknown words. In Proceedings of the 23rd Annual Meeting of the Association for Computational Linguistics, pages 277–283, Chicago, Illinois.

http://www.statmt.org/moses
8. Kishore Papineni, Salim Roukos, Todd Ward, and Wei- Jing Zhu. 2002. Bleu: a method for automatic evaluation of machine translation. In Proceedings of 40th Annual Meeting of the Association for Computational Linguistics, pages 311–318, Philadelphia, Pennsylvania,USA, July. Association for Computational Linguistics.
9. Jisha. P.Jayan, Rajeev RR, Dr.S.Rajendran, Morphological Analyser and Morphological Generator for Malayalam-Tamil Machine Translation. International journal of Computer Applications (0975-8887) volume 13 No-8, January 2011.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(1)**

FI 9054 NON LINEAR SIGNAL PROCESSING L T P C
3 0 0 3

UNIT I MATHEMATICAL PRELIMINARIES 9

Signal Processing Model - Signal and Noise Models – Fundamental problems in Noise Removal - Random Variables and Distributions – Estimation - Point Estimation – Maximum likelihood Estimators – M - Estimators - L- Estimators– R- Estimators – Scale Estimation.

UNIT II NONLINEAR FILTERS 9

Nonlinear filters – Measures of robustness – Order Statistics Filters – Median filters and their characteristics – Impulse noise filtering by median filters – recursive and weighed median filters – Stack filters - Decision based filters- Switched Median filters.

UNIT III SORTING AND SELECTION ALGORITHMS FOR NON LINEAR FILTERS 9

Sorting and Selection Algorithm – Running Median Algorithm – Bitonic sort-Bubble sort - and its variant- Shell sort -Quick sort - Bucket and Sample sort-Enumeration sort and Radix sort-Comparison of various Sorting Techniques

UNIT IV BINARY IMAGE AND COLOUR IMAGE PROCESSING 9

Introduction –Binarisation -Mathematical Morphology-Morphological Image Processing-Basic set theory-Logic Operations-Standard Binary morphological operations-Dilation and Erosion based Operations. Introduction to colour image processing-Light and colour - Colour Formation-Human perception of Colour- Colour Model-the Chromaticity Diagram- Colour image Quantization-Histogram of a Colour image – Colour image Filtering - Pseudo-Colouring –colour image segmentation.

UNIT V ARCHITECTURES FOR NONLINEAR FILTERS 9

Fast Structures for order statistics filtering – systolic array implementation – wavefront array implementation – General Non linear filter Structure – Signal Dependent Noise filtering – Computational Complexity of general non linear filter model – Performance of various nonlinear filters.

TOTAL: 45 PERIODS

REFERENCES:

1. Nonlinear Signal Processing: A Statistical Approach Gonzalo R. Arce, Wiley-Interscience, 2004.
2. Nonlinear Image Processing S.K Mitra, Academic Press, 2000.
3. Nonlinear digital filters: principles and applications, Ioannis Pitas, Anastasios N. Venetsanopoulos, Springer, 1990 - Technology & Engineering
4. Fundamentals of Nonlinear Digital Filtering, Jaakko Astola ,Pauli Kuosmanen 1997,CRC Press,NY.

5. Advances in Nonlinear Signal and Image Processing, Stephen Marshall, Giovanni L. Sicuranza , EURASIP Book Series,2006
6. VLSI Digital Signal Processing Systems: Design And Implementation By Keshab K. Parhi,Wiley Publications 2008.
7. Michael J. Quinn, Parallel Computing : Theory & Practice, Tata McGraw Hill Edition, 2003.
8. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, Introduction to Parallel Computing, 2nd Edition, Addison Wesley, 2003.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(2)**

FI 9055 APPLIED AND CLINICAL THYROID L T P C
3 0 0 3

UNIT I ANATOMY 9

Microanatomy – Histology – Development – Structure, Size, Shape - Blood Supply Relational - Abnormal Anatomy.

UNIT II PHYSIOLOGY 9

Hormones of the thyroid secretion & synthesis – Chemical nature- regulation and control – functions.

UNIT III APPLIED AND CLINICAL PHYSIOLOGY 9

Thyroid function tests – Hyper and hypo secretion – cretinism-myxedima, clinical and surgical.

UNIT IV ALGORITHM USED IN NEURAL NETWORK 9

SOM architecture and algorithm- Vector Quantization- Encoder Decoder Model- LVQ- Back Propagation algorithm –Learning algorithm - Classification – Perceptron learning algorithm- Applications.

UNIT V METHODS OF MEASUREMENTS 9

Temperature measurement – Pyrometer - Thermographic camera – infrared thermometer – thermograph – thermister – thermocouple, Body fluid measurement- Plethysmography, Skin texture measurement – edge detection – image segmentation – image Erosion.

TOTAL: 45 PERIODS

REFERENCES:

1. Arthur C. Guyton, “Textbook of Medical Physiology”, W.B. Saunders Company, 10th Edition, 2002.
2. Cyrul A Keele and Eric Neil – Samsons Wrights Applied physiology – Oxford University press New Delhi – 1991
3. Ranganathan T S,Text Book of human Anatomy S. Chand and company New Delhi – 1994
4. Simon Haykins, Neural Networks ,Prentice Hallinternationallnc, 1999.
5. James A Freeman and David M. Skapura, Neural Networks, Addison - Wesley,India 1999.
6. Philip D.Wasermann, Advanced Methods in neural Computing, Van Nostrand Reinhold,NewYork 1993.
7. R.C.Gonzalez and R.E.Woods, ‘Digital Image Processing’, Second Edition, Pearson Education, 2002.
8. Anil. K. Jain, ‘Fundamentals of Digital Image Processing’, Pearson education, Indian Reprint 2003.
9. John L.Semmlow,”Biosignal and Biomedical Image Processing Matlab Based applications” Marcel Dekker Inc.,New York,2004

FI 9056 RENAL DISEASE SPECIFIC IMAGING MODALITIES L T P C
3 0 0 3

UNIT I ANATOMY OF KIDNEY 9

Morbid anatomy, Microscopy – conventional microscopy & electron microscopy, Nephron and its structure

UNIT II PHYSIOLOGY OF KIDNEY 9

Cell metabolism - functions of the nephron, renal function regulatory mechanisms, regulation of production and excretion of urine. Other functions of kidney – Electrolytes and fluid volume maintenance. Production of hormones- Renin for blood pressure, erythropoietin for RBC production.

UNIT III CURRENT DIAGNOSTIC IMAGING MODALITIES 9

X-ray - Plain and chest. Ultrasound – Abdomen and Pelvis. Computed Tomography (CT) -KUB, Magnetic Resonance Imaging (MRI) KUB and gamma camera

UNIT IV IMAGING INSTRUMENTATION 9

Principles and working, operation of instruments , Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Endoscopic Ultrasound (EUS), X-RAY, Ureterorenoscopy

UNIT V NORMOGRAM 9

Creation of Normogram, BMI based normogram to create standard. Chart preparation, statistical ratio.

TOTAL: 45 PERIODS

REFERENCE BOOKS:

1. Arthur C Guyton, John E. Hall “Text book of Medical Physiology’’ W.B. Saunders Co Publishers., 2005
2. Arthur C Guyton, John E. Hall Human Physiology and Mechanism of Disease: W.B. Saunders Co Publishers, 1991
3. Robert W. Schrier “Diseases of the Kidney and Urinary Tract’’ Vol.-II 8th Edition of LWW medical book, philapedia 2007.
4. RN Srivastava Aravind Bagga “Pediatric Nephrology’’ JP Medical Publishers (p) Ltd., 2004
5. G.M.Roberts & J.P.Hughes “Clinical Radiology for Medical Students’’ 3rd edition Butterworth-Heinemann Publishers, 1998.

FI 9057 DIGITAL LOGIC CIRCUITS DESIGN USING CNTFET L T P C
3 0 0 3

UNIT I PHYSICS OF CARBON NANO TUBES 9

Introduction –Electronic properties of Graphene, Carbon nanotube-electronic structure, carrier concentration in intrinsic and doped carbon Nano tubes, physics of nanotubes –metal contacts, end bonded contacts, sidecontacts. Contacts to metallic carbon nanotubes. Metal/ oxide/ nanotube contacts.

UNIT II PRINCIPLES OF CARBONANOTUBES 9

Theory of carbon nanotube p-n junctions, metal semiconductor junctions, Field effect transistor(FET)-ohmic contacts- schottky contacts -sub threshold swing -high k-dielectric –logic circuits-mobility-short channel effects –crosstalk-noise.

UNIT III CHARACTERISTICS OF CNTFET 9

Current voltage characteristics, Capacitance Voltage characteristics,C-V of n-i-n CNT MOSFETS,C-V of p-i-n CNT BTBTFETS. Assessing intrinsic circuit level performance - $1DC_{gate}$ Vs V_{gs} dependence.Effect of parasitics- parasitic capacitance in CNTFETS layout.

UNIT IV MODELLING OF CNTFET DEVICE 9

CNT count variation models-probabilistic model for metallic-CNT induced count variation, Grown density variation-CNT count distribution from spacing distribution, asymptotic CNT count distribution, spatial correlation in CNT count distribution, CNT count failures-Probabilistic model-Aligned active layout technique- Optimized correlation length under CNT length variations. Overcoming delay variations –sampling variable assignment –calculating gate delay.

UNIT V DIGITAL LOGIC DESIGN 9

Logic design with am bipolar devices –dynamic and static logic with am bipolar CNTFETS-Transmission gate static logic family -Alternate CNTFET families. Multilevel logic synthesis with static CNTFETS - Transmission gate static design -design of alternative CNTFET families. Library characterization logic synthesis.Dynamic PLA architecture,static regular fabrication.CNT-based computer.

TOTAL: 45 PERIODS

TEXT BOOKS.

1. Francois leonard, “The physics of carbon nanotube devices”, william Andrew inc,2008.
2. Ali javey, Jing kong, “Carbon nanotube electronics”, springer 2009.

REFERENCES.

1. Yunfeigao, “Benchmarking proposed logic technologies against silicon CMOS” thesis, 2008, purdue university.
2. Mohamed haykel Ben jamaa, “Fabrication and Design of Nano scale regular circuits”thesis,2009,EcolePolytechniquefederale de Lausanne.
3. Jiezhang “Variation aware design of carbon Nanotube digital VLSI circuits”,thesis,2011,Stanford university.
4. Albert Lin,“Carbon nanotube synthesis, device fabrication and circuit design for digital logic applications”thesis,2010,Stanford University.
5. Julia van meter cline, “Characterization of schottky barrier carbon nanotube transistors and their applications to digital circuits design”, thesis,2004 Massachusetts institute of technology.

FI 9058 QUANTUM CELLULAR AUTOMATA- DIGITAL LOGIC CIRCUITS DESIGN L T P C
3 0 0 3

UNIT I QCA ARCHITECTURES 9

Overview of Nanotechnology – Nanoelectronic Devices. Nano-Scale Crossbars. Architectures. Array-Based Architectures.QCA – QCA Implementation. Clocking. Power Gain and Dissipation. Comparison of Nanotechnology.QCA Combinational Logic Design – Conventional Gate-Based Combinational Logic Design. Logic Synthesis. Structural Design.

UNIT II QCA TESTING 9

Logic-Level Testing – Stuck-at Test Properties of MV-Based Circuits. Test Set for MVs. C-Testability of MV-Based Designs.Defect Characterization of Devices – Simulation Engines. MV Defect Analysis. Interconnect Defect Analysis. INV Defect Analysis. Probabilistic Analysis and Testing. Defect Analysis and Testing of QCA Circuits. Scaling in the Presence of Defects.

UNIT III DIGITAL LOGIC DESIGN 9

AND-OR-Inverter (AOI) Gate – AOI Gate Characterization. Defect Characterization of the AOI Gate. Logic Level Testing of AOI Gate Based Circuits. Logic Synthesis Using the AOI Gate.Two-Dimensional Schemes for Clocking/Timing of QCA Circuits – Clocking Analysis. Two-Dimensional QCA Clocking. Two-Dimensional Wave QCA Clocking. QCA Circuits with Feedback Paths.

UNIT IV SEQUENTIAL LOGIC DESIGN 9

Tile-Based QCA Design – QCA Design by Tiling. Fully-Populated Grid Analysis. Tiles of a 3 x 3 Grid. Logic Analysis.Sequential Circuit Design in QCA – RS Flip-Flop and D Flip-Flop in QCA. Timing Constraints in QCA Sequential Design. Stretching Algorithm for Delay Matching. Defect Characterization of QCA Sequential Circuits.

UNIT V MEMORY DESIGN 9

QCA Memory – Introduction. Review of QCA Memories. Parallel Memory Architecture. Serial Memory Architecture.Implementing Universal Logic in QCA – Universal Gate. Universal Gate Designs. Memory Based LUT. Multiplexer Based LUT.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Fabrizio Lombardi and Jing Huang, Design and testing of digital logic circuits by quantum-dot cellular automata, Artech House(2007).

REFERENCES:

1. “Fundamentals of Nanoelectronics” by George W. Hanson, Pearson/Prentice Hall (2008).
2. “Nanoelectronics and Information Technology”, 2nd Ed. by Rainer Waser (Ed.), John wiley&sons (2008).

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04 (6)**

FI 9059 DIGITAL AND ANALOG PLL DESIGN L T P C
3 0 0 3

UNIT I DIGITAL PHASE LOCKED LOOPS 9

Classification of Digital PLL, Distinctive Properties of Digital PLLs, and Digital Transfer Function: Configuration of a Digital PLL-Difference Equations- z- Transforms of the Loop Elements-Loop Filter-Loop Transfer Functions- Poles and Zeros.

UNIT II DESIGN AND ANALYSIS OF DIGITAL PLL 9

Digital PLL Design-Introduction, Basic Topology, Z-Domain Analysis- Linear Model Of DPLL- Linear Performance Evaluation, Circuit Implementation Issues- DAC Optimization -Reference Current Temperature Stability, Stability And Frequency Response Of Digital Loops, Digital PLL Responses And Acquisition: Linearized Input Responses, Nonlinear Analysis, Phase Plane Analysis, Phase Error Variance, Probability Of Acquisition, Probability Of Cycle Slip, Nonlinear Analysis Of Second Order Loops, Acquisition For Non-Uniform Sampling Phase-Locked Loops

UNIT III ANALOG PHASE-LOCKED LOOPS 9

Basic Transfer Functions- Transfer Functions of Individual Elements, Combined Transfer Functions, Characteristic Equation, Nomenclature, Coefficients, and Units -Second-Order PLLs, Loop Filters, Order and Type, Loop Parameters, Frequency Response - Other Loop Types and Orders, General Definition of Loop Gain *K,* Examples of Type 1 PLLs, Examples of Type 2 PLLs, Higher-Type PLLs

UNIT IV DESIGN AND ANALYSIS OF ANALOG PLL 9

Time Domain Analysis of Phase-Locked Loops - Frequency Domain Analysis of Phase-Locked Loops - Partial Fraction Expansion - First Order Loop Responses - Definition of Loop Order - Second Order Phase-Locked Loops - Third Order Phase-Locked Loops

UNIT V APPLICATIONS OF PHASELOCK LOOPS 9

PLL FREQUENCY SYNTHESIZERS **-** Synthesizer Configurations: Basic Configuration- Alternative Configurations, Frequency Dividers: Analog Frequency Dividers - Digital Counters as Frequency Dividers, Fractional-N Counters- Dual-Modulus Counters- Fractional-N PLLs with Analog Compensation- Fractional-N PLLs with Delta-Sigma Modulators, PLL CLOCK GENERATORS, PLL CLOCK AND DATA RECOVERY CIRCUITS.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. "Digital Phase Lock Loops Architectures and Applications" SALEH R. AL-ARAJI, ZAHIR M. HUSSAIN, MAHMOUD A. AL-QUTAYRI, Springer publications,2006.
2. **PHASE-LOCKED LOOPS FOR WIRELESS COMMUNICATIONS-**Digital, Analog and Optical Implementations, Second Edition, Donald R. Stephens, KLUWER ACADEMIC PUBLISHERS, 2002.

REFERENCES

1. Phase lock techniques, Third Edition, Floyd M. Gardner, Wiley Sciences publications.
2. PLL performance and design, 4th Edition, Dean Banerjee,2006, Pearson publications.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04 (7)**

FI 9060 RECONFIGURABLE AND WEARABLE ANTENNAS L T P C
3 0 0 3

UNIT I INTRODUCTION TO RECONFIGURABLE ANTENNAS

Microstrip antennas-design parameters--Micromachining to improve performance--Micromachining for Small antennas--Micromachined Reconfigurable antennas--Tunable Dipole Antennas--Tunable Microstrip Patch-Array Antennas.

UNIT II FREQUENCY AND PATTERN RECONFIGURABILITY

Frequency Response Reconfigurability: Fundamental Theory of Operation--Reconfiguration Mechanisms: Switches--Variable Reactive Loading--Structural/Mechanical Changes--Material Changes.

Radiation Pattern Reconfigurability: Theory of Operation--Reconfiguration Mechanisms.

UNIT III BODY-CENTRIC WIRELESS COMMUNICATIONS

Off-Body to On-Body Communications--On-Body Communications. Electromagnetic Characteristics of Human Tissues--Physical Body Phantoms--Numerical Phantoms--Numerical Modeling Techniques for Body-Centric Wireless Communications.

UNIT IV WEARABLE ANTENNAS FOR ON-BODY COMMUNICATION

On-Body Channel Measurement and Modelling--Antenna Design-- Antenna Match and Efficiency--Antennas and Human Body Interaction in Personal Telemedicine--Antenna-Body Effects--Emerging Antennas.

Wearable Antennas--Design--Critical Design Issues—Characterization-- Effects of Substrate Materials--Application

UNIT V TRANSMISSION MECHANISM OF WEARABLE DEVICES

Introduction to Communications Using Circuits in Direct Contact with the Human Body--Numerical Analysis and Equivalent Circuit Models,--Whole Body Models--Arm Models--Effective Electrode Structure--Equivalent Circuit Models--Experiments Using Human Phantom--Measurement of the Signal Distributions--Comparison Between Measurement and Calculation

TOTAL: 45 PERIODS

TEXTBOOKS

1. Vijay K. Varadan, K.J. Vinoy, K.A.Jose ”RF MEMS and Their Applications”, John Wiley 2003.
2. Héctor J. De Los Santos ”RF MEMS Circuit Design for Wireless Communications”, Artech House 2002.
3. Jennifer T. Bernhard “Reconfigurable Antennas”, Morgan & Claypool 2007.
4. Peter S. Hall Yang Hao ”Antennas and Propagation for Body-Centric Wireless Communications”, Artech House 2006.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04 (8)**

FI 9061 CARBON NANOTUBES L T P C

3 0 0 3

UNIT I CARBON NANOTUBES – STRUCTURE AND PHYSICAL PROPERTIES 9

Carbon Nanotube Morphology and Structure: SWCNTs, MWCNTs, Fibers - Synthesis - Spectra and Characterization – Properties – Carbon Nanotube composites

UNIT II SYNTHESIS OF CARBON NANOTUBES 9

CNT synthesis method overview: Arc discharge synthesis – Laser ablation synthesis – Thermal synthesis – PECVD synthesis - CNT Growth: Growth Mechanics - Carbon feedstock – Catalyst – Recent advances in SWCNT growth control: Location and Orientation control – Growth of ultra long SWCNTs – Diameter and Chirality control

UNIT III CHARACTERIZATION OF NANOMATERIALS 9

Introduction to Molecular Spectroscopy and differences with Atomic Spectroscopy-Infrared (IR) Spectroscopy - Microwave Spectroscopy- Raman Spectroscopy - Electron Spin Resonance Spectroscopy; New Applications of NMR Spectroscopy; Dynamic Nuclear Magnetic Resonance; Double Resonance Technique.

UNIT IV CARBON NANOTUBE ELECTRONICS AND DEVICES 9

Metallic carbon nanotubes - Ballistic transport - Resonant scattering centers and resonant tunneling - Current-carrying capacity, current saturation - Semiconducting carbon nanotubes - Review of the silicon MOSFET - Nanotube field effect transistor - Schottky barriers - Gate-oxide scaling - Ambipolar transistor - High-performance FETs - Doping- Logic gates- Infrared emitters- Photodetectors - Outlook and challenges

UNIT V MICROWAVE APPLICATIONS OF CARBON NANOTUBES 9

Nanotubes as Interconnects - CNT as a wire Nano-antenna – Nano-TWT - Nano-FEL – EM Shielding – Electromagnetic Compatibility and integrated circuits on nano scale – CNT based Composites and Metamaterials.

TOTAL: 45 PERIODS

REFERENCES:

1. "Nanotubes and Nanowires", C.N.R. Rao, FRS and A.Govindaraj, RSC Publishing, 2005
2. "Carbon Nanotubes – Properties and Applications", Michael J.O. Connell, Taylor and Francis Group, 2006
3. "Carbon Nanomaterials", Yury Gogotsi, Taylor and Francis Group, 2006
4. "Nanomaterials Chemistry – Recent developments and New directions", C.N.R. Rao, A.Muller, A.K.Cheetham, Wiley, 2007
5. "Electron Beam Analysis of Materials", M. H.Loretto, Chapman and Hall, 1984.
6. R.M.Rose, L.A.Shepard and J.Wulff, "The Structure and Properties of Materials", Wiley Eastern Ltd,
7. "Modeling Investigation of an Ultrawideband Terahertz Sheet Beam Traveling-Wave Tube Amplifier Circuit," Shin Young-Min, A. Baig, L. R. Barnett, N. C. Luhmann, J. Pasour, and P. Larsen, *Electron Devices, IEEE Transactions on,* vol. 58, pp. 3213-3218, 2011.
8. "Carbon Nanotube Devices for GHz to THz Applications", Peter J. Burke, Nanosensing: Materials and Devices- Proceedings of SPIE Vol. 5593, pp. 52 -61
9. "THz bandwidth optical switching with carbon nanotube metamaterial", Andrey E. Nikolaenko et. al, OPTICS EXPRESS, Vol. 20, No. 6, pp. 6068 – 6079, 2012

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04 (9)**

FI9062 ANATOMY, PHYSIOLOGY AND CLINICAL THYROID L T P C

3 0 0 3

UNIT I ANATOMY 9

Microanatomy – Histology – Development – Structure, Size, Shape - Blood Supply Relational - Abnormal Anatomy.

UNIT II PHYSIOLOGY 9

Hormones of the thyroid secretion & synthesis – Chemical nature- regulation and control – functions.

UNIT III APPLIED AND CLINICAL PHYSIOLOGY 9

Hyper and hypo secretion – cretinism-myxedima, clinical and surgical.

UNIT IV IMMUNOLOGICAL STUDIES IN ABNORMALITIES 9

Tri iodo thyronine, thyroxine, thyroid stimulating hormone, thyroid stimulating immunoglobulin-protein bordered iodine.

UNIT V RADIOLOGICAL DIAGNOSTIC METHODS 9

Basal metabolic rate estimation-radioactive iodine uptake studies-ultrasonography-thyroid scan.

TOTAL: 45 PERIODS

REFERENCES:

1. Arthur C. Guyton, "Textbook of Medical Physiology", W.B. Saunders Company, 10th Edition, 2002.

2. Cyrul A Keele and Eric Neil – Samsons Wrights Applied physiology – Oxford University press New Delhi – 1991
3. Ranganathan T S,Text Book of human Anatomy S. Chand and company New Delhi – 1994
4. Simon Haykins, Neural Networks ,Prentice Hallinternationallnc, 1999.
5. James A Freeman and David M. Skapura, Neural Networks, Addison - Wesley,India 1999.
6. Philip D.Wasermann, Advanced Methods in neural Computing, Van Nostrand Reinhold,NewYork 1993.
7. John L.Semmlow,"Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc.,New York,2004

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04 (10)**

FI 9063	**WIRELESS SENSOR NETWORKS AND ITS ROUTING PROTOCOLS**	**L T P C 3 0 0 3**

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORK 8

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks-Enabling Technologies for Wireless Sensor Networks

UNIT II ARCHITECTURES 9

Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture – Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING OF SENSORS 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols –Energy-Efficient Routing, Geographic Routing.

UNIT IV SENSOR NETWORK PLATFORMS AND TOOLS 8

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

UNIT V ROUTING PROTOCOLS 10

Interior protocols: Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP), Low Energy Adaptive Clustering Hierarchy (LEACH) protocol, Power Efficient Gathering in Sensor Information Systems (PEGASIS) protocol, Threshold sensitive Energy Efficient Sensor Network (TEEN) protocol, Adaptive Threshold sensitive Energy Efficient Sensor Network (APTEEN) protocol, Maximum lifetime Data Routing (MLDR), Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

TOTAL: 45 PERIODS

REFERENCES:
1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Network", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks – An Information Processing Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
5. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge Press, 2005.
6. Mohammad llyas And Imad Mahgaob, "Handbook Of Sensor Network: Compact Wireless And Wired Sensing Systems", CRC Press, 2005.
7. Wayne Tomasi, "Introduction to Data Communication and Networking", Pearson Education, 2007.
8. William Stallings, 'High speed networks and Internets Performance and Quality of Service', IInd Edition, Pearson Education Asia. Reprint India 2002.
9. M. Steen Strub, 'Routing in Communication network, Prentice – Hall International, Newyork, 1995.
10. Kemmal Akkaya and Mohamed Younis, 'A survey on routing protocols for wireless sensor Networks, Elseiver 2005.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(11)**

FI9064 ROUGH SET THEORY AND APPLICATIONS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction—Knowledge—Classification—Knowledge Base---Imprecise Categories—Approximations---Rough Sets---Equivalence Relations—Elementary Sets---Composed Sets—Accuracy of Approximations—Membership Functions

UNIT II KNOWLEDGE REPRESENTATION 9

Core—Reduct—Dependencies---Knowledge Representation—Decision Tables

UNIT III VARIABLE PRECISION ROUGH SETS 9

Model—Conditional Probability---Majority Inclusion relation—Set Approximation—Measure of Approximation

UNIT IV GENERALISATIONS AND HYBRID SYSTEMS 9

Multi Universes--Methods—Properties—Rough Sets and Soft Computing Paradigms

UNIT V ROUGH SET APPLICATIONS 9

Data Analysis—Conflict Analysis—Data Mining--Decision Support – Methods and Applications in Engineering and Management.

TOTAL : 45 PERIODS

REFERENCES:
1. Zdzisław Pawlak,"Rough Sets: Theoretical Aspects of Reasoning About Data", Springer, 1991.
2. M. Inuiguchi, S. Hirano, and S. Tsumoto, "Rough Set Theory and Granular Computing", Springer, 2003.
3. J.Yao, P.Lingras, W.Wu, M.Szczuka, N.J. Cercone and D.Slezak, "Rough .Sets and Knowledge Discovery, Springer, 2007.
4. A.E Hassanien, Z. Suraj, D.Slezak,and P.Lingras, "Rough Computing-Theories, Technologies and Applications", Information Science Reference, 2008.

5. Georg Peters, Pawan Lingras, Dominik Ślęzak, Yiyu Yao, “Rough Sets: Selected Methods and Applications in Management and Engineering”, Springer, 2012.
6. Current Research Publications.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(12)**

FI 9065	**SENSOR NETWORKS FOR MARINE APPLICATIONS**	**L T P C**
		3 0 0 3

UNIT I OVER VIEW OF WIRELESS SENSOR NETWORKS 10

Challenges in wireless sensor networks, Characteristics of wireless sensor networks, Difference between mobile ad-hoc and Sensor Networks, Applications of sensor networks, Enabling Technologies for wireless sensor network, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture.

UNIT II RF TELEMETRY BASED SENSOR NETWORK FOR MARINE APPLICATIONS 7

Routing algorithms and network protocols RF sensor networks, Systems for sensor networks

UNIT III CABLED SENSOR NETWORK FOR MARINE APPLICATIONS 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control, Routing algorithms, Network protocols in cabled and fibre optic sensor networks, Underwater Wired Systems for networking.

UNIT IV ACOUSTIC SENSOR NETWORK FOR MARINE APPLICATIONS 10

Over view of Acoustic communication, Theory of acoustic signal transmission and reception, Challenges in Acoustic Sensor network, SOFAR channel and its implications. Network protocols and Routing algorithms, Simulators Acoustic Sensor networks, Localization in underwater sensor networks, Synchronization and delays in underwater sensor networks

UNIT V CASE STUDIES OF SENSOR NETWORK FOR MARINE APPLICATIONS 9

Environmental applications, Surveillance applications, Advanced underwater sensor-based applications

TOTAL: 45 PERIODS

REFERENCES:

1. Anna Hac “Wireless Sensor Network Designs” Jhon Wiley,2007
2. Kazem Sohraby,Daniel Minoli, & Taieb Znati,” Wireless Sensor Network Technology,Protocols, And Applications” John Wiley 2007
3. A. D. Waite “Sonar for Practising Engineers, 3rd Edition”,John Wiley, 2002
4. Under Water Sensor Network NEPTUNE “http://www.neptunecanada.ca/
5. Coastal Network VENUS “http://venus.uvic.ca/”
6. Stefanov, A.; Stojanovic, M. “Design and Performance Analysis of Underwater Acoustic Networks”, Selected Area in Communications, IEEE Journal on, Vol.29, Issue 10,pp 2012-2021,2011
7. Zorzi, M.; Casari, P.; Baldo, N.; Harris, A.,"Energy-Efficient Routing Schemes for Underwater Acoustic Networks",Selected Areas in Communications, IEEE Journal on Vol.26,Issue. 9, pp 1754-1766,2008

8. John Heidemann, Wei Ye, Jack Wills, Affan Syed, Yuan Li, “Research Challenges and Applications for Underwater Sensor Networking” Wireless Communications and Networking Conference, IEEE ,Vol.1,pp 228-235,2006.

FI 9066 COLLABORATIVE E LEARNING L T P C
3 0 0 3

UNIT I LEARNING FUNDAMENTALS 9

The emergence of lifelong learning, The social background of life long learning, Experimental Learning, Types of Learning, Cultural Learning, Self-Directed Learning, Contracts and Learning, Work based and problem based learning, Open and distance Learning, Assessing Learning

UNIT II LEARNING THEORIES 9

Behaviorists approaches to Learning, Learning Issues, Historical Perspectives, Conditioning Theories, Cognitivist theories, Social Learning, Social Cognitive Theory, and Cognitive Learning Processes. Constructivist Theory, Cognition and Instruction, Development and Learning, Neuroscience of Learning, Content-Area Learning.

UNIT III E-LEARNING 9

The Context for E-Learning, Reality Issues versus The Hype of E-Learning, Technology Issues, Design Issues, Economic Issues.

UNIT IV COLLABORATIVE E-LEARNING INTRODUCTION 9

Introduction-The case for Collaborative Learning, Implementing Collaborative Learning-Orienting Students, Forming Groups, Structuring the learning tasks, Facilitating Student Collaboration, Grading and Evaluating Collaborative Learning.

UNIT V COLLABORATIVE E-LEARNING TECHNIQUES 9

Techniques for Discussion, Techniques for reciprocal teaching, Techniques for problem solving, Techniques using graphics information organizers, Techniques focusing on writing.

TOTAL: 45 PERIODS

REFERENCE BOOKS

1. Dale H. Schunk,” Learning Theories: An Educational Perspective”, 5/e, Pearson Education Publishers, 2008.
2. Peter Jarvis , John Holford , Colin Griffin,” The Theory and Practice of Learning “, Amazon Publications, 2nd Edition 2003.
3. Saul Carliner , Patti Shank ,” The E-Learning Handbook: A Comprehensive Guide to Online Learning, An imprint of Wiley, 2008.
4. Elizabeth F. Barkley , K. Patricia Cross , Claire Howell Major,” Collaborative Learning Techniques: A Handbook for College Faculty”, A Wiley Imprint ,2005.

FI 9067 CHEMICAL TEXT MINING L T P C
3 0 0 3

UNIT I TEXT MINING 10

Overview of Text Mining – Issues – Basic Text Mining principles – Textual information to numerical vectors – Text mining prediction - Text classification & Categorization methods – Feature selection and dimensionality reduction.

UNIT II INFORMATION EXTRACTION 8

Role of text mining in Information Retrieval – Finding structure in a document collection – Entity extraction – Information extraction – Databases and data sources in Chemistry - Data sources for prediction – Case studies – Web analytics and Web mining – Emerging directions.

UNIT III INTRODUCTION TO CHEMOINFORMATICS 9

Chemoinformatics – Introduction – Representation of chemical compounds – Power of information – Chemical semantics – Chemical names – Identification and conversion to structure searchable information – Chemical entity formatting – Chemical XML formatting.

UNIT IV CHEMOINFORMATICS NOMENCLATURE AND REPRESENTATION 9

Nomenclature – Line Notations – Coding & Processing constitution – Connection table – Special notations for chemical structures, Stereochemistry – Representation of 3D structures – Molecular surfaces and their visualization – Tools - Representation of Chemical reactions – Chemical reactivity – Reaction classification.

UNIT V CHEMICAL TEXT MINING METHODS 9

Searching Chemical structures – full structures - Sub-structures search – Similarity search. Methods for data analysis – Introduction – Machine Learning Techniques – Chemometrics – Neural Networks – Fuzzy sets & Fuzzy logic-Genetic algorithm – Data mining – Applications - Trends – Language Processing for Text Mining – Semantic web – Future of searching chemical information.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, “Fundamentals of predictive Text Mining (Texts in Computer Science)”, Springer; 2010 edition.
2. Gary Miner, John Elder IV, Thomas Hill, Robert Nisbet, Dursun Delen, Andrew Fast , “ Practical Text Mining and Statistical Analysis for Non-structured Text Data Applications”, Academic Press; 1 edition (January 25, 2012).
3. Ronen Feldman, James Sanger, “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”, Cambridge University Press (December 11, 2006).
4. Johann Gasteiger , Thomas Engel, “Chemoinformatics: A Textbook”, Wiley-VCH; 1 edition (December 8, 2003).
5. Debra L. Banville, “Chemical Information Mining: Facilitating Literature-Based Discovery”, CRC Press; 1 edition (December 15, 2008) .

REFERENCE BOOKS:

1. Sophia Ananiadou, John Mcnaught, “Text Mining for Biology And Biomedicine”, Artech House (December 30, 2005).
2. Michael W. Berry, Jacob Kogan, “Text Mining: Applications and Theory”, Wiley; 1 edition (May 4, 2010).
3. Damon Ridley, “Information Retrieval: SciFinder”, Wiley; 2 edition (December 8, 2009).

FI 9068 ALGORITHMS FOR GRAPH AND COMBINATORIAL PROBLEMS L T P C
3 0 0 3

UNIT I

Permutations - Lexicographic Permutations –Generation - Ranking and Unranking - Random Permutation - Mininum Change Permutations - Johnson Trotter Algorithm - Ranking and Unranking - Cycle Structure of Permutations -To and From Cycles - Stirling Numbers of the First Kind - Generating Permutations with k-cycles - Hiding and Revealing Cycles - Random Permutation with k-cycles

UNIT II

Subsets - Lexicographic Subsets – Generation - Ranking and Unranking - Gray Codes - Hamiltonian Cycles in Graphs - k-subsets - Lexicographic k-subsets – Generation - Ranking and Unranking - Gray Code k-subsets

UNIT III

Integer Partitions - Reverse Lexicographic Ordered – Generation - Ranking and Unranking - Random Partitions - Counting Integer Partitions - Gray Code Integer Partitions - Introduction to Generating Functions - Examples: Fibonacci Numbers, Coin Changing - Applications of Generating Functions to Integer Partitions - Set Partitions - Generating Set Partitions - Stirling Numbers of the Second Kind and Bell Numbers - Ranking, Unranking, and Random Set Partitions

UNIT IV

Restricted Growth Functions - Bijection between Set Partitions and Restricted Growth Functions - Generating, Ranking, and Unranking Restricted Growth Functions - Young Tableaux - Young Tableaux and Involutions -Insertion into and Deletion from a Tableaux - Robinson-Schensted-Knuth Correspondence -The Hook Formula - Generating Young Tableaux - Counting Tableaux by Shape-Generating Random Tableaux

UNIT V

Trees - Cayley's Theorem - Prufer's Correspondence and Labeled Trees - Generating Unlabeled Rooted Trees - Generating Unlabeled Free Trees -Random Unlabeled Trees - Counting Spanning Trees of Graphs: Matrix Tree Theorem - Groups and Symmetry - Elementary Theory of Permutation Groups -Automorphism Groups of Graphs - Vertex Transitive Graphs: Lovasz's Hamiltonian Cycle Conjecture - Symmetries of other combinatorial objects: necklaces, polyhedra - Simple Approaches to the Graph Isomorphism Problem -Computing Certificates - Tree Isomorphism - Graph Isomorphism

TOTAL : 45 PERIODS

REFERENCES:

1. Introduction to Graph Theory, Douglas B. West ,Prentice-Hall, 1996
2. Combinatorial Algorithms: Generation, Enumeration, and Search, Donald L. Kreher and Douglas R. Stinson, CRC Press, 1999
3. Concrete Mathematics : A Foundation for Computer Science, Ronald Graham, Oren Patashnik, Donald E. Knuth,Addison-Wesley, 1990
4. The Art of Computer Programming : Fundamental Algorithms (Art of Computer Programming, Vol 1, 2nd Ed), Donald E. Knuth, Addison-Wesley, 1999
5. The Art of Computer Programming : Sorting and Searching (Art of Computer Programming, Vol 3, 2nd Ed), Donald E. Knuth, Addison-Wesley, 1999

6. Constructive Combinatorics, Dennis Stanton and Dennis White, Springer-Verlag, 1986, Combinatorial Algorithms, Albert Nijenhuis and Herbert S. Wilf, Academic Press, 1978,
7. Combinatorial Algorithms : An Update , Herbert S. Wilf, CBMS-NSF Regional Conference Series in Applied Mathematics, 1989.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(16)**

FI 9069 TEXT MINING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Overview of text mining-document classification- information retrieval- clustering and organizing documents- information extraction- prediction and evaluation-Textual information to numerical vectors -Collecting documents- document standardization- tokenization- lemmatization- vector generation for prediction- sentence boundary determination -evaluation performance

UNIT II INFORMATION RETRIEVAL AND TEXT MINING 9

Information retrieval and text mining- keyword search- nearest-neighbor methods- measuring similarity- web-based document search- document -matching- inverted lists- evaluation of performance -Structure in a document collection - clustering documents by similarity- evaluation of performance - information extraction- patterns and entities from text- coreference and relationship extraction- template filling and database construction

UNIT III CLUSTERING AND CLASSIFICATION 9

Cluster-preserving dimension reduction methods for efficient classification of text data - Dimension reduction in the vector space model- Orthogonal basis of centroids- discriminant analysis - Trace optimization using an orthogonal basis of centroids - Automatic Discovery of similar words **-** Simultaneous clustering and dynamic weighting - simultaneous soft clustering and term weighting - robustness in the presence of noise -Feature selection and document clustering

UNIT IV LEARNING AND TEXT MINING 9

Vector space models (VSM) for search and cluster mining - Major and minor cluster discovery - Discovering hot topics from dirty text - Thesaurus assistant- sentence identifier- sentence extractor- mining case excerpts for hot topics -Combining families of information retrieval algorithms using metalearning

UNIT V TRENDS IN TEXT MINING 9

Trend and behavior detection from web queries - query data and analysis- Zipf's law- vocabulary growth - ETD systems-technology opportunities analysis(TOA)- constructive collaborative inquiry-based multimedia E-learning (CIMEL)- TimeMines- New event detection- ThemeRiver- PatentMiner- HDDI- Commercial software overview -Summarization- active learning- learning with unlabeled data- different ways of collecting samples- question answering - Case studies : market intelligence from the web- lightweight document matching for digital libraries- generating model cases for help desk applications- assigning topics to new articles- E-mail filtering- search engines- extracting named entities from documents- customized newspapers- Text Mining and Social Networks

TOTAL : 45 PERIODS

REFERENCES :

1. Michael Berry, "Survey of Text Mining: Clustering- Classification- and Retrieval"- Springer, 2004
2. Sholom Weiss, "Text Mining: Predictive Methods for Analyzing Unstructured Information", Springer, 2005

3. Hercules Antonio do Prado, Edilson Fernada, " Emerging Technologies of Text Mining: Techniques and Applications", Information Science Reference (IGI), 2008
4. Min Song, Yi-fang Brrok Wu, "Handbook of Research on Text and Web Mining Technologies", Vol I & II, Information Science Reference (IGI),2009.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(17)**

FI 9070 HETEROGENEOUS COMPUTING L T P C
3 0 0 3

OBJECTIVE:
At the end of this course, the student will be able to :
- Identify parallelism in an application
- Choose the right parallel processing paradigm and solution for a heterogeneous multi-core platform
- Program using OpenMP and OpenCL

UNIT I MULTI-CORE PROCESSOR FUNDAMENTALS 9
Multi-core Processors and Need for Parallel Computing – ILP, TLP and Data Parallelism - Chip Multiprocessing, SMP, Homogeneous Vs Heterogeneous Processors – GPUs - GPGPUs - Shared memory architectures - Cache Memory - Cache Coherency Protocols.

UNIT II MULTICORE PROGRAMMING 9
Parallel Programming Overview – Processes, Tasks and Threads – Parallel Programming Models – Techniques for Parallelizing Programs – Shared Memory Programming – Message Passing Paradigm - Memory Consistency Models – Synchronization Issues.

UNIT III OPENMP PROGRAMMING 9
OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT IV OPENCL FUNDAMENTALS 9
OpenCL Architecture – Platform model – Kernels – Execution Model - Memory model - Programming model - Task and data decomposition - CPU-GPU communication

UNIT V OPENCL ADVANCED FEATURES 9
GPU Memory - Coalescing - Conflicts - Event timing and profiling - Threading and Scheduling - Programming multi devices - Applications.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Hennessey & Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann – Elsevier, 5th edition, 2012.
2. Benedict R. Gaster, Lee Howes, D.R. Kalei, Mistry, Schaa, "Heterogeneous Computing with OpenCL" Morgan Kaufmann, 2012.
3. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.

REFERENCE BOOKS
1. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris", Pearson, 2011.

2. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
3. David B. Kirk, Wen-mei W Hwu, "Programming massively parallel processors“, 2010.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(18)**

FI 9071 OPTO ELECTRONIC THEORY L T P C
3 0 0 3

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9
Wave nature of light, Polarization, Interference, Diffraction, Light Source, Review of Solid State Physics.

UNIT II DISPLAY DEVICES AND LASERS 9
Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III OPTICAL DETECTION DEVICES 9
Photo detector, Thermal detector, Photo Conductors, Photo diodes.

UNIT IV OPTOELECTRONIC MODULATOR 9
Introduction, Analog and Digital Modulation, Electro-optic modulators, Modulators, Magneto Optic Devices, Acoustoptic devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9
Introduction, Hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated Transmitters and Receivers.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Pallab Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2. S C Gupta, Opto Electronic Devices and Sysems, Prentice Hal of India, 2005.
3. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall, 1995.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(19)**

FI 9072 CLOUD SECURITY AND PRIVACY L T P C
3 0 0 3

UNIT I INTRODUCTION TO CLOUD COMPUTING 9
Cloud Computing – Definition – Essential Characteristics – Benefits – Service models – Deployment Models – Cloud management – Web Services - Service Oriented Architecture and Cloud – Cloud Standards –Vendors - Security in the cloud.

UNIT II SECURING THE CLOUD 9
Architecture- Data Security – Key Strategies and best practices – Building an internal cloud – Selecting an external cloud provider

UNIT III DATA SECURITY, STORAGE AND SECURITY MANAGEMENT 9

Aspects of data security – Data security mitigation – Provider data and security – Security management standards – Security management in cloud – Availability management – SaaS – PaaS – IaaS – Access Control – Security Vulnerability and Configuration management

UNIT IV PRIVACY, AUDIT AND COMPLIANCE 9

Privacy – Data life cycle – Key privacy concerns – Privacy risk management and compliance – legal and regulatory implications – International laws and regulations – Internal policy compliance – Cloud security Alliance – Auditing the cloud for compliance

UNIT V CASE STUDIES 9

Implementing a Secure Cloud Backup – GSA Cloud Security – Azure cloud platform for critical cash security application - Interoperability in Cloud Computing

TOTAL: 45 PERIODS

REFERENCES:

1. Alex Amies, Harm Sluiman, Qiang Guo Tong, Guo Ning Liu, Developing and Hosting Applications on the Cloud, IBMPress, 2012.
2. John W. Rittinghouse, James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O' Reilly Media, Sep 2009
4. Vic (J.R.) Winkler, Securing the Cloud: Cloud Computer Security Techniques and Tactics, Elsevier, 2011.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(20)**

FI 9073 CLOUD INFRASTRUCTURE AND VIRTUALIZATION L T P C

3 0 0 3

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Cloud Computing – Definition – Essential Characteristics – Benefits – Service models – Deployment Models – Cloud management – Web Services - Service Oriented Architecture and Cloud – Cloud Standards –Vendors - Security in the cloud.

UNIT II CLOUD SOFTWARE INFRASTRUCTURE 9

Computational Resources - Infrastructure as a Service - Modern On-Demand Computing, Amazon's Elastic Cloud, Amazon EC2 Service Characteristics – RackSpace Mosso – Storage – Data as a Service – Megastore – BigTable - Azure Storage Services - EBS – SimpleDB - Amazon S3 –- OpenStack Swift - Communications – Communication as a Service - Advantages of CaaS, Fully Integrated, Enterprise-Class Unified Communications.

UNIT III VIRTUALIZATION TECHNIQUES 9

Virtualization Concepts – Virtualization Types - Hardware Virtualization –Types - Full Virtualization – Partial Virtualization – Para Virtualization – Desktop Virtualization – Software Virtualization – Memory Virtualization – Storage Virtualization - Network Virtualization – Hypervisor – Key Concepts - Microsoft Implementation – Microsoft Hyper V – VMware features and infrastructure – Virtual Box – Thin Client.

UNIT IV VIRTUAL MACHINES 9

Virtual Machine Basics – Types – Virtual Machine Architecture – Process Virtual Machine – System Virtual Machine – Resource Virtualization - Multiprocessor Virtualization – Partitioning of multiprocessor systems – Physical and logical partitioning – Virtual Machine Instances – Virtual Machine Images - VM Products.

UNIT V MIGRATION APPROACHES 9

Process migration – Virtual Machine migration – Migration requirements – Saving and Restoring a domain – Migration approaches – Pre-copy memory migration – Post-copy memory migration – Live migration - XenMotion– VMotion - KVM

TOTAL: 45 PERIODS

REFERENCES:

1. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
2. William von Hagen, Professional Xen Virtualization, Wrox Publications, January, 2008.
3. Chris Wolf, Eric M. Halter, Virtualization: From the Desktop to the Enterprise, APress 2005.
4. Alex Amies, Harm Sluiman, Qiang Guo Tong, Guo Ning Liu, Developing and Hosting Applications on the Cloud, IBM Press, 2012.
5. John W. Rittinghouse, James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(21)**

FI 9074 COMPRESSED SENSING L T P C
3 0 0 3

UNIT I INTRODUCTION TO COMPRESSED SENSING

Introduction; Motivation; Mathematical Background; Traditional Sampling; Traditional Compression; Conventional Data Acquisition System; Drawbacks of Transform coding; Compressed Sensing (CS).

UNIT II SPARSITY AND SIGNAL RECOVERY

Signal Representation; Basis vectors: Fourier Transform, DCT, DWT, Surfacelets, Curvelets; Restricted Isometric Property; Coherence; Stable recovery; Number of measurements; Sensing matrix: Gaussian matrix, Sub-Gaussian matrix, Bernoulli matrix, Toeplitz matrix, Circulant matrix, Binomial Matrix, Structured Random matrices.

UNIT III RECOVERY ALGORITHMS

Basis Pursuit algorithm : L1 minimization; Matching pursuit : Orthogonal Matching Pursuit(OMP), Stagewise OMP, Regularized OMP, Compressive Sampling Matching Pursuit (CoSaMp); Iterative Thresholding algorithm : Hard thresholding, Soft thresholding; Model based : Model based CoSaMp, Model based HIT.

UNIT IV COMPRESSIVE SENSING FOR WSN

Basics of WSN: Power supply unit, Sensing unit, Processing unit, Communication unit; Wireless Sensor without Compressive Sensing; Wireless Sensor with Compressive Sensing; Compressive Wireless Sensing: Spatial compression in WSNs, Projections in WSNs, Compressed Sensing in WSNs.

UNIT V APPLICATIONS OF COMPRESSIVE SENSING

Compressed Sensing for Real-Time Energy-Efficient ECG Compression on Wireless Body Sensor Nodes; Real-Time Compressive Sensing MRI Reconstruction Using GPU Computing and Split Bregman Methods; Compressive sensing in video surveillance; An Application of Compressive Sensing for Image Fusion; Sparse MRI: The Application of Compressed Sensing for Rapid MR Imaging; Single-Pixel Imaging via Compressive Sampling.

TOTAL: 45 PERIODS

REFERENCES:

1. Mark A. Davenport, Marco F. Duarte, Yonina C. Eldar and Gitta Kutyniok, "Introduction to Compressed Sensing," in Compressed Sensing: Theory and Applications, Y. Eldar and G. Kutyniok, eds., Cambridge University Press, 2011
2. Duarte, M.F.; Davenport, M.A.; Takhar, D.; Laska, J.N.; Ting Sun; Kelly, K.F.; Baraniuk, R.G.; , "Single-Pixel Imaging via Compressive Sampling," Signal Processing Magazine, IEEE, vol.25, no.2, pp.83-91, March 2008.
3. David S. Smith.; John C. Gore.; Thomas E. Yankeelov.; and E. Brian Welch.;, "Real-Time Compressive Sensing MRI Reconstruction Using GPU Computing and Split Bregman Methods", International Journal of Biomedical Imaging Volume 2012 (2012), Article ID 864827, 6 pages.
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FI 9075 INFORMATION SECURITY **L T P C**
3 0 0 3

UNIT I FOUNDATIONS

History, Evolution of Information Security, Information Security Principles, Critical Characteristics of Information, Security Requirements, Different Security Models, NSTISSC Security Model, Need for Security, Business Needs, Components of an Information System, Securing the Components, Approaches to Information Security Implementation, Threats, Attacks, Legal, Ethical and Professional Issues, Security vulnerabilities, Security countermeasures, Security Principles and practices, Balancing Security and Access, The SDLC, The Security SDLC.

UNIT II CRYPTOGRAPHY

Introduction to cryptography, cryptosystems, communication channel used in cryptographic system, various types of ciphers, classic crypto, Simple Substitution Cipher, Cryptanalysis of a Simple Substitution, Secure cipher, Double Transposition Cipher, One-Time Pad, Project VENONA, Codebook Cipher, Ciphers of the Election of 1876, Modern Crypto History, SYMMETRIC KEY CRYPTO, Stream Ciphers, A5/1, RC4, Block Ciphers, Feistel Cipher, DES, Triple DES, AES, Three More Block Ciphers, TEA, Block Cipher Modes.

PUBLIC KEY CRYPTO, Knapsack, RSA, Diffie-Hellman, Elliptic Curve Cryptography, Public Key Notation, Uses for Public Key Crypto, Confidentiality in the Real World, Signatures and Non-repudiation, Confidentiality and Non-repudiation, Public Key Infrastructure,

HASH FUNCTIONS, What is a Hash Function?, The Birthday Problem, Non-Cryptographic Hashes, Tiger Hash, HMAC, Uses of Hash Functions, Online Bids, Spam Reduction

ADVANCED CRYPTANALYSIS, Linear and Differential Cryptanalysis, Quick Review of DES, Overview of Differential Cryptanalysis, Overview of Linear Cryptanalysis, Tiny DES, Differential Cryptanalysis of TDES, Linear Cryptanalysis of TDES, Block Cipher Design, Side Channel Attack on RSA, Lattice Reduction and the Knapsack, Hellman's Time-Memory Trade-Off.

UNIT III ACCESS CONTROL

AUTHENTICATION, Authentication Methods, Passwords, Keys Versus Passwords, Choosing Passwords, Attacking Systems via Passwords, Password' Verification, Math of Password Cracking, Other Password Issues, Biometrics, Types of Errors, Biometric Examples, Biometric Error Rates, Biometric Conclusions, Two-Factor Authentication, AUTHORIZATION, Access Control Matrix, ACLs and Capabilities, Confused Deputy, CAPTCHA, Firewalls, Intrusion Detection, Signature-Based IDS, Anomaly-Based IDS-Scanning and analysis tools.

UNIT IV RISK MANAGEMENT AND INFORMATION SECURITY MAINTENANCE

Risk Management, An overview of Risk Management, Risk Identification, Risk Assessment, Risk control strategies, Selecting a risk control strategy, Quantitative vs Qualitative risk control practices, Risk Management discussion points, Information Security Maintenance, Security Management Maintenance Models, The Security maintenance model, Monitoring the external environment, monitoring the internal environment, planning and risk assessment, Vulnerability assessment and remediation, readiness and review.

UNIT V INFORMATION SECURITY POLICIES AND STANDARDS

Blueprint for Security, Information Security Policy, Enterprise Information Security policy (EISP), Issue-Specific Security Policy (ISSP), System-Specific Policy (SysSP), Policy Management, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

TOTAL : 45 PERIODS

REFERENCE BOOKS

1. Mark Stamp, “Information Security, Principles and Practices", 2006, A JOHN WILEY & SONS, INC., PUBLICATION. .
2. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Fourth Ed.,

FI 9076 **BIG DATA** **L T P C**
3 0 0 3

UNIT I BIG DATA

Introduction–Standards, policies and benchmarks-Characteristics of Big data- Importance of Big data - Challenges of Big data –System Architectures, Platforms, Design, and Deployment Theoretical- and Computational Models - Theories and methodologiesfor big data processing – Architecture and design of big data processing systems - High Performance/Parallel Computing Platforms - Energy-efficient Computing.

UNIT II HADOOP AND BIG DATA

Introduction to Hadoop - Components of Hadoop – Hadoop File systems- Data flow - Hadoop Archives – Hadoop I/O - MapReduce : Types and formats –MapReduce and Hadoop applications- MapReduce features - User Interface- Payload –Job Configuration –Task Execution and Environment – Improving Programmability: Pig and Hive – Improving Data Access: HBase, Sqoop and Flume - Coordination and Workflow: Zookeeper and Oozie – Machine Learning: Mahout.

UNIT III DATABASE MANAGEMENT AND DATA SECURITY

NoSQL Database-Advanced databases - Data Model and Structure – Storage, preservation and provenance-Information Integration and Fusion - Workflow Optimization - Big Data Search, Mining, processing: Architectures and Algorithms

Security and Risk in Processing - A Privacy Threats Analysis for Big Data Systems – Database security - Trust, Reputation and Recommendation Systems-High Performance and Efficiency Data Cryptography- Privacy Threats Analysis for Big Data Systems- Visualizing Large Scale Security Data - Security and Risk in Big Data Processing - Trust, Reputation and Recommendation Systems for Big Data Systems -Privacy Preservation for Distributed Big Data Computing System

UNIT IV DATA ANALYTICS

Analytic Techniques –Semantic based analytics –Statistical concepts: Linear regression – Time series analysis – Graphical analysis and presentation graphics - Predictive/Text analytics - Visualization - Interfaces to Database Systems and Analytics Software - Data Models in Analytics - Applications of Big data analytics.

UNIT V BIG DATA IN CLOUD

Cloud computing –Introduction – Cloud architecture -Cloud stacks for Big Data –Programming Models and Environments - Technics for mastering Big data - Systems and applications – Case studies.

TOTAL: 45 PERIODS

REFERENCES:

1. O'Reilly., Big data now, O'Reilly Media Inc.,2012.
2. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis., Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill, 2012.
3. Tom White., Hadoop: The Definite Guide, O'Reilly Media Inc., 2012.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.

FI 9077 NANO SENSOR COMMUNICATION NETWORKS L T P C
3 0 0 3

UNIT I SEMICONDUCTOR NANODEVICES

Single-Electron Devices; Nano scale MOSFET – Resonant Tunneling Transistor - Single-Electron Transistors; Single-Electron Dynamics; Nanorobotics and Nanomanipulation; Mechanical Molecular Nanodevices; Nanocomputers: Theoretical Models; Optical Fibers for Nanodevices; Photochemical Molecular Devices; DNA-Based Nanodevices; Gas-Based Nanodevices; Micro and Nanomechanics.

UNIT II THERMAL SENSORS

Thermal energy sensors -temperature sensors, heat sensors- Electromagnetic sensors- electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors - Mechanical sensors -pressure sensors, gas and liquid flow sensors, position sensors - Chemical sensors - Optical and radiation sensors.

UNIT III BIOSENSORS

Principles- DNA based biosensors – Protein based biosensors – materials for biosensor applications-fabrication of biosensors—future potential.

UNIT IV NANO SENSOR NETWORKS

Overview of nano-networks – Application – communication among nanomachines – short range and long range communication – Internet of multimedia nano-thing – nano sensor device architecture – components manufacturing and integration

UNIT V MOLECULAR AND ELECTROMAGNETIC COMMUNICATION

Biological-inspired communication - Molecular communication for long and short range nano networks – Mobile adhocnano networks in molecular communication - molecular transport system – Network simulator – MAC protocol and low weight channel coding in electromagnetic nano networks – nano addressing for nanosystem - Security in nano-communication

TOTAL : 45 PERIODS

REFERENCES:

1. W. Ranier, “Nano Electronics and Information Technology”, Wiley, (2003).
2. K.E. Drexler, “Nano systems”, Wiley, (1992).
3. M.C. Pettey, “Introduction to Molecular Electronics”.
4. www.elsevier.com/locate/nanocomnet
5. IanF.Akyildiz ,J M Jornet ,”Electromagnetic wireless nanosensor networks(2010)”, ”Internet of multimedia nanothings(2012)”.

FI 9078 SOFTWARE RISK MANAGEMENT L T P C
3 0 0 3

UNIT I RISK PLAN, ANALYSIS AND METRICS 9

The importance of Risk Plan – Risk Software Identification – Analysis – Asset Identification – Risk Modelling – Basic Terminology – Related approaches – Risk Analysis Methods –Table based Risk Analysis Techniques – Tree Based Risk Analysis Techniques – Graph based risk analysis Techniques – Software Safety and Security Risks – Risk Measurement and metrics

UNIT II THE RISK MODELLING LANGUAGE 9

Risk models – Identification using Threat Diagrams – Risk Estimation using Threat Diagram – Risk Evaluation using Risk Diagrams – Risk Treatment using Treatment Diagrams – Model Checking Case studies – Threat – Threat Scenario – Vulnerability – Unwanted Incident – Asset – Asset Diagrams – Threat Diagrams – Risk Diagrams – Treatment Diagrams – Translate Asset Diagrams – Threat Diagrams – Risk Diagrams – Treatment Diagrams – Treatment Overview Diagrams – Causality and Complexity risks and Case studies.

UNIT III RISK IDENTIFICATION AND EVALUATION 9

Categorising Threat Diagrams – Identification of Threats and Unwanted Incidents – Scenarios – Vulnerabilities – Risk Estimation of Using Threat Diagrams – Likelihood Estimation – Consequence Estimation – Risk Estimation – Risk Evaluation using Risk Diagrams – Confirming the Risk Estimates – Accumulating Risks – Estimating Risk with Respect to Indirect Assets -Evaluating the Risks - Risk Treatment using Treatment Diagrams – Grouping of Risks – Treatment Identification – Collaborative application risks – quality deficiency risks.

UNIT IV ANALYSING LIKELIHOOD AND MITIGATION 9

Calculating Likelihood – Specifying – Rules for Calculating Probability Frequency as Probability – Generalisation to intervals and Distributions – Using CORAS Diagrams to Check Consistency – Using CORAS to Analyse Scenarios with Logical Connectives – Using CORAS to Analyse Scenario with Logical Conjunction and Logical Disjunction – Risk Mitigation – Meta model – EBNF Grammer – Legal CORAS approach.

UNIT V RISK MANAGEMENT AND QUANTITATIVE RISKS 9

Risk Referring and Referenced Diagrams – Threat Scenario – Unwanted Incidents - Risks-Treatment Scenarios - Analysing the Relation between the Likelihood of a Referring Element – Legal Risk-Uncertainty of Legal Aspects – Faculty Uncertainty - Combining Legaland Faculty Uncertainty – Change Management – Dependency Analysis – Legal Risk Management –FMECA – Risk Management Plan – Risk estimation and minimization.

TOTAL: 45 PERIODS

TEXT BOOK

1. Model-Driven Risk Analysis: The CORAS Approach by Mass Soldal Lund, Bjornar Solhaug and Ketil Stolen (Oct 21, 2010)

REFERENCES

1. Software Risk Management: Barry Boehm 1989.
2. Quantitative Risk Management: A Practical Guide to Financial Risk by Thomas S. Coleman and Bob Litter man May 8, 2012.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(26)**

FI 9079	**TECHNOLOGICAL ADVANCEMENTS IN TEXT-TO-SPEECH SYNTHESIS**	**L T P C** **3 0 0 3**

UNIT I FUNDAMENTALS OF TEXT-TO-SPEECH SYNTHESIS

Fundamentals of speech synthesis [1], vocoder Vs synthesis [1]. Types of synthesis - articulatory synthesis [2], source - filter synthesis [1], waveform synthesis - USS [1] and PSOLA [1], [3]–[5], and parametric synthesis (HTS) [6]. Restricted and unrestricted domain

TTS [2]. Feature extraction for TTS systems source features, pitch estimation, prosody [2], [7] system features - MFCC, LPCC [8], significance of dynamic features in synthesis [9]. Speech units for synthesis monophone, diphone, triphone, pentaphone, CV, syllable [1], [5], [10], [11]

UNIT II PRACTICAL ISSUES IN DEVELOPING AN UNRESTRICTED DOMAIN TTS

Text and speech data collection, recording environment, choosing an appropriate speech unit, including prosodic features, duration of speech data, naturalness versus intelligibility, footprint size. Quantifying the performance of synthesized speech perceptual measures, objective measures [10]–[14], waveform versus parametric speech synthesis [6]. Language-dependent and independent modules in TTS. Issues in incorporating emotions in TTS [15]. Multilingual TTS finding and sharing common features in a cross-lingual scenario [16].

UNIT III WAVEFORM SYNTHESIS

Unit selection synthesis text preprocessing, segmentation, incorporating acoustic, phonetic, and contextual features, phrasing and intonation, phoneset creation, fallback procedure, building letter to sound rules, classification and regression trees (CART), target cost, concatenation cost, clustering based USS, lexicon creation. Building new voices in Festival framework [17]–[21].

UNIT IV STATISTICAL PARAMETRIC SPEECH SYNTHESIS

Types of distribution - univariate, multivariate, unimodal, and multimodal distributions [22]. Modelling - Gaussian mixture modeling (GMM) [23]–[25], Hidden Markov modeling (HMM) [10], [22]. HTS - core architecture of a typical HMM-based TTS, duration modeling, modeling source and system [23]–[29], data driven and tree based clustering, question set formation [30]–[32]. Advantages of HTS over USS speaker adaptation MAP and MLLR [33], [34] , mixing voices, Eigen voices, multiple regression [24], multilingual speech synthesis [35], cross-lingual speaker adaptation [36], [37], footprint size, emotional speech synthesis [38].

UNIT IV ADVANCEMENTS IN TTS

Voice conversion speech parameterization and modification. ApproachesGMM-based, time- independent mapping, and speaker transformation in HMM-based TTS [39]. Text-dependent and text- independent voice conversion [40], cross-lingual voice conversion and voice transformation in TTS [41]– [43]. Multilingual TTS issues [44], [45], cross-lingual speaker adaptation [36], [37]. From multilingual to polyglot polyglot speech synthesis [46]–[51]. Emotional speech synthesis issues, emotion modeling, emotion recognition and synthesis [38], [52], [53].

TOTAL: 45 PERIODS

REFERENCES

1. B. Gold and N. Morgan, Speech and Audio Signal Processing - Processing and Perception of Speech and Music. Wiley India, 2007.
2. D. O'Shaughnessy, Speech Communications - Human and Machine. Universities Press, 2001.
3. H. Valbret, E. Moulines, and J. Tubach, "Voice transformation using psola technique," in Proceedings of IEEE Int. Conf. Acoust., Speech, and Signal Processing, vol. 1, 1992, pp. 145–148.
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6. Y. Tabet and M. Boughazi, "Speech synthesis techniques. a survey," in International

Workshop on Systems, Signal Processing and their Applications, 2011, pp. 67–70.
7. J.-S. Jung, J.-J. Kim, and M.-J. Bae, “Pitch alteration technique in speech synthesis system,” IEEE Trans. Consumer Electronics, vol. 47, no. 1, pp. 163–167, 2001.
8. T. Fukada, K. Tokuda, T. Kobayashi, and S. Imai, “An adaptive algorithm for mel-cepstral analysis of speech,” in Proceedings of IEEE Int. Conf. Acoust., Speech, and Signal Processing, vol. 1, 1992, pp. 137–140.
9. K. Tokuda, T. Kobayashi, and S. Imai, “Speech parameter generation from hmm using dynamic features,” in Proceedings of IEEE Int. Conf. Acoust., Speech, and Signal Processing, vol. 1, 1995, pp. 660–663.
10. L. Rabiner and B. Juang, Fundamentals of Speech Recognition. Pearson Education, 1993.
11. D. O”Shaughnessy, “Interacting with computers by voice: automatic speech recognition and synthesis,” Proceedings of the IEEE, vol. 91, no. 9, pp. 1272–1305, 2003.
12. T. Dutoit, An introduction to text-to-speech synthesis. Kluwer Academic Publishers, 1997.
13. J. Allen, “Synthesis of speech from unrestricted text,” Proceedings of the IEEE, vol. 64, no. 4, pp. 433–442, 1976.
14. P. Taylor, Text-to-speech synthesis. Cambridge University Press, 2009.
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19. A. Louw, “A short guide to pitch-marking in the Festival speech synthesis system and recommendations for improvements”, CSIR, Pretoria, Tech. Rep.,2004.
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21. A. W. Black and P. Taylor, “Automatically clustering similar units for unit selection in speech synthesis,” in Proceedings of EUROSPEECH, 1997, pp. 601–604.
22. R. O. Duda, P. E. Hart, and D. G. Stork, Pattern Classification. Wiley India, 2006.
23. D. Reynolds, “Gaussian Mixture Models,” MIT Lincoln Laboratory, Tech. Rep.
24. C. Bishop, Pattern recognition and machine learning. Springer Science, 2006.
25. T. Yoshimura, “Simultaneous modeling of phonetic and prosodic parameters, and characteristic conversion for hmm-based text-to-speech systems,” PhD Dissertation, Jan 2002.
26. H. Zen, K. Tokuda, and A. W. Black, “Statistical parametric speech synthesis,” Speech Communication, vol. 51, no. 11, pp. 1039 – 1064, 2009.
27. T. Masuko, K. Tokuda, T. Kobayashi, and S. Imai, “Speech synthesis using hmms with dynamic features,” in Proceedings of IEEE Int. Conf. Acoust., Speech, and Signal Processing, vol. 1, 1996, pp. 389–392.
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32. G. Boulianne and P. Kenny, “Optimal tying of hmm mixture densities using decision trees,” in Proceedings of Int. Conf. Spoken Language Processing, vol. 1, 1996, pp. 350–353.
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34. P. C. Woodland, “Speaker adaptation for continuous density hmms: A review,” 2001.
35. H. Bourlard, J. Dines, M. Magimai-Doss, P. Garner, D. Imseng, P. Motlicek, H. Liang, L. Saheer, and F. Valente, “Current trends in multilingual speech processing,” Sadhana, vol. 36, no. 5, pp. 885–915, 2011.
36. K. Oura, K. Tokuda, J. Yamagishi, S. King, and M. Wester, “Unsupervised cross-lingual speaker adaptation for hmm-based speech synthesis,” in Proceedings of IEEE Int. Conf. Acoust., Speech, and Signal Processing, 2010, pp. 4594–4597.
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FI 9080 BROADBAND MICROSTRIP ANTENNAS L T P C
3 0 0 3

AIM:
To enable the student to understand theory, design and testing of wideband Micro-strip Antenna

OBJECTIVES:
i) To understand the radiation phenomenon from Micro-strip antenna using different types of models.
ii) To get exposed to Numerical Techniques for the analysis of MSA
iii) To understand the theory and design approach to different types of MSAs
iv) To implement the design and evaluate the performance of MSAs using standard software
v) To fabricate and test the performance of a standard MSA.

UNIT I AN INTRODUCTION TO MICROSTRIP ANTENNAS (MSAS) 9
Characteristics of MSAs, Feeding Techniques, Methods of analysis, Review of various Broadband Techniques for MSAs, Broadband compact MSAs, Tunable and dual-band MSAs, Broad band circularly polarized MSAs, Broad-band planar mono-pole antennas.

UNIT II REGULARLY SHAPED BROAD BAND ANTENNAS (RMSAS) 9
Parametric study of RMSAs, Circular MSAs (CMSAs), Semicircular MSAs, Equilateral triangle MSAs (ETSMAs), Annular ring MSAs.

UNIT III PLANAR MULTI-RESONATOR BROAD BAND MSAS 9
Mechanism of parasitic Coupling for Broad BW, Gap coupled RMAs, Directly Coupled RMSAs, Gap and Hybrid coupled CMSAs, Gap-Coupled SCMSAs.

Multilayer Broad band MSAs: Electromagnetically Coupled SMAs (ECMSAs), Aperture Coupled MSAs (ACMSAs).

Stacked Multi-resonator MSAs: Stacked Multi-resonator Rectangular Patches on thick substrates, Effect of probe diameter at the bottom and four patches on the top on a thin dielectric substrate, Stacked multi-resonator CMSAs, Log-periodic MSA arrays.

UNIT IV COMPACT BROAD BAND MSAS 9

Compact shorted RMSAs, Compact shorted CMSA and its variations, Compact shorted TMSAs and Sectoral MSAs, Chip-Resistor loaded square MSAs, Slot loaded MSAs, Slot - Short loaded MSAs. Plannar Broad band Compact MSAs, Broad band stacked Compact MSAs, Broad band MASs with U-slot.

Tunable and Dual-band MSAs: Tunable MSAs, Dual band MSAs.

UNIT V BROAD BAND CIRCULARLY POLARIZED MSAS 9

Linear, Circular, Elliptical Polarizations, Dual-feed Circularly polarized MSAs, Single feed circularly Polarized MSAs, Compact Circularly Polarized MSAs, Broad band Circularly Polarized MSAs, Travelling wave Circularly Polarized MSAs.

Broad band Monopole Antenna: Planar Rectangular and Square Monopole antennas, Planar Triangular and Hexagonal Monopole antennas, Planar Circular Monopole antennas, Planar Elliptical Monopole antennas, Design of Monopole antenna.

UNIT VI

Design and performance evaluation for typical standard MSA for wide band applications using IE3D and Ads software.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Girish Kumar and K. P. Ray, " Broadband Micro-strip Antennas", Artech House, Boston, London, 2003.

REFERENCE BOOKS:

1. Ramesh Garg, Prakash Bhartia, Inder Bhal, Apisak and Ittipiboon, " Micro-strip antenna design handbook" Artech House, Boston, London, 2001.
2. Constantine A. Balanis," Antenna Theory Analysis and design", II edition John Wiley & sons, Inc., 1997.
3. John D. Kraus, Ronald J. Marhefka, " Antennas for all application", III edition, McGraw Hill, International Edition.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(28)**

FI 9081 WIRELESS COMMUNICATION SYSTEMS L T P C

3 0 0 3

UNIT I WIRELESS COMMUNICATION

Wireless channels- Input /output model of the wireless channel- Time and frequency coherence-Statistical channel models Detection in a Rayleigh fading channel- Time diversity-Antenna diversity-frequency diversity-impact of channel uncertainty

UNIT II CELLULAR SYSTEMS DESIGN

Narrow band cellular system- GSM system-Wide band systems-Broadband Wireless Access – UWB - CDMA-uplink-CDMA down link- OFDM-Allocation design principles-Hopping pattern-receiver design-sectorization.

UNIT III WIRELESS CHANNELS CHARACTERIZATION

AWGN channel capacity-resources of the AWGN channel-Linear time–invariant Gaussian channels-capacity of fading channels- Characterizing performance through channel capacity-Frequency selective fading channel-Multi user diversity.

UNIT IV COOPERATION DIVERSITY

Relay channels and protocols – Non-Cooperative Scheme - Cooperative Scheme – MIMO Enhancement - Multi-node cooperative communications – Distributed Input Distributed Output - Cooperative networking- MIMO for Mobile telephone standards.

UNIT V MIMO DIVERSITY

Diversity –multiplexing, Space–time–frequency diversity and coding -,trade-off-universal code design for optimal diversity-Uplink with multiple receive antennas-MIMO uplink-Down link with multiple transmit antennas- MIMO down link.

TOTAL: 45 PERIODS

TEXT BOOK

1. David Tse, PramodViswanath, **"**Fundamentals of Wireless Communication**"**, Cambridge University Press, 2005
2. K. J. Rayliu,Ahmed K. Sadek, Weifeng Su, Andres Kwasinski, "Cooperative Communications and Networking", Cambridge University Press, 2009.

REFERENCES

1. Paulraj, RohitNabar, Dhananjay Gore, "Introductin to Space Time Wireless Communication Systems", Cambridge University Press, 2003.
2. SavoG.Glisic, "Advanced Wireless Networks: 4G Technologies", Kindle Editions, 2006.
3. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(29)**

FI 9082 CYBER SECURITY L T P C
3 0 0 3

UNIT I CYBER SECURITY FUNDAMENTALS

Information assurance fundamentals – Authentication, Authorization, Non-repudiation, Confidentiality, Integrity, Availability; Basic Cryptography; Symmetric encryption; Public key encryption; The Domain Name System (DNS) – Security and the DNS; Firewalls – History, Packet-filtering firewalls, Stateful firewalls, Application gateway firewalls; Virtualization; Radio frequency Identification – Security and privacy concerns; Microsoft Windows Security Principles – Windows Tokens, window messaging, windows program execution, The Windows Firewall.

UNIT II CYBER CRIME AND THREATS

e-Crime; Epidemiological models for war ware and cyber-crime propagation; Record and retrieval of cyber-crimes; Cyber-pranks, hoaxes; Phishing / Pharming and anti-phishing; Cyber- terrorism; Information warfare, Cyber Espionage, Cyber piracy, Cyber Stalking, Cyber hatred, Cyber Obscenities, Cyber Trespass, Cyber deflamation, E-mail Spoofing, E-mail Bombing, Cracking, Hactivism, Cyber Terror, Virus/Worm Attacks, Intellectual Property crimes, Web defacement, Web Jacking, Online Gambling, Cyber harassment, Cyber Bulling, Cyber terrorism, Cyber pornography, Copyright infringement, Embezzlement, Phishing, Illegal Online sale, Data diddling, Salami Attacks, Internet Time Theft, Trojans and Keyloggers, Online cyber-crime reporting; Accuracy and security of cyber - reports; Fighting cyber - crimes, Cyber - crime prevention; Cyber-crime vulnerabilities; Cyber-

counterattack at source; Distributed cyber-attacks; Orchestrated cyber-attacks; Recursion attacks; Cyber-storm attacks;

UNIT III IMPLEMENTING SYSTEM SECURITY

Introduction, Implementing Broadband security measures; Implementing browser and E- mail security – Types of dangerous code, Making Browsers and E-Mail Clients More Secure, Securing Web Browser Software, Securing Netscape Navigator, Securing Opera; Implementing Web Server Security; Understanding Security and Microsoft Operating Systems - General Microsoft Security Issues, Securing Windows 9x Computers; Understanding Security and UNIX/Linux Operating Systems; Understanding Security and Macintosh Operating Systems; Understanding Mainframe Security; Understanding Mainframe Security.

UNIT IV DEFENCE TECHNIQUES

Memory Forensics - Why Memory Forensics Is Important, Capabilities of Memory Forensics, Memory Analysis Frameworks, Dumping Physical Memory, Installing and Using Volatility, Finding Hidden Processes, Volatility Analyst Pack, Conclusion; Security Auditing and Log Files - Auditing for Windows Platforms, Auditing for UNIX and Linux Platforms; Firewall Logs, Reports, Alarms, and Alerts; Understanding E-Mail Headers; Tracing a Domain Name or IP Address; Commercial Intrusion Detection Systems; IP Spoofing and Other Antidetection Tactics; Honeypots, Honeynets, and Other "Cyberstings"; Malicious Code Naming; Automated Malicious Code Analysis Systems - Passive Analysis, Active Analysis, Physical or Virtual Machines; Intrusion Detection Systems.

Cyber Forensics - Cyber Forensics Investigation Framework; Mapping Process; Cyber Forensics Investigation Methodology; Cyber Investigation Essentials – What is Cyber Investigation?, Investigation Process Model, Sample Cases, Cyber Investigation Techniques, Investigation Scenario, Cyber Investigation Cell; Handling a Cyber Crime Scene, Guidelines for handling a Cyber Crime, Basic Principles, Steps in Handling a Cyber Crime Scene, Authorizing the Cyber Crime Scene, Preparations to Handle the scene, Survey of Cyber Crime Scene, Preserving the crime scene.

UNIT V LAW ENFORCEMENTS

Introduction to IT laws – Foreign Laws – International Legal Regime – International legal regime relating to Cyber Crimes – European Convention on Cyber Crimes – Hague Convention on Jurisdiction and Foreign Judgments: Jurisdiction Agreement – International legal regime relating to E-Commerce – UNCITRAL Model Law on Electronics Commerce 1996 – International legal regime relating to Intellectual Property Rights – (i) Berne Convention; (ii) Rome Convention; (iii) WIPO Copyright Treaty; (iv) WIPO Performance and Phonograms Treaty; (v) UDRP; (vi) OECD convention on Database protection.

Indian Laws – Information Technology Act, 2000 – Information Technology (Amendment) Act, 2008 – Cyber crime investigation cell – Communications convergence Bill, 2001 – Cyber security forum – Joint collaboration between India and U.S. – E- Governance and E-Policy – Objectives of I.T. legislation in India – The Information Technology Act 2000 – Policy Level Regulation – Administrative Level Regulation – Judicial Level Regulation – Offences and Penalties – Amendment Act 2008 – Preamble – Digital and Electronic Signature – Electronic Governance – Nature of Offences and Penalties – Amendment to Indian Penal Code – Amendment to Indian Evidence Act – Cyber Crime Investigation Cell – Electronic Communication Privacy Act.

TOTAL: 45 PERIODS

REFERENCES:-

1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", 2011, CRC Press, Taylor and Francis Group, LLC.

2. Debra Littlejohn Shinder, Ed Tittel, “Scene of the Cybercrime : Computer Forensics Handbook”, Syngress Publishing, Inc.
3. Eoghan Casey, “Digital Evidence and Computer Crime: forensic science, computers and the internet”, Third edition.
4. Dr. Pramod Kr. Singh, “Laws on Cyber Crime”, Book Enclave

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(30)**

FI 9083 ADVANCED ONTOLOGY L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Ontologies: State Of The Art - Business Potential - Grand Challenges –Description Logic : Introduction - The Expressive Description Logic *SHIQ* - Describing Ontologies in *SHIQ* - Ontologies in F-Logic : Introduction - F-Logic by Example - Implementations of F-Logic .

UNIT II ONTOLOGY LEARNING AND REASONING 9

Ontology Learning: Introduction - An Architecture and Process Model for Ontology Learning - Ontology Learning Layers – Advanced Issues.

Ontology Reasoning: Tableau Based Reasoning Techniques - A Tableau Algorithm for ALC - Implementation and Optimization Techniques - The Automata Based Reasoning Approach - Structural Based Reasoning Approaches

UNIT III ONTOLOGY MATCHING TECHNIQUES 9

Introduction - Classifications of ontology matching techniques: Matching dimensions Classification of matching approaches - Basic techniques: Similarity, distances and other measures - Name-based techniques - Structure-based - Extensional techniques - Semantic-based techniques – Matcher Composition.

UNIT IV ONTOLOGY MATCHING SYSTEMS AND TOOLS 9

Schema-based systems - Instance-based systems - Mixed, schema-based and instance-based systems - Meta-matching systems – Ontology merging - Machine Learning Approach for Ontology Mapping Using Multiple Concept Similarity Measures - **Prompt**: Ontology merging tool – **YAM++** tool : A machine learning approach to ontology matching

UNIT V ONTOLOGY-BASED APPLICATIONS 9

Text Mining – Social Network Analysis - Knowledge Management - Recommender Systems - Information Security.

TOTAL : 45 PERIODS

REFERENCE BOOK:

1. Steffen Staab and Rudi Studer, “ Handbook on Ontology”, Springer, 2nd edition, 2009.
2. Van Harmelen, Lifschitz and Porter , “Handbook of Knowledge Representation”, 1st Edition , Springer, 2004.
3. M.Hepp, P. Leenheer, A de Moor and Y. Sure, “Ontology Management Semantic Web, Semantic Web Services, and Business Applications”, Springer, 2008.
4. Jérôme Euzenat and Pavel Shvaiko, “ Ontology Matching”, Springer , 2007.

5. Sam K. M. and Chatwin C.R., "Ontology-based text-mining model for social network analysis", *IEEE International Conference on Management of Innovation and Technology (ICMIT)*, vol. 226, no. 231, pp. 11-13, June 2012.
6. Artem Vorobiev and Nargiza Bekmamedova, "An Ontology-Driven Approach Applied to Information Security", Journal of Research and Practice in Information Technology, Vol. 42, No. 1, pp. 61-76, February 2010.
7. Fensel, D., "Ontology-based knowledge management," *Computer*, vol. 35, no. 11, pp. 56-59, Nov 2002.
8. Natalya Fridman Noy and Mark A. Musen, "PROMPT: Algorithm and Tool for Automated Ontology Merging and Alignment", AAAI/IAAI 2000: 450-455.
9. Aguirre José Luis, et al. "Results of the ontology alignment evaluation initiative 2012", in proceeding of 7th ISWC workshop on ontology matching (OM). 2012.
10. Ichise, R., "Machine Learning Approach for Ontology Mapping Using Multiple Concept Similarity Measures," in Proceeding of *Seventh IEEE/ACIS International Conference on Computer and Information Science*, vol. 340, no.346, pp.14-16, 2008.
11. DuyHoa Ngo, Zohra Bellahsene, "YAM++ - A combination of graph matching and machine learning approach to ontology alignment task", Journal of Web Semantics, 2012.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(31)**

FI 9084	**FEMTOCELLS**	**L T P C**
		3 0 0 3

UNIT I

Introduction – Indoor coverage techniques – Improvement of Indoor coverage, Indoor base stations – Comparison of Indoor coverage techniques – Femtocell Design – Concept – System benefits - Handset impact – Applications.

UNIT II

Femtocell reference interfaces – IMS femtocell architecture – UMTS femtocell architecture – LTE femtocell architecture – Self organizing femtocell networks – Femtozones.

UNIT III

System level simulation – Network level simulation – Link and system level simulations – Wireless radio channel modelling – Static and Dynamic system level simulations – Interference in the presence of femtocells – Key concepts, interference cancellation, Interference avoidance, Interference management with UMTS.

UNIT IV

Mobility management for femtocells in 3GPP – Femtocell characterization – Access control – Paging procedure – Cell selection and reselection – Cell Handover.

UNIT V

Self organization in femtocell scenarios – Self Configuration and optimization of femtocell parameters – Start up procedure in femtocells – Femtocell Security Solutions – Security vulnerabilities, IPsec, Cryptographic hash algorithms, Air interface ciphers, Cryptographic legal issues, Internet key exchange, Universal integrated circuit card, Home device security – Issues in femtocells.

TOTAL: 45 PERIODS

REFERENCES:

1. Joseph Boccuzzi, Michael Ruggiero, Femtocells: Design and Application, The Mc Graw Hill Pub. Co., USA, 2011.
2. Jie Zhang, Guillaume de la Roche, Femtocells – Technologies and Deployment, John Wiley & Sons Ltd., U. K., 2010.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(32)**

FI9085 CHIP DESIGN VALIDATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic concepts of silicon debugging methods.
- To know about the research that is happening in validation techniques of today's processors.
- To explore and apply the tools for working with silicon debug.

UNIT I INTRODUCTION

Verification of a modern processor- Verification throughout the processor life cycle- Pre-Silicon Verification- Simulation-based technique- Formal Verification Methods- Post-Silicon Validation- Structural Testing- Functional Post-Silicon Validation- Runtime Verification.

UNIT II FUNCTIONAL POST-SILICON VALIDATION

Post-silicon validation of processor cores- Traditional Post-silicon validation in industry- Directed tests- Random and Stress tests. Post-silicon Validation of multi core processors- Overview - Challenges - Verification of Memory Consistency.

UNIT III RUNTIME VERIFICATION IN MODERN MICROPROCESSORS

Analysis of Escaped Errors-Classification of Runtime Verification solutions-Dynamic Verification of Microprocessors(DIVA)- Hardware Patching with Field Repairable Control Logic- Overview- Design flow- Trusted Hardware Design with Semantic Guardians- Runtime Verification in Multicores- Dynamic Verification of Memory Consistency- Post-Silicon debugging with Casper

UNIT IV POST-SI DEBUG TECHNIQUES

Physical methods for Silicon debug- Design for Debug(DFD) techniques: scan-chain based technique and trace-based technique- Other debugging techniques: check pointing, On chip program and data tracing, fault-tolerant computing, online assertion checking, Instruction Footprint Recording and Analysis(IFRA) and Quick Error Detection(QED)- Tools for silicon debug

UNIT V ADVANCES AND TRENDS IN PROCESSOR VALIDATION

Bridging Pre-Silicon verification and Post-Silicon validation- Assertions- Case studies of silicon failures- Overview of research problems- Overview of various techniques in research literature – Coverage Metrics and Formal Analysis and their pros and cons

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Chip design validation is research area with lots of challenging problems spanning bug detection, localization, root-cause and debug, bug fixing, and emulation. The student will learn about research problems, as well as an overview of techniques in research literature (together with their drawbacks).

REFERENCES:

1. “Post-Silicon and Runtime Verification for modern processors”, Ilya Wagner and Valeria Bertacco, Springer 2011.

2. “Scalable Hardware Verification with Symbolic Simulation”, Valeria Bertacco, Springer 2006
3. “Post- Silicon Verification and Debugging for C- Based Designs”, Masahiro Fujita, Springer.
4. “Hardware and software: Verification and Testing”,Allon Adir,springer 2011

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(33)**

FI9086 BIOMECHANICS OF HUMAN MOVEMENT AND WEARABLE ROBOTS **L T P C 3 0 0 3**

OBJECTIVES

- To understand the fundamental Physiological and Biomechanical aspects in Human Movement.
- To utilize concepts derived from biomedical research to aid in the design of Wearable Robot systems.
- To apply available research techniques and methods to solve new problems in movement related research.

UNIT I FUNDAMENTALS OF HUMAN MOVEMENT **9**

Biomechanics vs. Kinesiology, Anatomical Movement Descriptors, Mechanics of Musculoskeletal System – Tissue loads, Response of tissues to forces, Biomechanics of Muscle-Tendon Unit, Bone and Ligaments, Mechanical Characteristics of Muscles, Neuromuscular Control of Movement.

UNIT II BIOLOGICAL MODELS **9**

Biomechatronic systems in close interaction with biological systems, Biologically Inspired Models – Neuromotor Control Structures and Mechanisms as Models, Muscular Physiology as a Model, Sensorimotor Mechanisms as a Model, Biomechanics of Human Limbs as a Model. Biomimetism and Bioimitation.

UNIT III WEARABLE ROBOTS **9**

Kinematics and Dynamics of Wearable Robots – Robot Mechanics: Motion Equations, Leg Kinematics, Kinematic Models of Limbs, Dynamic Modelling of Human Limbs, Dual human–robot interaction in wearable robotics, Exoskeletons: an instance of wearable robots, Technologies involved in robotic exoskeletons, A classification of wearable exoskeletons: application domains.

UNIT IV HUMAN ROBOT INTERACTION **9**

Cognitive Interaction (cHRI) – cHRI using Electroencephalography (EEG) Monitoring, cHRI through Electromyography (EMG) Monitoring, cHRI through Biomechanical Monitoring. Physical Interaction – Kinematic Compatibility between Human limbs and Wearable Robots, Human Tolerance of Pressure, Transmission of forces through Soft Tissues. Control of Human-Robot Interaction – Closes Loop Behaviour, Stability Concepts.

UNIT V LOWER LIMB WEARABLE ROBOTS – CASE STUDIES **9**

Lower Limb Exoskeleton Control based on learned Gait Patterns, Identification and Tracking of Involuntary Human Motion based on Biomechanical Data, EEG based cHRI of a Robotic Wheelchair, Stance Stabilisation During Gait through Impedance Control, Ankle – Foot Orthosis Powered by Artificial Pneumatic muscles, GAIT – ESBiRRO, HAL (Hybrid Assistive Limb), BLEEX Exoskeleton.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Jos´e L. Pons, “Wearable Robots: Biomechatronic Exoskeletons”, John Wiley & Sons Ltd (2008).

2. Duane Knudson, “Fundamentals of Biomechanics”, Second Edition, Springer Science+Business Media, LLC (2007).

REFERENCES

1. Joseph Hamill and Kathleen M.Knutzen “Biomechanical Basis of Human Movement”, Third Edition, Lippincott Williams & Wilkins (2009).
2. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design”, The McGraw-Hill Companies, Inc. (2003).

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(34)**

FI9087 FUNDAMENTALS OF BIBLIOMETRICS RESEARCH L T P C
3 0 0 3

UNIT I INTRODUCTION

Bibliometric Indicators – components of bibliometrics – elements of bibliometric research: mathematical models – basic postulates – axiomatic approach – deterministic models of productivity and citation processes – stochastic approach to bibliometrics - Indicators of publication activity – factors, subject characteristics – bibliometric search algorithms

UNIT II CITATION ANALYSIS

Role of self-citations – co-citations – cross-citations – classification of citations, types – measuring citation impact – journal citation measures – relative citation indicators - ISI citation indices – citation analysis in research evaluation – Issues in author name resolution – citation analysis and peer review – citation analysis for expert recommendation – citation analysis as a tool in journal evaluation - problems of citation analysis – efficient algorithms of citation network analysis

UNIT III SCIENTIFIC COLLABORATION ANALYSIS

Indicators of scientific collaboration – co-authorship – guest authorship – indicators of co-operating and collaborating networks – dynamic social network communities: analysis, discovery – mining and evolution – use of semantic technologies for mining social networks - academic research networks - recommendation systems - author co-citation analysis - bibliometric methods in webometrics

UNIT IV ADVANCED DATA ANALYTICS

Bibliometric Transaction Matrices – Bibliographic coupling and co-citation analysis – co-word, co-heading and co-author clustering techniques – data mining for citation networks - application of graph theory in bibliometrics – social network data – models and algorithms for analyzing social influence – expertise finding – link prediction – critical link analysis – evolutionary game theory - modeling network using game theory - visualizing social networks

UNIT V APPLICATIONS

Potential research in Bibliometrics – measuring the impact of scientific articles – measuring originality and novelty - Measuring journal impact – author importance – measuring continuing research – opinion mining – author contribution mining – trend analysis and prediction – critical evaluation of scientific articles – application of reasoning in bibliometrics

TOTAL: 45 PERIODS

REFERENCES
1. Borko Furht , Handbook of Social Network Technologies and Applications, Springer, 2010
2. Charu C. Aggarwal, Social network data analytics , Springer, 2011
3. W. Glanzel, Bibliometrics as a Research Field - A course on theory and application of bibliometric indicators, 2003
4. David Easley, Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, illustrated, Cambridge University Press, 2010
5. Henk F. Moed, Citation Analysis in Research Evaluation, Volume 13, illustrated, Springer, 2005
6. Rick Blazek, Author-statement Citation Analysis Applied as a Recommender System to Support Non-domain-expert Academic Research, ProQuest, 2007.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(35)**

FI9088 ULTRA WIDEBAND ANTENNAS L T P C
3 0 0 3

UNIT I UWB SYSTEMS AND APPLICATIONS 9

History of UWB – UWB frequency regulations – UWB types – UWB-OFDM applications – Typical applications of Impulse radio UWB, UWB-FH and UWB-FM – Operating Scenario and Standardization – System Outlook – Impact on Antennas

UNIT II THEORY OF UWB ANTENNA ELEMENTS 9

Monopole antennas: Mechanism of UWB Monopole Antenna – Planar UWB monopole antenna – Planar UWB slot antenna – Time Domain characteristics of monopoles

Planar dipole antennas: Printed elliptical dipoles – Vivaldi Antennas

UWB Arrays: Elements for UWB array design – Modeling and Design considerations – Feed configuration

UNIT III MODELING AND EXPERIMENTAL CHARACTERIZATION 9

Modeling: Specificities of UWB antennas – Temporal behavior – Distortion & Ideality – Performance characterization in synthetic radiators

Experimental Characterization: Measurements of radiation and electrical characteristics: Basic concepts – Frequency domain methods – Time domain methods

UNIT IV OVERVIEW OF UWB ANTENNAS 9

Classification of UWB antennas – Techniques of frequency independent antennas – Equiangular antenna – Log-periodic antenna – Bi-conical antenna – Discone antenna – Bow-tie Antenna – UWB antenna for surface penetrating RADAR – Performance improvement techniques – Miniaturization techniques

UNIT V ANTENNA AND CHANNEL JOINT EFFECTS IN UWB 9

UWB radio channel – Impact of channel on the performance of UWB systems – Effective antenna performance in an ideal channel – Non-directional antennas in dispersive channel – Directional antenna in dispersive channel – Factorization of antenna patterns.

TOTAL: 45 PERIODS

REFERENCES:

1. "Ultra Wideband Antennas", Xavier Begaud, Wiley, 2011
2. "Ultra Wideband Antennas and Propagation for Communications, RADAR and Imaging", Wiley, 2013.

Faculty of I and C Engg **(Approved in 18th AC 09.08.2014) ITEM NO. FI 18.04(36)**

FI9089 FREQUENCY SELECTIVE SURFACES L T P C
3 0 0 3

UNIT I INTRODUCTION TO FSS 9

Periodic structures - Surface Waves Unique to Finite Periodic Structures - Complementary Arrays - Passive Versus Active Arrays - Dipole Versus Slot Arrays - Applications of Periodic Structures: Hybrid Radomes, Bandstop filters, Dichroic reflectors, Circuit Analog Absorbers, Meanderline Polarizer

UNIT II ELEMENT TYPES 9

Center Connected or N-Poles: Unloaded Tri-pole Array, Square Spiral Element - Loop Types: Three-legged and Four-legged Loaded Element - Solid Interior Types - Combination of Elements - Some Common Misconceptions about Elements - Comparison of Elements - Evaluation of Periodic Structures

UNIT III FSS RADOME MODELING 9

Modeling of an N-Layered Hybrid Radome - Determination of the Transmission Coefficient for an N - Layered Hybrid Radome - Analysis of the Hybrid Radome – Honeycomb and Thick Screen Radomes - Reflection: Image Lobes - Luebbers' Anomaly - Calculation of Scattering from N Arrays of Dipoles - Matching in the Band-Pass Region

UNIT IV ANALYSIS OF FSS 9

Estimating the resonant frequency of a Single Periodic Surface: Effect of Dielectric Material, Bandwidth **-** Extension to arrays of wide Flat elements **-** Filter Geometries and Equivalent Circuits - Matrix methods - Derivation of Cascading Matrix

UNIT V SUBSTRATE INTEGRATED WAVEGUIDES 9

Substrate Integrated Waveguides – Circuits and Components - SIW and FSS - Modeling and Design Considerations – Applications – Merits and Demerits

TOTAL: 45 PERIODS

REFERENCES:

1. Ben A Munk, Frequency Selective Surfaces-Theory and Design, John Wiley, 2000
2. Ben A Munk, Finite Antenna Arrays and FSS, Wiley-IEEE Press, July 2003
3. Salvatore Celozzi, Electromagnetic Shielding, 2nd Edition, Wiley Interscience Publication, 2008
4. The Gentleman's Guide to Frequency Selective Surfaces - E.A.Parker, 17th Q.M.W. Antenna Symposium, London, April 1991
5. M. Bozzi, F. Xu, D. Deslandes, and K. Wu, "Modeling and design considerations for substrate integrated waveguide circuits and components," in Int. Telecomm. Modern Satellite, Cable, Broadcast. Serv.Conf., Sep. 2007, pp. 7–16.
6. Everything You Ever Wanted to Know About Frequency-Selective Surface Filters but Were Afraid to Ask - Benjamin Hooberman - May 2005

FI 9090 SEMANTIC COMPUTING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Distributional Semantics-Formal Semantics-Sentential Semantics-Discourse Semantics: Anaphoric expressions, Discourse Representation Theory, Dynamic Semantics-Semantic Constraints-Events & time: Event Semantics, Tense, Temporal anaphora-Deep and shallow semantic methods: Intensionality and Non-verdicality, Monotonicity

UNIT II SEMANTIC REPRESENTATION 9

Computational Semantics- Semantic Representations: First order representation, methodology of first order modeling-Computing Semantic Representations: Unification based approaches, Lambda based approaches-Latent Semantic Analysis-Semantic Role Labeling-Semantic Networks- Semantic Spaces- Semantic Web

UNIT III ONTOLOGY 9

Description Logics-Ontologies in F-Logic- Formal Concept Analysis-Ontology Learning-RDF- RDFS & OWL- SPARQL- OntoText-Linked Data - Linked Open Data and Semantics- Linked Data Query Processing- Publishing Linked Data on the Web-Link Prediction-Deploying Linked Data-Querying Semantic Data-Linked Data Resolution.

UNIT IV ENTITY SEARCH 9

Named Entity Resolution for Entities-Tools and Techniques for Entity Search-Entity Resolution-Entity Centric Data Management-Extracting Entities- Entity Storage Architecture- Entity Representation-Relational Entity Search -Parallel Entity Resolution with Dedoop- Deep Web Entity Monitoring - Entity Linking- Entity Matching.

UNIT V APPLICATIONS 9

Semantics Based: Query Refinement, Collaborative Filtering, Duplicate Document Detection and Elimination, Language Translation, Text Summarization, Text Classification-Ontology Based: Text Mining – Social Network Analysis - Knowledge Management - Recommender Systems - Information Security. Entity Search Based: Search Engines-Big Data Analytics.

REFERENCES :

1. David Beaver and Joey Frazee, Semantics,2010
2. Blackburn, Patrick, and Johan Bos. "Computational semantics." THEORIA. An International Journal for Theory, History and Foundations of Science 18.1 (2008): 27-45.
3. Steffen Staab and Rudi Studer, “Handbook on Ontology”, Springer, 2nd edition, 2009. Handbook on Ontologies
4. Bauer, Florian, and Martin Kaltenböck. "Linked Open Data: The Essentials."Edition mono/monochrom, Vienna (2011).
5. Talburt, John R. Entity resolution and information quality. Elsevier, 2011.
6. Bob DuCharme, Learning SPARQL,2nd Edition, Querying and Updating with SPARQL1.1 and published by O'Reilly Media
7. Lewis, Mike, and Mark Steedman. "Combined Distributional and Logical Semantics." TACL 1 (2013): 179-192.
8. Paul Buitelaar, Natural Language Processing for the Semantic Web
9. Ian Horrocks, Description Logic: A Formal Foundation for Ontology Languages and Tools

10. Xu, Mengling, et al. "Discovering Missing Semantic Relations between Entities in Wikipedia." The Semantic Web–ISWC 2013. Springer Berlin Heidelberg, 2013. 673-686.
11. Motik, Boris, et al. "Owl 2 web ontology language: Profiles." W3C recommendation 27 (2009): 61.
12. Martha Palmer, Shumin Wu and Ivan Titov, Semantic Role Labeling Tutorial
13. Craig Knoblock, Building Semantic Descriptions of Sources
14. Barry Norton and Denny Vrandecic, OntoText
15. Mathew Rowe, Semantic Technologies: Representing Semantic Data,2011
16. Soren Auer, LOD2 Creating Knowledge out of Interlinked Data

Faculty of I and C Engg **(Approved in 19th AC 03.12.2014) ITEM NO. FI 19.04(3)**

FI9091 SECURITY ANALYTICS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Evolution of Analytic Scalability; Analytic Processes and Tools; Analysis vs Reporting;Modern Data Analytic Tools; Security Analytics Warehouse; Enterprise security evolution;Security Analytics interface; Customizing the interface.

UNIT II SECURITY MONITORING 9

Implement Policies for monitoring – blacklist monitoring, anomaly monitoring, policy monitoring, monitoring against defined policies;Types of policies;Select targets for monitoring - Methods for Selecting Targets - Business Impact Analysis, Revenue Impact Analysis, Expense Impact Analysis, Legal Requirements, Sensitivity Profile, Risk Profile, Visibility Profile;Practical Considerations for Selecting Targets; Recommended Monitoring Targets; Choosing Components Within Monitoring Targets - Example: ERP System, Gathering Component Details for Event Feeds; Feed and Tune - Network Intrusion Detection Systems; NIDS Deployment Framework; System Logging; Net Flow.

UNIT III INCIDENT INVESTIGATION 9

Need for incident investigation; The Investigation thought process – differences between traditional problem solving and structured RCA, the typical investigator, a structured approach to the analysis; Casual factors and root causes; the goal of the incident investigation process; the SOURCE™ Root Cause analysis process; Initiating investigations; Gathering and preserving data –general data gathering and preserving issues, gathering data from people, physical data, electronic data, position data; Analyzing data – Cause and effect tree analysis, timelines, casual factor charts, using casual factor charts, timelines, Cause and effect trees together during an investigation; Completing the Investigation - writing investigation reports; communicating investigation results; resolving recommendations and communicating resolutions; Selecting incidents for analysis – Why be careful when selecting incidents for investigation?; some general guidance; performing the investigation; near misses; acute analysis versus chronic analysis; identifying chronic incidents that should be analyzed; Data and results trending – determining the data to collect, data analysis.

UNIT IV MALWARE ANALYSIS 9

Goals of malware analysis techniques; Basic static techniques – Anti-virus scanning, Hashing: A fingerprint for Malware, finding string, packed and obfuscated malware, linked libraries and functions, static analysis in practice – PotentialKeylogger.exe : An unpacked executable; Malware analysis in virtual machines – creating your malware analysis machine, using your malware analysis machine, the risks of using VMware for malware analysis; Basic dynamic analysis – sandboxes, running

malware, monitoring with process monitor, faking a network, packet sniffing with Wireshark; Advanced static analysis – the IDA PRO interface, using Cross-references, analyzing functions, extending IDA with plug-ins; Advanced dynamic analysis – debugging, OllyDbg, kernel debugging with WinDbg; Malware functionality – malware behavior, covert malware launching, malware-focused network signatures.

UNIT V LOG COMPLIANCE REPORTING 9

Regulations – An introduction to Legislation related to internal controls – regulatory impact on IT Audit; The Sarbanes-Oxley Act of 2002 – Core point of the Sarbanes-Oxley Act, Sarbanes-Oxley's Impact on IT departments; Gramm-Leach-Bliley Act (GLBA), GLBA requirements; Health Insurance Portability and Accountability Act of 1996 (HIPAA) - HIPAA's Privacy and security rules; Payment Card Industry (PCI) Data Security Standard – PCI impact on the Payment Card Industry.

TOTAL: 45 PERIODS

REFERENCE BOOKS:

1. Chris Fry and Martin Nystrom, "Security Monitoring."O'Reilly Media, Inc., First ed., 2009.
2. Lorenzo, Donald K., and Walter E. Hanson, "Root Cause Analysis Handbook: A Guide to Efficient and Effective Incident Investigation." Rothstein Associates Inc, Third ed., 2008.
3. Sikorski, Michael, and Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software." No Starch Press, 2012.
4. Chris Davis, Mike Schiller, and Kevin Wheeler "It Auditing." Tata McGraw Hill Edition 2007.

Faculty of I and C Engg **(Approved in 19th AC 03.12.2014) ITEM NO. FI 19.04 (4)**

FI9092 INTEGRATION OF RFID AND WIRELESS SENSOR NETWORKS **L T P C 3 0 0 3**

UNIT I INTRODUCTION 9

Introduction – Security goals, Challenges, Key management, Secure Routing; Preliminaries – Elliptic Curves, Elliptic curve Groups and the Discrete Logarithm Problem, Bilinear Pairings, Diffie-Hellman Problems; Types of Attacks – Passive Attacks, Active attacks, DoS Attacks, Wormhole attacks, Rushing attacks, Masquerade attacks, Replay attacks, Message manipulation attacks, Delay attacks, Sybil attacks; Countermeasure - Key Establishment and Management, Anonymous Communication, Intrusion Detection, Security Measures for WSN - Secure Routing – SEAD, Ariadne, ARAN, SLSP; Applications- RFID threats, attacks.

UNIT II WSN SECURITY FRAMEWORK AND STANDARDS 9

Standards - IEEE 1451, IEEE 802.15.4, ZigBee, ISA100.11a, WirelessHART, MiWi Protocol, 6LoWPAN, ITU standards; Protocols – MAC Protocols - UnscheduledMAC Protocols - MultichannelMAC Protocols, Application-Oriented MAC Protocols, Multi-Path Data PropagationMAC Protocols, Rendezvous-BasedMAC Protocols, Preamble-BasedMAC Protocols, ScheduledMAC Protocols - Slotted Contention-BasedMAC Protocols, Time Division-Based MAC Protocols, Reservation-BasedMAC Protocols, Priority-Based MAC Protocols; HybridMAC Protocols - Preamble-Based HybridMAC Protocols, Reservation-Based Hybrid Protocols, Traffic-Sensitive Protocols, Clustering-BasedMAC Protocols; Quality-of-Service-Specific MAC Protocols, Cross-LayerMAC Protocols, Tree-Based Data Aggregation Protocols, Cluster-Based Data Aggregation Protocols, Multipath-Based Data Aggregation Protocols, Popular Probabilistic Clustering Protocols, Nonprobabilistic Clustering Approaches.

UNIT III RFID **9**

RFID Technology-The Elements of an RFID system, Coupling , range and Penetration - The Distributed Intelligent Systems Center, Low-Cost RFID Protocols, Low-cost Manufacturing, The Software and the Network, Privacy, Harnessing the Juggernaut, The Six Auto-ID Labs, Understanding RFID's Privacy Threats, RFID authentication protocols, Current State of RFID Policy - Medium Access Control in RFID, Anti-collision algorithm in RFID, Low power transponders for RFID, The Creation of EPC global, EPC GEN-2 Standard for RFID, RFID security, RFID Deployment, Risk analysis of RFID, RFID Enhanced Soultions - IR-Sign Post technology, Acoustic Sign Post technology, Multi Antennae design

UNIT IV INTEGRATED RFID AND WIRELESS SENSOR NETWORKS **9**

Introduction, Need for integrating RFID and WSN, Requirements for integrating RFID and WSN, Classification of integration, Architectures of Integrated RFID and Sensor Networks, Integrated RFID and sensor networks applications - Ultra wide band and narrow wide band WSN and RFID - Finite field Arithmetic for RFID and Sensor Networks - RFID and Sensors channel measurements and modeling- Middleware and software tools- Performance Evaluation and modeling in WSN and RFID - Risks in RFID and WSN

UNIT V RFID-WSN SECURITY **9**

Security in RFID and sensor networks, Resource, Mobility, and Security Management in RFID-WSN, RFID-WSN Quality of service: Techniques, Standards and applications, distributed antenna systems. - Design Secure Wireless Embedded Systems - Research issues in RFID sensor network: Information security and privacy protection laws- Data Integrity in RFID based WSN

TOTAL: 45 PERIODS

REFERENCE BOOKS :

1. Yan Zhang, Laurence.T.Yang, Jiming Chen, "RFID And Sensor Networks Architectures, Protocols, Security and Integrations" Auerbach Publications 2009.
2. Kazem Sohraby, Daniel Minoli Taieb Znati, "Wireless Sensor Networks: Technology, Protocols, and Applications" John Wiley &Sons INC. Publications.
3. L.K.Bandyopadhyay, S.K.Chaulya, P.K.Mishra "Wireless Communication in Underground Mines: RFID-based Sensor Networking "
4. Simson Garfinkel and Beth Rosenberg, "RFID Applications, Security, and privacy", Pearson Education
5. Steven Shepard, "Radio Frequency Identification", McGraw-Hill Professional, First edition.
6. Rappaport Theodore S., "Wireless Communication Principles & Practice" Pearson education second edition.

Faculty of I and C Engg **(Approved in 20th AC 07.07.2015) ITEM NO. FI 20.04 (1)**

FI9093 RECONFIGURABLE ANTENNAS **L T P C**
3 0 0 3

UNIT I RECONFIGURABLE ANTENNAS **9**

Introduction to reconfigurable antennas – Critical parameters for antenna operation – frequency response and radiation characteristics – Implications for reconfigurable antennas

UNIT II DESIGN TECHNIQUES 9

Reconfiguration mechanisms – Substrate modification – Conductor modification – Frequency reconfigurability – Pattern reconfigurability – Polarization reconfigurability – Methods for compound reconfigurable antennas – Implementation mechanism – matching network design

UNIT III MODELING USING GRAPH THEORY 9

Introduction to Graphs – Graph algorithms on reconfigurable antennas – Reconfigurable antenna design steps – redundancy reduction – Analysis of complexity and reliability – Graph modeling of array of reconfigurable antennas – Detection and correction of switch failures

UNIT IV SELECTED RECONFIGURABLE ANTENNAS 9

Reconfigurable Apertures – Reconfigurable traveling wave antennas – Reconfigurable arrays – Reconfigurable microstrip antennas – Reconfigurable slot antennas – Reconfigurable monopole/dipole antennas.

UNIT V OPTIMIZATION TECHNIQUES 9

Introduction – Basic optimization concept – Real coded genetic algorithm – Neurospectral design of antennas – Artificial Neural Network (ANN) – Particle Swarm Optimization (PSO)

TOTAL: 45 PERIODS

REFERENCES:

1. John L. Volakis: Antenna Engineering Handbook, Fourth Edition, McGraw-Hill Professional, 2007, Access Engineering
2. Jennifer T. Bernhard, “Reconfigurable Antennas,” Morgan &Claypool Publications, 2007.
3. Joseph Costantine, Youssef Tawk, and Christos G. Christodoulou Design of Reconfigurable Antennas Using Graph Models, Synthesis Lectures on Antennas, July 2013
4. Debatosh Guha, Yahia, M.M. Antar, “Microstrip and Printed Antennas; new trends, techniques, applications,” John Wiley & Sons Ltd.2011.

Faculty of I and C Engg **(Approved in 20th AC 07.07.2015) ITEM NO. FI 20.04(2)**

		L	T	P	C
FI9094	**ELECTROMAGNETIC NON-DESTRUCTIVE TESTING OF COMPOSITES**	**3**	**0**	**0**	**3**

UNIT I INTRODUCTION TO NDT OF COMPOSITES 9

Composite Structure, Types of Defects in Composites, NDT of Composites – Ultrasonic Testing of Composites- Principles and Technologies, Wave Propagation in Composite Materials, Digital Shearography – Practical Applications, Acoustic Techniques - Fundamentals of Acoustic Emission Testing, Acousto-Ultrasonics – Stress Wave Factor Analysis.

UNIT II ELECTROMAGNETIC NDT 9

Fundamentals of electromagnetism - Maxwell's equations, Electromagnetic wave propagation in dielectrics and conductors, Field distributions, Eddy current NDE techniques - Instrumentation, Applications, Conductivity, Permeability, Thickness measurement, Flaw detection, Magnetic measurements - Permeability, Remanence, Coercivity, Barkhausen noise, Flaw detection, Flux leakage testing, Electromagnetic generation and detection of ultrasonic waves, electromagnetic acoustic transducers (EMATs).

UNIT III ELECTROMAGNETIC CHARACTERIZATION OF COMPOSITES 9

Reflection Methods - Modifications of Open Ended Probe, Free Space Reflection Method, Cavity Perturbation Method, Resonator method, Straight Ribbon Resonator Method, Measurement of Elastic-Stiffness Tensor of Metal-Matrix Composites by Electromagnetic Acoustic Resonance Method, Advanced Ceramic Composites - Characterization of Microstructure and Interfacial Properties.

UNIT IV NUMERICAL MODELING FOR ELECTROMAGNETIC NDT 9

General Elliptical Partial Differential Equations, Classes of Problems - Static Elecric Fields, Quasi-Static Fields, Applications to NDT - Electrostatic Testing, Magnetostatic Testing, Sinusoidal Eddy Current Testing, Testing in Waveguide and Resonant Cavities.

UNIT V MICROWAVE NDT 9

Sensing Architectures, Surface and Sub-surface Imaging of Fiber-Reinforced Structures, Design of Patch Sensors for NDE of Aircraft Radomes, Non-destructive Microwave Characterization of Materials – Inspection of Dielectric and Layered Dielectric Materials.

TOTAL: 45 PERIODS

REFERENCES:

1. Vistasp M. Karbhari., 'Non-Destructive Testing of Polymer Matrix Composites', Woodhead Publishing, 2013
2. Jeremy Knopp, Mark Blodgett, Buzz Wincheski, Nicola Bowler, 'Electromagnetic Nondestructive Evaluation (XIII), IOS Press, 2010.
3. L. F. Chen, C. K. Ong, C. P. Neo, V. V. Varadan, Vijay K. Varadan.,'Microwave Electronics: Measurement andMaterials Characterization' John Wiley & Sons, 2004
4. N. Ida., 'Numerical Modeling for Electromagnetic Non-Destructive Evaluation',Chapman & Hill, 1995

Faculty of I and C Engg **(Approved in 20th AC 07.07.2015) ITEM NO. FI 20.04(3)**

FI9095 PREDICTIVE ANALYTICS L T P C
3 0 0 3

UNIT I FOUNDATION 9

The Prediction Effect, Liftoff Prediction Takes Action, Power Comes Responsibility, The Data Effect, Chase's Prediction of Mortgage Risk, The Ensemble Effect, Watson and the Jeopardy! Challenge, Persuasion by the Numbers.

UNIT II PRINCIPLES AND TECHNIQUES 9

Statistical modeling and distributions, Time Series Analysis, Model Goodness Measures, Optimization Methods. Descriptive modeling, Interpreting Descriptive Models, Assesing Predictive models, Decision Models, Model ensembles, Text mining, Model deployment.

Analytical Techniques - Regression techniques **-** Machine learning techniques - Geospatial predictive modeling**.**

UNIT III PREDICTIVE MODELING 9

General Strategies - Predictive Modeling Process, Data Pre-processing, Over-Fitting and Model Tuning. Regression Models - Classification Models - Measuring Predictor Importance, Feature Selection, Measuring Predictive models.

UNIT IV REAL -TIME ANALYTICS 9

Streaming Analytics Architecture - Analysis and Visualization - Communicating Results - Visualization, data products, visual data analytics , Provenance, privacy, ethics, governance. Graph Analytics - Diagnostic analytics, Prescriptive analytics, Descriptive analytics

UNIT V TOOLS AND APPLICATIONS 9

R, Orange, GraphLab Create, Octave, Data Science Studio, H2O, GGobi, Tanagra, PredictionIO, RapidMiner, KNIME.

Big Data, Improper Payment Prevention & Recovery, Fraud Detection, Audit Data Analytics, Risk Management Analytics, Grant Oversight Analytics, Text Analytics / Unstructured Data Analysis

TOTAL : 45 PERIODS

REFERENCES:

1. Michael Wessler "Predictive analytics for dummies" Wiley Alteryx Special Edition 2014.
2. James Wu, Stephen Coggeshall, "Foundations of predictive analytics" CRC Press, First edition, 2012.
3. Dean Abbott, "Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst " Wiley 2014.
4. Max Kuhn, Kjell Johnson, "Applied Predictive Modeling" Springer, 2013.
5. Byron Ellis, “Real -Time Analytics: Techniques to Analyze and Visualize Streaming Data”, John Wiley & Sons, Inc, 2014.
6. Eric Siegel, "Predictive Analytics: The Power to Predict who will Click, Buy, Lie, or Die”, John Wiley & Sons, 2013.

Faculty of I and C Engg **(Approved in 21st AC 07.01.2016) ITEM NO. FI 21.02 (1)**

FI9096 STREAM DATA ANALYTICS L T P C

3 0 0 3

UNIT I DATA ANALYTICS 9

Big Data features - Big data sources – Acquisition – Security, Compliance, auditing and protection – Evolution of Big data – Big data characteristics – Best Practices for Big data – parallel processing systems – map reduce – Analytics – Summary of predictive analytics – Clustering techniques – Visual data analysis techniques - Differences of streaming data from big data

UNIT II STREAM ANALYTICS ARCHITECTURE 9

Designing real– time streaming architectures – Real-Time Architecture Components –Features of Real-Time Architectures – Languages for Real Time Programming – A Real Time Architecture Checklist – Processing Streaming Data – Distributed Streaming Data Processing – Processing Data with Storm – Processing Data with Samza – Storing Streaming Data – Consistent Hashing – "NoSQL" Storage Systems – Other Storage Technologies – Choosing a Technology – Warehousing

UNIT III STREAM COMPUTING 9

Introduction to Streams Concepts - Sources of streaming data - Operational Monitoring - Web Analytics - Online Advertising - Social Media - Mobile data and IoT - Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window

UNIT IV STREAM DATA MINING 9

Clustering from data streams – Partition clustering – Hierarchical clustering – Micro clustering – Grid Clustering – Frequent pattern mining – Decision trees from data streams – Very fast decision tree algorithm -Learning and Novelty in stream data- Novelty Detection as a One-Class Classification Problem - Learning New Concepts - The Online Novelty and Drift Detection Algorithm - Ensembles of Classifiers - Linear Combination of Ensembles - Sampling from a Training Set - Adapting to Drift using Ensembles of Classifiers - Mining Skewed Data Streams with Ensembles

UNIT V TOOLS FOR STREAM DATA ANALYTICS 9

Massive online analysis - Apache zookeeper - Apache Kafka - Apache Flume - Apache YARN- Storm based data processing- Samza based data processing- Redis - MongoDB - Cassandra - Hadoop as ETL and warehouse - Lambda architectures - IBM Cognos – Pentaho

TOTAL:45 PERIODS

REFERENCES

1. Byron Ellis, Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, wiley publisher, 2014.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
3. Joao Gama, Knowledge Discovery from Data Streams, Chapman and Hall/CRC; 1st edition, 2010.
4. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.

Faculty of I and C Engg **(Approved in 21st AC 07.01.2016) ITEM NO. FI 21.02 (2)**

FI9097 UNDERWATER ACOUSTIC MODELING & SIMULATION L T P C
3 0 0 3

UNIT I ACOUSTICAL OCEANOGRAPHY 9

Introduction, Physical and Chemical Properties- Temperature Distribution, Salinity Distribution, Water Masses, Sound Speed, Calculation and Measurements, Sound-Speed Distribution, Boundaries- Sea Surface, Ice Cover, Sea Floor, Dynamic Features, Large-Scale Features, Mesoscale Features, Fronts and Eddies, Internal Waves, Fine-Scale features.

UNIT II MEDIUM CHARACTERISTICS 9

Observations and Physical Models, Nature of Measurements, Sea-Surface Boundary, Forward Scattering and Reflection Loss, Image Interference and Frequency Effects, Turbidity and Bubbles, Open Ocean, Coastal Ocean, Sea-Floor Boundary- Forward Scattering and Reflection Loss, Acoustic Interaction with the Sea Floor, Boundary Conditions and Modeling, Geoacoustic Models, Interference and Frequency Effects, Attenuation by Sediments, Attenuation and Absorption in Sea Water, Surface Ducts, Mixed-Layer Distribution, General Propagation Features, Low-Frequency Cutoff, Deep Sound Channel, Convergence Zones, Reliable Acoustic Path, Shallow-Water Ducts.

UNIT III PROPAGATION MODELING 9

Theoretical Basis for Propagation Modeling, Wave Equation, Classification of Modeling Techniques, Ray-Theory Models, Basic Theory, Caustics, Gaussian Beam Tracing, Range Dependence, Arrival Structure, Beam Displacement, Normal-Mode Models, Normal-Mode Solution, Dispersion Effects, Range Dependence, High-Frequency Adaptations, Multipath Expansion Models.

UNIT IV MODELS AND PROPAGATION CHARACTERISTICS 9

Surface Duct Models, Ray-Theory Models, Wave-Theory Models, Oceanographic Mixed- Layer Models, Shallow-Water Duct Models, Shallow-Water Propagation Characteristics, Optimum Frequency of Propagation, Numerical Models, Upslope Propagation, Downslope Propagation, Empirical Models.

UNIT V APPLICATIONS 9

Special Applications: Prediction Uncertainties in Complex Environments, Underwater Acoustic Networks and Vehicles, Channel Models, Localization Methods, Range-Based Schemes, Range-Free Schemes, Vehicles, Marine-Mammal Protection, Rising Levels of Underwater Noise, Increased Shipping Levels, Ocean Acidification, Windfarm Development, Seismic Operations and Protection of Whales.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Paul C.Etter, Underwater Acoustic Modeling & Simulation, CRC press,4th Edition, Taylor & Francis group, International Standard Book Number-13: 978-1-4665-6494-7,2013
2. Boris Katsnelson, Valery Petnikov, James Lynch, Fundamentals of shallow water acoustics, Springer New York Dordrecht Heidelberg London, DOI 10.1007/978-1-4419-9777-7, ISBN 978-1-4419-9776-0

REFERENCE BOOKS:

1. Herman Medwin, Clarence S. Clay, Fundamentals of Acoustical Oceonography, Academic Press, ISBN 0-12-487570-X,1998
2. Yang-Hann Kim, Sound propagation : an impedance based approach, John Wiley & Sons (Asia) Pte Ltd,2010.

Faculty of I and C Engg **(Approved in 21 st AC 07.01.2016) ITEM NO. FI 21.02 (3)**

FI9098 MULTILEVEL INVERTERS L T P C
3 0 0 3

UNIT I PULSE WIDTH MODULATED INVERTERS 9

Introduction – Principle of operation – Performance Parameters – Single phase bridge inverters – Three phase inverters – Voltage control of single phase inverters – Advanced Modulation Techniques

– Voltage control of three phase inverters – Harmonic reductions – Current source inverters – Variable DC link inverter – Boost inverter – Inverter circuit design.

UNIT II MULTILEVEL TOPOLOGIES 9

Introduction – Generalized Topology with a Common DC bus – Converters derived from the generalized topology – symmetric topology without a common DC link – Asymmetric topology.

UNIT III DIODE CLAMPED MULTILEVEL CONVERTER 9

Introduction – Converter structure and Functional Description – Modulation of Multilevel converters – Voltage balance Control – Effectiveness Boundary of voltage balancing in DCMC converters – Performance results.

UNIT IV FLYING CAPACITOR MULTILEVEL CONVERTER 9

Introduction – Flying Capacitor topology – Modulation scheme for the FCMC –Dynamic voltage balance of the FCMC .

UNIT V CASCADE ASYMMETRIC MULTILEVEL CONVERTER 9

Introduction – General Characteristics of the CAMC – CAMC Three phase Inverter – Comparision of the Five level Topologies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rashid M.H,"Power Electronics Circuits, Devices and Applications", Prentice Hall of India, Third Edition, New Delhi, 2004.
2. Sergio Alberto Gonzalez, Santiago Andres Verne, and Maria Ines Valla, "Multilevel Converters for Industrial Applications",CRC Press, 22-Jul-2013.

REFERENCE BOOKS

1. D. Grahame Holmes and Thomas A. Lipo, "Pulse Width Modulation for Power Converters: Principles and Practice", John Wiley & Sons,Oct-2003.
2. Fang Lin Luo and Hong Ye, "Advanced DC/AC Inverters: Applications in Renewable Energy", CRC Press, 22-Jan-2013.

FI9099 IMAGE FEATURE DETECTION TECHNIQUES IMPLEMENTATION **L T P C 3 0 0 3**

UNIT I FEATURE DETECTION AND MATCHING 9

Feature points and patches-Feature detectors and descriptors-Feature matching-Feature Tracking. Performance driven animation-Edge detection-Edge linking-Lines- Successive approximation-Hough Transforms-Vanishing points-Rectangle detection.

UNIT II CORNER DETECTION 9

Points of Interest-Harris corner detection-Local structure matrix-Corner response function-Determining Corner points and its Implementation. Computing the corner response function-Selecting Good corner points-Displaying the corner points.

UNIT III CANNY EDGE DETECTION 9

Introduction-One dimensional formulation-Detection and Localization-Elimination of Multiple responses-Finding Optimal Detectors-Detectors for step edges-Efficient approximations-Noise estimation and Thresholding-Need for Multiple widths.

UNIT IV INTRODUCTION TO FPGA & SRAM PROGRAMMABLE FPGA 9

Logic Implementation- Advantages & Disadvantages of FPGA-Technology Trends-Designing for FPGA. Programming Technology- Xilinx XC2000, XC3000 and XC4000 device architecture-Software- Design Applications.

UNIT V RECONFIGURABLE AND EVOLVABLE HARDWARE 9

Basic Architectures-PLD's, FPGA's-Design Phase- Execution Phase – Functional overview of POEtic Architecture. Basic idea of Evolvable Hardware- Programmable Hardware devices-Evolutionary Computation-Genetic Algorithm-Digital & Analog Hardware Evolution

TOTAL: 45 PERIODS

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer 2010.
2. Wilhelm Burger, Mark James Burge, Digital Image Processing, Springer 2011
3. Stephen M.Timberger, "Field Programmable Gate Array Technology" Springer,1994.
4. Tetsuya Higuchi, Xin Yao and Yong Liu, "Evolvable Hardware", Springer Verlag,2004.
5. Garrison W. Greenwood and Andrew M. Tyhrrell, "Introduction to Evolvable Hardware: A Practical Guide for Designing Self Adaptive Systems", Wiley IEEE Press, 2006.
6. John Canny, "A Computational Approach to Edge Detection" IEEE transaction on Pattern Analysis & Machine Intelligence, Vol 6,679-698, Nov 1986.

Faculty of I and C Engg **(Approved in 21st AC 07.01.2016) ITEM NO. FI 21.02 (5)**

FI9100 FREE SPACE OPTICAL NETWORKS L T P C
3 0 0 3

OBJECTIVE:

To introduce wireless Gigabit technology by means of optical wireless communications.

UNIT I INTRODUCTION 9

Introduction: Propagation of light in unguided media - laser beam characteristics -atmospheric effects on optical signals - coding for atmospheric optical propagation - LIDAR.

UNIT II FSO TRANSCEIVER DESIGN 9

Light Sources: Modulators - photo detectors and receivers - optical amplification – optical signal to noise ratio - acquisition, pointing and tracking - adaptive and active optics – laser safety - node housing and mounting.

UNIT III POINT TO POINT FSO SYSTEMS 9

Simple PtP Design: Transponder nodes - hybrid FSO and RF - FSO point to multipoint – FSO point to mobile; Ring FSO Systems: Ring topologies and service protection - ring nodes with add drop - concatenated rings - ring to network connectivity.

UNIT IV MESH FSO SYSTEMS 9

FSO Nodes for Mesh Topology: Hybrid mesh FSO with RF - hybrid FSO fiber networks; WDM Mesh FSO: DWDM and CWDM optical channels - WDM FSO links - WDM mesh FSO networks - service protection in mesh FSO networks.

UNIT V FSO NETWORK SECURITY AND APPLICATIONS 9

Cryptography: Security levels - security layers - FSO inherent security features; FSO Specific Applications: FSO networks for highway assisted communications - mesh FSO in disaster areas - visual light communication.

TOTAL: 45 PERIODS

OUTCOME:

Students can understand the deployment of free space optics.

REFERENCES:

1. Stamatios V. Kartalopoulos, “Free Space Optical Networks for Ultra-Broad Band Services”, IEEE Press, 2011.
2. Arun K. Majumdar and Jennifer C. Ricklin, “Free-Space Laser Communications: Principles and Advances”, Springer, 2008.
3. Olivier Bouchet, Herve Sizun, Christian Boisrobert and Frederique De Fornel, “Free Space Optics: Propagation and Communication”, John Wiley and Sons, 2010.
4. Heinz Willebrand and Baksheesh S. Ghuman, “Free Space Optics: Enabling Optical Connectivity in Today's Networks”, Sams Publishing, 2002.

Faculty of I and C Engg **(Approved in 22nd AC 26.07.2017) ITEM NO. FI 22.04(1)**

FI9101 UAV AIDED MILITARY COMMUNICATIONS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To learn the UAV fundamentals and various UAV sensors
- To learn the techniques of UAV navigation and network of UAVs
- To learn the fundamentals of tactical wireless communications
- To learn the role of satellites in tactical wireless networks
- To learn the military applications of UAVs

UNIT I UAV FUNDAMENTALS 9

History and Overview-Classes and Missions of UAVs-Control Stations-Basic Aerodynamics-Distributed Hybrid Deliberative/Reactive Architecture for Unmanned Aircraft Systems-Autopilot- Sensors for Missions- Synthetic Aperture Radar Antenna- Identification of Friend or Foe.

UNIT II UAV NAVIGATION AND NETWORK OF UAVS 9

Introduction to UAV Navigation - NAVSTAR GPS - TACAN - LORAN C-Inertial Navigation-Radio Tracking-Waypoint Navigation- UAV Guidance Algorithms via Partially Observable Markov Decision Processes-Cooperative Task Assignment and Path Planning for Multiple UAVs-Control of Communication Networks for Teams of UAVs-Data Fusion and Tracking with Multiple UAVs.

UNIT III FUNDAMENTALS OF TACTICAL WIRELESS AND SATELLITE COMMUNICATIONS 9

Introduction- Physical Layer - DLL and Information Theory in Tactical Networks - MAC and Network Layers in Tactical Networks - Satellite Communication Basics- Link Budget- Frequency Bands - Tactical Satellite Communication Networks-Data Link Security- Connecting Satellites and UAVs.

UNIT IV TACTICAL RADIOS AND OPEN ARCHITECTURE MODEL 9

Non IP Tactical Radios and the Move toward IP - IP Based Tactical Waveforms and the GIG - Cognitive Radios - Open Architecture in Tactical Networks-Open Architecture Details- Bringing Commercial Cellular Capabilities to Tactical Networks- Network Management Challenges in Tactical Networks.

UNIT V MILITARY APPLICATIONS OF UAV 9

Case Studies : Border Area Surveillance with UAVs - Satellite linked UAV Network for Battlefield Tactical Commanding System - Application Requirements-Identification of Hardware and Software Standards - Design Requirements and Challenges.

TOTAL: 45 PERIODS

REFERENCES

1. George F. Elmasry, "Tactical Wireless Communications and Networks: Design Concepts and Challenges", John Wiley & Sons Ltd, 2012.
2. Kimon P. Valavanis and George J. Vachtsevanos, "Handbook of Unmanned Aerial Vehicles", Springer Science+Business Media, 2015.
3. Paul Gerin Fahlstrom and Thomas James Gleason, "Introduction to UAV Systems", John Wiley & Sons Ltd, 2012.
4. Reg Austin, "Unmanned Aircraft Systems: UAVs Design, Development and Deployment", John Wiley & Sons Ltd, 2010.
5. Zhili Sun, "Satellite Networking: Principles and Protocols", John Wiley & Sons Ltd, 2014.

FI 9102 DEEP LEARNING TECHNIQUES

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3	0	0	3

OBJECTIVES:

- To understand the concept of deep learning and fundamental mathematics required for deep learning
- To know the core parametric function approximation techniques behind deep learning
- To appreciate the modern practical deep networks and their applications
- To study about the various deep learning models
- To know about applications and visualization of deep learning networks

UNIT I INTRODUCTION AND PREREQUISITE MATHEMATICS 9

Introduction – Historical Trends in Deep Learning - Linear Algebra – Scalars – Vectors – Matrices and Tensors – Linear dependence and span - Probability and Information Theory –

The Chain rule of conditional probability - Bayes Rule – Machine Learning Basics – Supervised and Unsupervised learning algorithms – Stochastic Gradient Descent

UNIT II MODERN PRACTICAL DEEP NETWORKS 9

Deep Feedforward Networks – Gradient-Based Learning – Back-Propagation and Other Differentiation Algorithms – Regularization for Deep Learning: Parameter Norm Penalties – Norm Penalties as Constrained Optimization – Challenges in training deep models – Convolution Networks Operation – Pooling – Recurrent Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Recursive Neural Networks

UNIT III DEEP LEARNING RESEARCH 9

Probabilistic PCA and Factor Analysis - Independent Component Analysis (ICA) – Autoencoders - Representation Learning- Greedy Layer-Wise unsupervised Pretraining - Transfer Learning and Domain Adaptation - Semi-Supervised Disentangling of Causal Factors - Structured Probabilistic Models for Deep Learning -The Challenge of Unstructured Modeling - Using Graphs to Describe Model Structure - Sampling from Graphical Models - Learning about Dependencies - Inference and Approximate Inference

UNIT IV DEEP GENERATIVE MODELS 9

Boltzmann Machines - Restricted Boltzmann Machines - Deep Belief Networks - Deep Boltzmann Machines - Boltzmann Machines for Real-Valued Data - Convolutional Boltzmann Machines - Boltzmann Machines for Structured or Sequential Outputs - Other Boltzmann Machines - Back-Propagation through Random Operations - Directed Generative Nets - Drawing Samples from Autoencoders - Generative Stochastic Networks -Other Generation Schemes - Evaluating Generative Models

UNIT V APPLICATION AND VISUALIZATION 9

Large-Scale Deep Learning – Computer Vision – Speech Recognition – Natural Language Processing – Other Applications - Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course the student should be able to

- Design and implement a deep learning algorithm for a problem of their choice
- Design a suitable optimization strategy for deep learning implementation
- To identify application and adopt suitable deep learning models with suitable justification
- Choose a suitable visualization technique for the deep learning applications

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.
2. Yusuke Sugomori, "Java Deep Learning Essentials", PACKT, 2016
3. Timothy Masters, Deep Belief Nets in C++ and CUDA C: Volume 1: Restricted Boltzmann Machines and Supervised Feedforward Networks, 2015
4. Jeff Heaton, Artificial Intelligence for Humans, Volume 3: Deep Learning and Neural Networks, Heaton Research, 2015
5. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012

FI9103 COGNITIVE COMPUTATION FOR HEALTH CARE L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of Healthcare data and advanced analytics
- To learn various techniques of cognitive computing and big data analytics
- To learn cognitive computational models and algorithms for Healthcare
- To know about Population Health Management

UNIT I COGNITIVE COMPUTING AND BIG DATA ANALYTICS 9

Foundation of Cognitive Computing - Understanding Cognition - Elements of a Cognitive System - Design Principles for Cognitive Systems-Bringing Data into the Cognitive System -Machine Learning - NLP in Support of a Cognitive System - Relationship between Big Data and Cognitive Computing - Dealing with Human-Generated Data -Architectural Foundation for Big Data- Integration of Big Data with Traditional Data.

UNIT II HEALTHCARE DATA ANALYTICS 9

Healthcare Data Sources and Analytics- Advanced Data Analytics for Healthcare - Applications and Practical Systems for Healthcare - Electronic Health Records- Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Genomic Data Analysis for Personalized Medicine- NLP and Data Mining for Clinical Text - Social Media Analytics for Healthcare.

UNIT III ADVANCED DATA ANALYTICS FOR HEALTHCARE 9

Clinical Prediction Models - Temporal Data Mining for Healthcare Data - Visual Analytics for Healthcare - Predictive Models for Integrating Clinical and Genomic Data - Information Retrieval for Healthcare - Privacy-Preserving Data Publishing Methods in Healthcare - Data Analytics for Pervasive Health - Fraud Detection in Healthcare - Data Analytics for Pharmaceutical Discoveries - Clinical Decision Support Systems - Computer-Assisted Medical Image Analysis Systems- current trends.

UNIT IV COGNITIVE APPLICATION DEVELOPMENT 9

Process of building a Cognitive Application - Emerging Cognitive Platform - Creating and Refining the Corpora -Training and Testing - Cognitive Computing for Healthcare - Healthcare Ecosystem- Learning from Patterns in Healthcare Data - Cognitive Applications across the Healthcare Ecosystem -Cognitive Application to Enhance the Electronic Medical Record - Cognitive Application to Improve Clinical Teaching- Research Issues.

UNIT V POPULATION HEALTH MANAGEMENT 9

Introduction – Population Health Management(PHM) – Key components – Obstacles to PHM – Three pillars of PHM – Uses of Population Health Management – A leap forward for PHM – Data Infrastructure – Data Sources – Big data's role – analytics – Predictive modeling – Social and Behavioral Determinants of Health – Behavioral Health – Future of Population Health Management.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course, the students should be able to:

- Describe the fundamentals of cognitive computing and its relationship with big data
- Apply advance data analytics of techniques in health care domain
- Develop cognitive applications in the area of population health management

REFERENCES:

1. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley, 2015.
2. Chandan K. Reddy, Charu C. Aggarwal, Healthcare Data Analytics , CRC Press, 2015.
3. Richard Hodach, Paul Grundy, Anil Jain, Michael Weiner, Karen Ezekiel Handmaker, Provider-Led Population Health Management: Key Healthcare Strategies in the Cognitive Era, 2nd Edition, Wiley 2016
4. Rob high, The Era of Cognitive Systems: An Inside Look at IBM Watson and How it Works - An IBM Red guide publication, 2012.

Faculty of I and C Engg **(Approved in 23rd AC 03.05.2018) ITEM NO. FI 23.7(1)**

FI9104 COMPUTATIONAL INTELLIGENCE AND FEATURE SELECTION L T P C
3 0 0 3

OBJECTIVES:

- To learn the basics of classical set theory, rough set theory and fuzzy set theory.
- To acquire knowledge on various traditional methods of classification and dimensional reduction.
- To study the rough set based approaches to feature selection.
- To acquire knowledge about the hybrid approaches to feature selection.
- To get introduced to other types of feature selection methods.

UNIT I INTRODUCTION 9

The Importance of Feature Selection – Classical Set Theory – Rough Set Theory – -Fuzzy & Rough Set Theory

UNIT II CLASSIFICATION METHODS AND DIMENSIONALITY REDUCTION 9

Crisp Approaches – Fuzzy Approaches – Rule-base Optimization – Transformation based Reduction – Selection based Reduction – Rough Set Attribute Reduction – RSAR Optimizations

UNIT III ROUGH SET BASED APPROACHES TO FEATURE SELECTION 9

Discernibility matrix based Approaches – Reduction with Variable Precision Rough Sets– Dynamic Reducts – Relative Dependency Method –Tolerance-Based Method Alternative Approaches – Comparison of crisp Approaches– Applications of RSAR

UNIT IV FUZZY – ROUGHHYBRIDIZATION AND FEATURE SELECTION 9

Theoretical Hybridization – Supervised Learning and Information Retrieval –Feature Selection with Fuzzy Rough Set – Fuzzy Rough Reduction Process – Complexity Analysis – Optimizations – Evaluating the Fuzzy – Rough Metrics

UNIT V ADVANCED FEATURE SELECTION METHODS 9

Introduction – New Fuzzy-Rough Feature Selection – Feature Grouping – Ant Colony Optimization Based Selection – Applications: Web Content Categorization, Medical Image Classification

OUTCOMES:

Upon Completion of the course, the students will be able to,

- Apply the different feature selection techniques to various problem domain.
- Underline the basics of classical set theory, rough set theory and fuzzy logic.
- Perform attribute reduction using rough sets.
- Analyze the various types of feature selection techniques.
- Apply hybrid techniques for feature selection.
- Apply the appropriate feature selection algorithm to a problem domain

REFERENCES:

1. Jensen, Richard, and Qiang Shen, "Computational intelligence and feature selection: rough and fuzzy approaches", Vol. 8. John Wiley & Sons, 2008.
2. Liu, Huan, and Hiroshi Motoda, "Feature selection for knowledge discovery and data mining", Vol. 454. Springer Science & Business Media, 2012.
3. Liu, Huan, and Hiroshi Motoda, "Computational methods of feature selection", CRC Press, 2007.
4. Stańczyk, Urszula, and Lakhmi C. Jain, "Feature selection for data and pattern recognition" Springer Berlin Heidelberg, 2015.

Faculty of I and C Engg **(Approved in 23rd AC 03.05.2018) ITEM NO. FI 23.7(2)**

FI9105	**FOG COMPUTING**	**L T P C**
		3 0 0 3

OBJECTIVES:

- To understand the basics of fog computing.
- To get an idea about the various services provided by fog computing**.**
- To familiarize themselves with various communication techniques.
- To get an idea of some application area where fog computing can be applied.
- To understand the various issues in fog computing.

UNIT I FUNDAMENTALS OF FOG COMPUTING 9

Basic principles - Architecture and general applications - Introduction - Background and motivation of computing - Fog layer and its characteristics - Design and organization of fog layer.

UNIT II STORAGE AND COMPUTATION SERVICES IN FOG 9

Storage services distributed caching for enhancing communication efficiency - Fog computing services - Wireless video fog: Collaborative live streaming with error recovery- Mind your own bandwidth - Elastic mobile device clouds: Leveraging mobile devices to provide cloud computing services at the edge.

UNIT III COMMUNICATION IN FOG 9

Communication services - Cloudlet mechanism - Cloudlet architecture in mobile cloud computing environment - Para Drop: An edge computing platform in home gateways- Socially_aware cooperative D2D and D4D communications toward fog networking -Survey on SDN,NFV in fog - SDN,NFV cooperation.

UNIT IV MANAGEMENT OF FOG IN IOT 9

Fog computing in IOT - Management of fog layer - IOT resource estimation challenges and modeling in fog - Tackling IOT ultra large scale system - Application scenario of fog.

UNIT V PRIVACY ISSUES AND APPLICATION IN FOG 9

Present and future of privacy preserving computation - Self aware fog computing in private and secure spheres - Urban IOT edge analytics - The role of fog computing in the future of the automobile geographic addressing for field networks.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to

- Articulate the main concepts, key technologies, strength and limitations of fog computing.
- Identify the architecture, infrastructure models of fog computing.
- Analyze the core issues of fog computing such as security, privacy and interoperability .
- Analyze and design different models for network dynamics.
- Identify and design the new models for market strategic interaction.

REFERENCES:

1. Amir.M.Rahmani, Pasi Liljeberg, Jurgo Preden, Alex Janstch., "Fog Computing in the Internet of Things" Intelligence at the edge by Springer, 28 June 2017.
2. Mung Chiang, Bharat Balasubramaniam, Flavio Bomoni.,"Fog For 5g and Iot (Information and communication Technology Series)" by Willey - Black well, 9 June 2017.
3. Evangelos Markakis, George Mastorakis, Constandinos X.Mavromoustakis and Evangelos Pallis.,"Cloud and Fog Computing in 5g Mobile Networks: Emerging advances and applications, 30 Mar 2017.
4. Julian Mullen., "The Fog Computing Handbook" Everything you need to know about fog computing, 20 Nov 2016.

Faculty of I and C Engg **(Approved in 23rd AC 03.05.2018) ITEM NO. FI 23.7(3)**

FI9106 POWER TESTING FOR CMOS DEVICES L T P C
3 0 0 3

OBJECTIVES:

- To identify the power issues at various levels of testing.
- To introduce methods to generate test patterns with low power.
- To introduce methods to reduce power in scan cells.
- To analyse the various types of defects in multivoltage design.
- To understand the power management techniques followed in memory cells.

UNIT I POWER ISSUES DURING TEST 9

Power and Energy Basics– Sources of Software Power Dissipation – Manufacturing Test Flow – Power Delivery Issues– Thermal Issues during Test – Test Throughput Problem – Test Power Metrics and Estimation – Power Estimation at the Logic Level – Circuit Level –

Software power Estimation – Optimization – Automated low power code generation – Codesign for Low Power - Low power VLSI design: Limits.

UNIT II LOW POWER TEST PATTERN GENERATION AND TEST DATA COMPRESSION 9

Low Power ATPG – Low Power Test Compaction – Low Power X-Filling – Low Shift and Capture Power X-Filling – Low Power X-Filling for Compressed Scan Testing – Low Power Test Ordering – Low Power Memory Test Generation – Coding, LFSR Decompressor and Broadcast Scan based Compression Methods – Low Power BIST Techniques.

UNIT III POWER AWARE DESIGN – FOR – TEST 9

Power Consumption in Scan Design – Low Power Scan cells – Scan Path Organization – Partitioning for low power – Core Based Test Architecture Design and Test Planning – Power Modelling, Estimation and Manipulation – Power Constrained Test Planning and Strategies for SOCs – Design Flows for Power Management – Test Automation Objectives – Integration of Power Management Techniques in DFT synthesis flow – Handling of state Retention Registers – Impact on DFT Architecture – Implementation – Test planning.

UNIT IV TEST STRATEGIES FOR MULTI VOLTAGE AND GATED CLOCK DESIGNS 9

Test for Multi voltage Design: Bridge Defect – Open Defect – DFT for Low Power Design – Open Research problems – DFT for Clock Gating Logic – Advantage of Clock Gating.

UNIT V LOW POWER DESIGN TECHNIQUES AND POWER MANAGEMENT 9

Low Power Design Trends – Power Specification Format – Implication to Test Requirement and Test Cost – Low Power Design Techniques for Test Power and Coverage Improvement – Self Calibrating and Self Correcting Systems – Self Repairing SRAM – Clock Gating Logic – Power Control Logic – Power Switches – Low Power Cells – Power Distribution Network.

TOTAL: 45 PERIODS

OUTCOMES:

- Able to estimate power at various levels of testing.
- Ability to generate low power test patterns.
- Ability to design low power DFT architecture.
- Will identify the defects in multivoltage design.
- Ability to design low power memory cells.

REFERENCES:

1. Patrick Girard, Nicola Nicolici, Xiaoqing Wen “Power – Aware Testing and Test
2. Strategies for Low Power Devices” – Springer, 2010.
3. Kaushik Roy, Sharat Prasad “Low Power CMOS VLSI Circuit Design” – John Wiley &
4. Sons – 2000.
5. KiatSeng Yeo, Kaushik Roy “Low Voltage, Low Power VLSI Subsystems” - McGraw Hill Professional, 2005.
6. Wolfgang Nebel, Jean Mermet “Low Power Design in Deep Submicron Electronics” Kluwer Academic Publishers, 1997.

FI9107 **BIOMEDICAL TEXT MINING** **L T P C**
3 0 0 3

UNIT I **9**

Introduction to NLP - historical background - fundamental concepts in biomedical text analysis.

UNIT II **9**

Named entity recognition – medical concept representation – concept normalisation – characterising biomedical concept relationships – relation extraction – ontologies and computational lexical semantics – biomedical ontologies.

UNIT III **9**

Corpus construction and annotation – text mining on big and complex biomedical literature – modelling text retrieval in biomedicine – identification of biological relationships from text documents.

UNIT IV **9**

Probabilistic topic models: LDA – correlated topic models – supervised topic models – dirichlet process: HDP – posterior inference for LDA – stochastic variational inference for LDA – mean field variational inference for LDA.

UNIT V **9**

Summarisation – gene pathway text mining and visualisation – genomic data mine – exploratory genomic data analysis.

TOTAL : 45 PERIODS

REFERENCES:

1. Cohen, K. B., and Fushman, D. D., “Biomedical Natural Language Processing”, John Benjamins Publishing Company, 2014.
2. Chen, H, Sherrilynne S. Fuller, Friedman, C and Hersh, W, “Medical Informatics:Knowledge Management and Data Mining in Biomedicine”, Springer Science+Business Media, 2005.
3. Information Resources Management Association, “Biomedical Engineering: Concepts, Methodologies, Tools and Applications”, IGI global, 2018.
4. Shatkay, H and Craven, M, “Mining the Biomedical Literature”,The MIT Press, Cambridge, 2012.
5. David M. Blei, “Probabilistic Topic Models”, Machine Learning summer school, 2012.
6. David M. Blei, “Probabilistic Topic Models”, ICML tutorial, 2012

FI9108 NEXT GENERATION MOBILE NETWORKS L T P C
3 0 0 3

UNIT I PERVASIVE CONNECTED WORLD & 5G INTERNET 9

Introduction - Historical Trend of Wireless Communications - Evolution of LTE Technology to Beyond 4G - 4 5G Roadmap - Pillars of 5G - Machine Type Communication - Developing Millimeter Wave RATs - Redesigning Backhaul Links - Energy Efficiency - Allocation of New Spectrum for 5G -Spectrum Sharing - RAN Virtualization - Internet of Things and Context Awareness - Networking Reconfiguration and Virtualization Support - Mobility - Quality of Service Control - Emerging Approach for Resource Over Provisioning.

UNIT II SMALL CELLS FOR 5G MOBILE NETWORKS 9

Introduction - Capacity Limits and Achievable Gains with Densification - Mobile Data Demand - Demand vs. Capacity - Small Cell Challenges;

UNIT III COOPERATION FOR NEXT GENERATION WIRELESS NETWORKS 9

Introduction - Cooperative Diversity and Relaying Strategies - PHY Layer Impact on MAC Protocol Analysis - Case Study: NCCARQ – Performance Evaluation

UNIT IV MOBILE CLOUDS AND COGNITIVE RADIO 9

Mobile Clouds - Introduction - The Mobile Cloud - Mobile Cloud Enablers – Network Coding - Cognitive Radio - Overview of Cognitive Radio Technology in 5G Wireless - Spectrum Optimization using Cognitive Radio - Relevant Spectrum Optimization Literature in 5G - Cognitive Radio and Carrier Aggregation - Energy Efficient Cognitive Radio Technology

UNIT V SECURITY & SON EVOLUTION 9

Security- Introduction - Overview of a Potential 5G – Communications System Architecture- Security Issues and Challenges in 5G Communications Systems - SON - Introduction - SON in UMTS and LTE - The Need for SON in 5G- Evolution towards Small Cell Dominant HetNets

TOTAL : 45 PERIODS

REFERENCES:

1. Fundamentals of 5G Mobile Networks, Jonathan Rodriguez, Wiley, 2015.
2. Cloud Based 5G Wireless Networks (Springer Briefs in Computer Science), Yin Zhang, Min Chen, 2016.
3. New Directions in Wireless Communications Systems: From Mobile to 50 , Athanasios G. Kanatas, Konstantina S. Nikita, Panagiotis (Takis) Mathiopoulos, 2017.