PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018
(AUTONOMOUS)
M.E. COMMUNICATION SYSTEMS
REGULATIONS 2015
CURRICULUM

SEMESTER III

Course Code	Course Title	L	T	P	C
PCS15301	Smart Antennas	3	2	0	4
PCS1555X	Elective V	3	0	0	3
PCS1565X	Elective VI	3	0	0	3
PCS15302	Project work Phase I	0	0	12	6

SEMESTER IV

Course Code	Course Title	L	T	P	C
PCS15401	Project work Phase II	0	0	24	12

ELECTIVE V

Course Code	Course Title	L	T	P	C
PCS15551	High Performance Networks	3	0	0	3
PCS15552	Speech Processing and Synthesis	3	0	0	3
PCS15553	DSP Processor Architecture and Programming	3	0	0	3
PCS15554	Neural Network and Applications	3	0	0	3

ELECTIVE VI

Course Code	Course Title	L	T	P	C
PCS15651	Wavelet transform and applications	3	0	0	3
PCS15652	VLSI Signal Processing	3	0	0	3
PCS15653	Internetworking Multimedia	3	0	0	3
PCS15654	VLSI for Wireless Communication	3	0	0	3

SEMESTER III

PCS15301 SMART ANTENNAS 3 2 0 4

COURSE OBJECTIVES

- To gain fundamental knowledge of smart antennas
- To learn about narrow and broad band processing
- To study about adaptive processing
- To provide in-depth knowledge on direction of arrival estimation methods
- To understand diversity combining

UNIT I SMART ANTENNAS 15

Historical development of smart antennas- Antenna gain, Antenna Pattern, Antenna bore sight, Phased array antenna, power pattern, beam steered and weighted arrays, beam steered circular arrays, rectangular planar arrays- fixed beam arrays- retro directive arrays, degree of freedom, optimal antenna, adaptive antennas, smart antenna -key benefits of smart antenna technology, wide band smart antennas, Digital radio receiver techniques and software radio for smart antennas.

UNIT II NARROW AND BROAD BAND PROCESSING 15

Signal model conventional beamformer- null steering beamformer-optimal beamformer-Optimization using reference signal, beam space processing - Tapped delay line structure, Partitioned realization, Derivative constrained processor, Digital beam forming, Broad band processing using DFT method.

UNIT III ADAPTIVE PROCESSING 15

Sample matrix inversion algorithm, unconstrained LMS algorithm, normalized LMS algorithm, Constrained LMS algorithm, Perturbation algorithms, neural network approach, Adaptive beam space processing - Implementation issues.

UNIT IV DIRECTION OF ARRIVAL ESTIMATION METHODS 15

Fundamentals of matrix algebra- array correlation matrix- AOA estimation methods- Spectral estimation methods- Bartlett method and Capon method, linear prediction method, Maximum Entropy method, Maximum Likelihood method, PHD method, Min-norm method, Eigen Structure methods, Music Algorithm -root Music and cyclic music algorithm, the ESPRIT algorithm

UNIT V DIVERSITY COMBINING 15

Spatial Diversity selection combiner - Switched diversity combiner – Equal gain combiner - Maximum ratio combiner - Optical combiner.

TOTAL: 75 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- understand the fundamentals of smart antennas
- gain knowledge on narrow, broad band and adaptive processing
- gain in-depth knowledge on direction of arrival estimation methods
- understand diversity combining

REFERENCES

1. Lal Chand Godara, "Smart Antennas" CRC press, 2004
2. Joseph C Liberti.Jr and Theodore S Rappaport, "Smart Antennas for Wireless Communication: IS-95 and Third Generation CDMA Applications", Prentice Hall 1999.
3. Frank B.Gross, " Smart Antennas for Wireless Communications", McGraw Hill, 2005
4. Balanis, "Antennas", John Wiley and Sons, 2005
5. IEEE Transaction on Antenna and Wave Propagation

WEB LINKS

1. www.microstripantenna.com
2. http://ids.nic.in/technical_letter/TNL_JCES_JUL_2013/Smart%20Ant%20Technology%20.pdf
3. http://117.218.52.222:8080/quality/TelecomBasics%5Csmart_ant.pdf
4. http://www.co.it.pt/seminarios/webcasting/itestg_21_07_05.pdf

ELECTIVE V

PCS15551 HIGH PERFORMANCE NETWORKS 3 0 0 3

COURSE OBJECTIVES

- To develop a sound knowledge on High Performance Networks.
- To inculcate a comprehensive understanding of multimedia networking.
- To study the wireless and Mobile networks
- To learn about network performance evaluation
- To implement various Network security in computer networks

UNIT I HIGH PERFORMANCE NETWORKS 9

History of Communication Networks, Networking Principles, Future Networks, High Performance Networks, The Internet and TCP/IP Networks, Packet Switched Networks, Circuit Switched Networks, Asynchronous Transfer mode.

UNIT II MULTIMEDIA NETWORKING 9

Multimedia Networking Applications, Streaming stored Audio and Video, Best effort service, Protocols for real time interactive applications, Distributing Multimedia: Content Distribution Networks, Beyond Best Effort, Scheduling and policing mechanism, Integrated services and Differentiated Services, RSVP.

UNIT III WIRELESS AND MOBILE NETWORKS 9

Introduction, Wireless links and network characteristics, Wi-Fi:802.11 Wireless LANs, Cellular Internet Access, Mobility management: Principles, Mobile IP, Managing Mobility in cellular Networks, Wireless and Mobility: Impact on Higher-layer protocols

UNIT IV COMPRESSION AND NETWORK PERFORMANCE EVALUATION 9

Foundations of compression, Audio compression, Video Compression, Network performance evaluation-Monitoring, SNMP, CMOT, and RMON, Models and Analysis, Simulation.

UNIT V SECURITY IN COMPUTER NETWORKS 9

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control: fire walls – attacks and counter measures – security in many layers: Case Studies

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- understand the concept of introduction of various network topology
- obtain the knowledge about the use of network in multimedia field

- know about the various advanced techniques used in networking
- realize the various ways of compression and evaluation of networks
- analyse the concept of network security in computer networks.

REFERENCES:

1. Jean Walrand, Pravin Varaiya, "High performance communication network", Morgan Kaufmann Publishers Inc, second edition, 2000.
2. James F Kurose & Keith W Ross, "Computer Networking- A top down approach featuring the internet", Pearson, third edition, 2006.
3. Jean Walrand, "Communication networks", Mc Graw Hill, second edition 2002.
4. LEOM-GarCIA, WIDJAJA, "Communication networks", TMH, seventh reprint 2002.
5. Hersent Gurle & petit, "IP Telephony, Packet Pored Multimedia communication Systems", Pearson education, 2003.
6. Nader F.Mir, "Computer and Communication Networks", first edition, 2010.
7. Larry l.Peterson & Bruce S.David, "Computer Networks: A System Approach", 1996.

WEBLINKS

1. www.nptelvideos.in/2012/11/high-performance-computing.html
2. www.iitvideos.blog.com

PCS15552 SPEECH PROCESSING AND SYNTHESIS 3 0 0 3

COURSE OBJECTIVES

- To understand the mathematical foundations needed for speech processing
- To learn the basic concepts and algorithms of speech processing and synthesis
- To familiarize the students with the various speech signal representation, coding and recognition techniques
- To appreciate the use of speech processing in current technologies and to expose the students to real– world applications of speech processing

UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral Processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

UNIT III SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques.

UNIT IV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation schematic – Speaking Style – Symbolic Prosody – Duration Assignment – Pitch Generation

UNIT V SPEECH SYNTHESIS 9

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems

.TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- identify the various temporal, spectral and cepstral features required for identifying speech
- describe units – phoneme, syllable and word

- determine and apply mel-frequency cepstral coefficients for processing all types of signals
- justify the use of formant and concatenative approaches to speech synthesis
- identify the apt approach of speech synthesis depending on the language to be processed
- determine the various encoding techniques for representing speech.

REFERENCES:

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, "Spoken Language Processing – A guide to Theory, Algorithm and System Development", Prentice Hall PTR, 2001.
2. Thomas F.Quatieri, "Discrete-Time Speech Signal Processing", Pearson Education, 2002.
3. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Prentice Hall Signal Processing Series, 1993.
4. Sadaoki Furui, "Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications)", Marcel Dekker, 2000.
5. Joseph Mariani, "Language and Speech Processing", Wiley, 2009.

WEBLINKS

1. mohitgoel4u.blogspot.com/p/speech-signal-processing.html
2. http://nptel.ac.in/syllabus/117104023/
3. http://onlinevideolecture.com/?course_id=374
4. https://www.youtube.com/watch?v=Xjzm7S__kBU
5. https://www.youtube.com/watch?v=Xjzm7S__kBU

PCS15553 DSP PROCESSOR ARCHITECTURE AND PROGRAMMING 3 0 0 3

COURSE OBJECTIVES

- To provide in-depth knowledge on Digital Signal Processor basics
- To understand the Third generation DSP Architecture and programming skills
- To get trained on the advanced DSP processors and its applications.

UNIT I PROGRAMMABLE DSPS 9

Multiplier and Multiplier accumulator – Modified Bus Structures and Memory access in PDSPs – Multiple access memory – Multiported Memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C5X PROCESSOR 9

Architecture – Assembly language syntax - Addressing modes – Assembly language Instructions - Pipeline structure, Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals.

UNIT III ARCHITECTURES FOR PROGRAMMABLE DIGITAL SIGNAL PROCESSING DEVICES 9

Introduction – Basic Architectural features – DSP Computational Building blocks – Bus Architecture and Memory – Data Addressing Capabilities – Address Generation Unit – Programmability and Program Execution

UNIT IV ADSP PROCESSORS 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT V ADVANCED PROCESSORS 9

Architecture of TMS320C54X: Pipe line operation, Code Composer studio – Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- gain in-depth knowledge on programmable DSPS
- understand the architecture of programmable DSPS
- analyze ADSPS and advanced processors

REFERENCES:

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. Avtar Singh and S. Srinivasan, "Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx", cengage Learning India Private Limited, Delhi 2012.
3. User guides Texas Instrumentation, Analog Devices, Motorola.
4. Rulph Chassaing, "Digital Signal Processing and Applications with the C6713 and C6416 DSK", John Wiley & Sons, Inc., Publication, 2005.

WEB LINKS

1. www.ti.com/lit/ug/spru056d/spru056d.pdf
2. www.ti.com/cn/lit/gpn/tms320c50
3. www.analog.com/media/en/.../data.../ADSP-2101_2103_2105_2115.pdf
4. www.dspguide.com/ch28/3.htm
5. elearning.vtu.ac.in/11/enotes/DSPAlgoArch/unit2-KSS.pdf

PCS15554 NEURAL NETWORK AND APPLICATIONS 3 0 0 3

COURSE OBJECTIVES

- To study the concepts of biological and artificial neurons
- To explore the fundamentals of various algorithms related to supervised neural networks and its applications
- To explore the Applications of various algorithms related Genetic algorithms and SVM

UNIT I LEARNING ALGORITHMS 9

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback – Learning Process: Error Correction Learning –Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering – Beam forming – Memory – Adaptation - Statistical Learning Theory

UNIT II RADIAL BASIS FUNCTION NETWORKS & SUPPORT VECTOR MACHINES

RADIAL BASIS FUNCTION NETWORKS 9

Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks - Learning in Radial Basis Function Networks - Applications: XOR Problem – Image Classification Support Vector Machines: Optimal Hyper plane for Linearly Separable Patterns and Non separable Patterns – Support Vector Machine for Pattern Recognition – XOR Problem - -insensitive Loss Function – Support Vector Machines for Nonlinear Regression

UNIT III ATTRACTOR NEURAL NETWORKS 9

Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos - Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs – Applications.

UNIT IV ADAPTIVE RESONANCE THEORY 9

Noise-Saturation Dilemma - Solving Noise-Saturation Dilemma – Recurrent On-center –Off-surround Networks – Building Blocks of Adaptive Resonance – Substrate of Resonance Structural Details of Resonance Model – Adaptive Resonance Theory – Applications.

UNIT V SELF ORGANIZING MAPS AND NEOCOGNITRON 9

Self-organizing Map – Maximal Eigenvector Filtering – Sanger's Rule – Generalized Learning Law – Competitive Learning - Vector Quantization – Mexican Hat Networks - Self-organizing Feature Maps – Applications. Architecture of Neocognitron – Data processing and performance of Neocognitron - Architecture of spatio – temporal networks for speech recognition.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- understand the basics of neural networks.
- know the concepts of radial basis functions.
- gain knowledge about bidirectional associative memory.
- understand the principles of resonance theory.
- gain in-depth knowledge about self organizing maps.

REFERENCES

1. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation", Addison Wesley Longman (Singapore) Private Limited, Delhi, second edition, 2001.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Education 2003.
4. Simon Haykin, "Neural Networks: A Comprehensive Foundation", second edition, Prentice Hall India, 2002.
5. Martin T.Hagan, Howard B. Demuth, and Mark Beale, "Neural Network Design", Thomson Learning, New Delhi, 2003.

WEB LINKS

1. https://www.youtube.com/watch?v=xbYgKoG4x2g
2. http://nptel.ac.in/courses/117105084/
3. www.cse.iitd.ac.in/~saroj/AI/ai2013/L22.ppt

ELECTIVE VI

PCS15651 WAVELET TRANSFORMS AND APPLICATIONS 3 0 0 3

COURSE OBJECTIVES

- To understand the fundamentals of Vector Analysis.
- To learn the concepts of multi resolution analysis.
- To understand the properties of continuous wavelet transforms.
- To characterize Filter Bank and Sub Band Coding Principles.
- To study the various Image Compression Techniques.

UNIT I MATHEMATICAL FUNDAMENTALS 9

Linear spaces – Vectors and vector spaces – Basis functions – Dimensions –Orthogonality and biorthogonalilty– Local basis and Riesz basis – Discrete linear normed space – Approximation by orthogonal projection –Matrix algebra and linear transformation..

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar Basis – Construction of General Orthonormal MRA – Wavelet Basis for MRA – Continuous Time MRA Interpretation for the DTWT – Discrete Time MRA – Basis Functions for the DTWT – PRQMF Filter Banks.

UNIT III CONTINUOUS WAVELET TRANSFORMS 9

Wavelet Transform – Definition and Properties – Concept of Scale and its Relation with Frequency – Continuous Wavelet Transform (CWT) – Scaling Function and Wavelet Functions (Daubechies Coiflet, Mexican Hat, Sinc, Gaussian, Bi Orthogonal) – Tiling of Time – Scale Plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORMS 9

Filter Bank and Sub Band Coding Principles – Wavelet Filters – Inverse DWT Computation by Filter Banks – Basic Properties of Filter Coefficients – Choice of Wavelet Function Coefficients – Derivations of Daubechies Wavelets – Mallat's Algorithm for DWT – Multi Band Wavelet Transforms Lifting Scheme- Wavelet Transform Using Poly phase Matrix Factorization –Geometrical Foundations of Lifting Scheme – Lifting Scheme in Z –Domain.

UNIT V TRANSFORMS AND ITS APPLICATIONS 9

Wavelet methods for signal processing- Image Compression Techniques: EZW–SPHIT Coding –Image Denoising Techniques: Noise Estimation – Shrinkage Rules – Shrinkage Functions – Edge Detection and Object Isolation, Image Fusion, and Object Detection.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- apply the fundamentals of vector analysis.
- know the concepts of multi resolution analysis.
- understand the properties of continuous wavelet transforms.
- apply the knowledge of filter bank and sub band coding principles.
- analyse the various image compression techniques.

REFERENCES

1. Rao R.M and A.S.Bopardikar, "Wavelet Transforms Introduction to theory and Applications", Pearson Education, Asia, 2000.
2. J.C.Goswami and A. K. Chan, "Fundamentals of wavelets: Theory, Algorithms and Applications", Wiley Inter science Publication, John Wiley & Sons Inc., 1999.
3. M. Vetterli, J.Kovacevic, "Wavelets and subband coding", Prentice Hall Inc, 1995.
4. Stephen G. Mallat, "A wavelet tour of signal processing", second edition Academic Press, 2000.
5. Soman K.P and Ramachandran K.I, "Insight into Wavelets from Theory to practice", Prentice Hall, 2004.

WEB LINKS

1. https://people.cs.kuleuven.be/~adhemar.bultheel/WWW/WAVE/print4.pdf
2. http://www.nipe.eeg.uminho.pt/Uploads/WP_2011/NIPE_WP_16_2011.pdf
3. www.siue.edu/~msong/Research/ency.pdf
4. disp.ee.ntu.edu.tw/tutorial/WaveletTutorial.pdf
5. gwyddion.net/documentation/user-guide-en/wavelet-transform.html

PCS15652 VLSI SIGNAL PROCESSING 3 0 0 3

COURSE OBJECTIVES

- To know about the DSP systems, pipelining and parallel processing of FIR filters
- To learn about Retiming, algorithmic strength reduction
- To gain knowledge about fast convolution, pipelining and parallel processing of IIR filters
- To know about numerical strength reduction, synchronous, wave and asynchronous pipelining
- To provide in-depth knowledge on scaling, round-off noise, bit-level arithmetic architectures

UNIT I DSP SYSTEMS, PIPELINING AND PARALLEL PROCESSING OF FIR FILTERS 9

DSP systems - Typical DSP algorithms - Data flow and Dependence graphs -critical path -Loop bound - iteration bound - longest path matrix algorithm - Pipelining and Parallel processing of FIR filters - Pipelining and Parallel processing for low power.

UNIT II RETIMING, ALGORITHMIC STRENGTH REDUCTION 9

Retiming – definitions and properties, Unfolding – an algorithm for unfolding, properties of unfolding, sample period reduction and parallel processing application, Algorithmic strength reduction in filters and transforms, 2-parallel FIR filter, 2-parallel fast FIR filter, DCT architecture, rank-order filters, Odd-Even merge-sort architecture, parallel rank order filters.

UNIT III FAST CONVOLUTION, PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS 9

Fast convolution - Cook-Toom algorithm - modified Cook-Toom algorithm - Pipelined and parallel recursive filters - Look-Ahead pipelining in first-order IIR filters - Look-Ahead pipelining with power of-two decomposition - Clustered look-ahead pipelining - Parallel processing of IIR filters - combined pipelining and parallel processing of IIR filters.

UNIT IV NUMERICAL STRENGTH REDUCTION, SYNCHRONOUS, WAVE AND ASYNCHRONOUS PIPELINING 9

Numerical strength reduction - sub expression elimination - multiple constant multiplication -, iterative matching - synchronous pipelining and clocking styles - clock skew in edge-triggered single phase clocking - two-phase clocking, wave pipelining - Asynchronous pipelining bundled data versus dual rail protocol.

UNIT V SCALING, ROUND-OFF NOISE, BIT-LEVEL ARITHMETIC ARCHITECTURES 9

Scaling and round-off noise - scaling operation, round-off noise - state variable description of digital filters - scaling and round-off noise computation - round-off noise in pipelined IIR filters - Bit-level arithmetic architectures - parallel multipliers with sign extension - parallel carry-ripple and carry-save multipliers - Design of Lyon’s bit-serial multipliers using Horner’s rule - bit-serial FIR filter - CSD

representation - CSD multiplication using Horner's rule for precision improvement - Distributed Arithmetic fundamentals and FIR filters.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- gain knowledge about the DSP systems, pipelining and parallel processing of fir filters
- remember about retiming, algorithmic strength reduction
- gain knowledge about fast convolution, pipelining and parallel processing of iir filters
- understand about numerical strength reduction, synchronous, wave and asynchronous pipelining
- evaluating the scaling, round-off noise, bit-level arithmetic architectures

REFERENCES

1. Keshab K. Parhi, "VLSI Digital Signal Processing Systems, Design and implementation", Wiley Interscience, first edition (reprint), 2008.
2. U. Meyer – Baese, "Digital Signal Processing with Field Programmable Gate Arrays", Springer, third edition, 2007.
3. Rogger Woods, John MCallister, Richard Turner and Ying Yi, "FPGA – based Implementation of Signal Processing Systems", John Wiley & Sons, first edition, 2008.

WEB LINKS

1. http://socdsp.ee.nchu.edu.tw/class/download/vlsi_dsp_102/night/DSP/Ch4_pipelining%20and%20parallel%20processing.pdf
2. alia.fc.uaslp.mx/~rmariela/RTDSP/ch4.pdf
3. www.ece.umn.edu/users/parhi/SLIDES/chap8.pdf
4. https://inst.eecs.berkeley.edu/~ee123/sp16/docs/FastConv.pdf
5. www.cs.columbia.edu/~nowick/nowick-singh-ieee-dt-11-published.pdf

PCS15653 INTERNETWORKING MULTIMEDIA 3 0 0 3

COURSE OBJECTIVES

- To provide in-depth knowledge about multimedia networking
- To gain knowledge about Broadband network technology
- To gain in-sight onto reliable transport protocol and applications
- To know about multimedia communication standards
- To learn about multimedia communication across networks

UNIT I MULTIMEDIA NETWORKING 9

Digital Sound, Video and Graphics – Basic Multimedia Networking – Multimedia Characteristics – Evolution of Internet Services Model – Network Requirements for Audio/ Video Transform – Multimedia Coding and Compression for Text, Image Audio And Video.

UNIT II BROADBAND NETWORK TECHNOLOGY 9

Broadband Services – ATM and IP, IPV6, High Speed Switching – Resource Reservation, Buffer Management – Traffic Shaping – Caching – Scheduling and Policing, Throughput, Delay and Jitter Performance – Storage and Media Services – Voice and Video Over IP – MPEG–2 over ATM/IP – Indexing Synchronization of Requests – Recording and Remote Control .

UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS 9

Multicast over Shared Media Network – Multicast Routing and Addressing – Scaling Multicast and NBMA Networks – Reliable Transport Protocols – TCP Adaptation Algorithm – RTP, RTCP – MIME – Peer–to–Peer Computing – Shared Application – Video Conferencing, Centralized and Distributed Conference Control – Distributed Virtual Reality – Light Weight Session Philosophy .

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

Objective of MPEG – 7 Standard – Functionalities and Systems of MPEG–7, MPEG–21 Multimedia Framework Architecture – Content Representation – Content Management and usage – Intellectual Property Management – Audio Visual System – H322 : Guaranteed QOS LAN Systems – MPEG-4 Video Transport across Internet.

UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS 9

Packet Audio/Video in The Network Environment –Video Transport across Generic Networks – Layered Video Coding– Error Resilient Video Coding Techniques – Scalable Rate Control – Streaming Video Across Internet – Multimedia Transport Across ATM Networks and IP Network – Multimedia Across Wireless Networks .

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- gain knowledge about multimedia networking
- describe about broadband network technology
- gain in-sight onto reliable transport protocol and applications
- illustrate about multimedia communication standards
- create multimedia communication across networks

REFERENCES:

1. B O Szuprowicz, "Multimedia Networking", McGraw Hill, Newyork, 1995.
2. K R Rao, Zoran S, Bojkovic and Dragorad A, Milovanovic, "Multimedia communication systems", PHI, 2003.
3. Jon Crowcroft, Mark Handley, Ian Wakeman "Internetworking Multimedia" Harcourt, Singapore, 1998.
4. Tay Vaughan, "Multimedia Making it to work", Tata McGraw Hill, New Delhi, fourth edition.

WEB LINKS

1. http://nptel.ac.in/courses/106105082/37
2. http://nptel.ac.in/courses/117101050/
3. www.nptel.ac.in/courses/106105080/pdf/M6L3.pd
4. www.nptel.ac.in/syllabus/117105083
5. nptel.ac.in/courses/106105082/37

PCS15654 VLSI FOR WIRELESS COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

- To realize the basics of wireless communication.
- To understand the concepts of transceiver architectures.
- To introduce to the students the low power design techniques of VLSI circuits.
- To learn the design and implementation of various VLSI circuits for wireless communication systems

UNIT I WIRELESS COMMUNICATION 9

Digital communication systems- minimum bandwidth requirement, the Shannon limit- overview of modulation schemes- classical channel- Characteristics of wireless channel – path loss- multipath fading- basics of spread spectrum and spread spectrum techniques.

UNIT II TRANSCEIVER ARCHITECTURE 9

Transceiver design constraints- baseband subsystem design- RF subsystem design- Super heterodyne receiver and direct conversion receiver- Receiver front-end- filter design- non-idealities and design parameters.

UNIT III LOW POWER DESIGN TECHNIQUES 9

Source of power dissipation- estimation of power dissipation- reducing power dissipation at device and circuit levels- low voltage and low power operation- reducing power dissipation at architecture and algorithm levels.

UNIT IV WIRELESS CIRCUITS 9

VLSI Design of LNA-wideband and narrow band-impedance matching - Automatic Gain Control (AGC) amplifier - Active mixer- analysis, conversion gain, distortion analysis- low frequency and high frequency case, noise - Passive mixer- sampling mixer and switching mixer- analysis of distortion, conversion gain and noise in these mixers.

UNIT V FREQUENCY SYNTHESIZERS 9

VLSI design of Frequency Synthesizers (FS) – Parameters of FS - PLL based frequency synthesizer, VCO- Phase Detector – Analog Phase Detectors – Digital Phase Detectors,LC oscillators- ring oscillator- phase noise, design approaches(DECT application)

TOTAL: 45 PERIODS

COURSE OUTCOMES

After the completion of the course, the students will be able to

- understand the application of vlsi circuits in wireless communication.
- gain knowledge of various architectures used in implementing wireless systems.

- simulate low power techniques using software
- establish the VLSI design of wireless circuits.

REFERENCES

1. Bosco Leung, “VLSI for Wireless Communication”, Springer, 2011.
2. Elmad N Farag and Mohamed I Elmasry, “Mixed Signal VLSI Wireless Design-Circuits and Systems”, Kluwer Academic Publishers, 2002.
3. David Tsee, Pramod Viswanath,” Fundamentals of Wireless Communication”, Cambridge Univ Press.

WEB LINKS

1. nptel.ac.in/video.php?subjectId=117102062
2. http://nptel.ac.in/courses/117102012/
3. https://www.youtube.com/watch?v=7xVSL93ZZq8
4. https://www.youtube.com/watch?v=CRgrQAgLVKc
5. nptel.ac.in/courses/106105034/