118COT01	APPLIED MATHEMATICS	L T P C
		3 0 0 3

UNIT I LINEAR ALGEBRAIC EQUATION AND EIGEN VALUE PROBLEMS 9

System of equations – Solution by Gauss Elimination, Gauss – Jordan and LU decomposition method – Jacobi, Gauss – Seidel iteration method – Eigen values of a matrix by Jacobi and power method

UNIT II WAVE EQUATION 9

Solution of initial and boundary value problems – Characteristics – D'Alembert's solution – Laplace transform solutions for displacement in a long string - a long string under its weight – a bar with prescribed force on one end – free vibrations of a string.

UNIT III SPECIAL FUNCTIONS 9

Bessel's equation – Bessel Functions – Legendre's equation – Legendre polynomials – Rodrigue's formula – Recurrence relations – generating functions and orthogonal property for Bessel functions – Legendre polynomials.

UNIT IV RANDOM VARIABLES 9

One dimensional Random Variable – Moments and MGF – Binomial, Poisson, Geometrical, Normal Distributions - Two dimensional random variables – Marginal and Conditional Distributions – Covariance and Correlation coefficient.

UNIT V QUEUEING THEORY 9

Introduction-Characteristics of Queueing Models- Little's Formula- Markovian Single server and multi server queuing models: Model I: (M/M/1): (∞/**FIFO**) , Model II: (M/M/s): (∞/**FIFO**) , Model III: (M/M/1): (**k/FIFO**) , Model IV: (M/M/s): (**k/FIFO**) -- (M/G/1) Queueing Syatem- Pollaczek Khinchin formula.

Total Hours: 45 Periods

REFERENCE(S) :

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, (2012).
2. Sankara Rao. K. "Introduction to partial differential equation" PHI,2010.
3. Taha, H.A., "Operations Research – An Introduction "6th Edition, PHI,2011.
4. Jain, M.K.Iyengar, S.R.K. &Jain R.K..," International methods for Scientific and Engineering Computation " New Age International (p)Ltd, Publishers,2012 .
5. Kanpur J.N.& Saxena.H.C "Mathematical Statistics", S.Chand & Co., New Delhi,2013.

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118COT02	ADVANCED DIGITAL SIGNAL PROCESSING	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Understand the concept of signals in frequency domain.
- Estimate the signal spectrum by parametric and Non-Parametric approach.
- Design and analysis of filtering functions.
- Understand the concept of Adaptive filters.
- Apply multirate signal processing in various applications.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density-Periodogram, Spectral Factorization, Filtering random processes.Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators-Modified periodogram, Bartlett and Welch methods, Blackman –Tukey method. Parametric Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction- Forward and backward predictions, Solutions of the Normal equations- Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction , FIR Wiener filter and Wiener IIR filters ,Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- Direct form FIR structures, Polyphase filter structures, time-variant structures. Multistage implementation of multirate system. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES:

Upon Completion of this course, students will be able to :

CO1: Analyze the discrete signal parameters in time and frequency domain.

CO2: Estimate statistical parameter of the signal in frequency domain.

CO3: Estimate and predict the different forms of signals.

CO4: Design and develop Adaptive filters.

CO5: Implement Sub-band coding for various Applications.

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REFERENCE BOOKS

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc.,Singapore, 2002
2. John G.Proakis, DimitrisG.Manolakis, Digital Signal Processing Pearson Education, 2002
3. G.M.REBEIZ, RF MEMS Theory, Design and Technology, John Wiley, 2003.
4. John G.Proakiset.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002
5. DimitrisG.Manolakiset.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000
6. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2	PS O 3
Co1	Analyze the discrete signal parameters in time and frequency domain.	3	2	3	1	3				1		3	3	1	
Co2	Estimate statistical parameter of the signal in frequency domain.	3	2	3	1	3				1		3	3	1	
Co3	Estimate and predict the different forms of signals.	3	2	3	1	3				1		3	3	1	
Co4	Design and develop Adaptive filters.	3	2	3	1	3				1		3	3	1	
Co5	Implement Sub-band coding for various Applications.	3	2	3	1	3				1		3	3	1	

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118COT03 **MODERN DIGITAL COMMUNICATION TECHNIQUE** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To extend the theory of Constant envelope modulation to M-ary schemes and to familiarize the concept of Spread Spectrum.
- To develop the mathematical and algorithmic foundations of the error detecting and error correcting codes used in modern communications systems.

UNIT I DETECTION AND ESTIMATION **9**

Pass band Transmission model - Gram Schmidt orthogonalization procedure, Geometric Interpretation of signals, Response of bank of correlators to a noisy input-Coherent detection of signals in noise, Probability of error - Correlation Receiver - Matched Filter - Detection of signals with unknown phase.

UNIT II CONSTANT ENVELOPE MODULATION **9**

Advantages of Constant Envelope Modulation - Minimum Shift Keying- Gaussian Minimum Shift Keying - M-ary Phase Shift Keying - M-ary Quadrature Amplitude Modulation - M-ary Frequency Shift Keying - Non Coherent modulation Techniques.

UNIT III CONVOLUTIONAL CODING **9**

Representation of codes using Polynomial - State diagram - Tree diagram - and Trellis diagram, Decoding techniques: Maximum likelihood decoding - Viterbi algorithm- Sequential decoding Coded modulation for bandwidth constrained channels.

Trellis coded modulation : Set Partitioning - Four state trellis - coded modulation with 8-PSK signal constellation - Eight state trellis code for coded 8-PSK modulation - Eight state trellis for rectangular QAM signal constellations.

UNIT IV TURBO CODING **9**

Introduction - Turbo Encoder -Turbo Decoder-Iterative Turbo Decoding Principles-Modifications of the MAP Algorithm - The Soft-Output Viterbi Algorithm (SOVA) -Turbo Coded BPSK Performance over Gaussian channels -Turbo Coding Performance over Rayleigh Channels.

UNIT V SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION **9**

Model of spread Spectrum Digital Communication System - Direct Sequence Spread Spectrum Signals - Error rate performance of the decoder - Generation of PN Sequences and its properties, Frequency Hopped Spread Spectrum Signals - Performance of FH Spread Spectrum Signals in an AWGN Channel - CDMA system based on FH spread spectrum signals - Synchronization of Spread Spectrum Systems.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Apply Digital communication technologies in a variety of engineering applications
CO2: Identify the major classes of error detecting and error correcting codes and how they are used in practice.
CO3: Implement Error control coding and Digital modulation techniques in MATLAB
CO4: Apply Spread Spectrum Techniques in Wireless Communication Technologies
CO5: Understand about the spread spectrum techniques

REFERENCE BOOKS

1. Simon Haykin, "Digital Communications", John Wiley and sons, Reprint 2009
2. Simon Haykin, "Digital Communication System", Wiley Student Edition, First Edition, 2013

3. L. Hanzo, T.H. Liew & B.L. Yeap, "Turbo Coding, Turbo Equalization & Space-Time Coding", Wiley, First Edition, 2002
4. John G. Proakis, "Digital Communication", McGraw Hill Publication, Fourth Edition, 2001
5. S.Lin & D.J.Costello, Error Control Coding (2/e) Pearson, 2005
6. Theodore S.Rappaport, "Wireless Communications", Pearson Education, Second Edition 2002.
7. Stephen G. Wilson, "Digital Modulation and Coding", Pearson Education, First Indian Reprint, 2003.
8. Rodger E. Ziemer, Roger L. Peterson, David E. Borth, "Introduction to Spread Spectrum Communications", Prentice Hall, First Edition, 1995.
9. Nptel Lecture: http://aicte-stream/

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Apply Digital communication technologies in a variety of engineering applications	3	2	3	1	3				1		3	1		1
Co2	Identify the major classes of error detecting and error correcting codes and how they are used in practice.	3	2	3	1	3				1		3	1		1
Co3	Implement Error control coding and Digital modulation techniques in MATLAB	3	2	3	1	3				1		3	1		1
Co4	Apply Spread Spectrum Techniques in Wireless Communication Technologies	3	2	3	1	3				1		3	1		1
Co5	Understand about the spread spectrum techniques	3	2	3	1	3				1		3	1		1

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118COT04	OPTICAL AND MOBILE COMMUNICATION NETWORK	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Devise in functionalities of various optical components and networking architectures like SONET / SDH used in Optical Networking
- Quote for cost effective laying of Access networks like Fiber to the Home in India.
- Recite make familiarize about MIMO and broadcast systems
- Read evaluate the performance of wireless networks

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers - Loss & bandwidth, Dispersion effects, Non-Linear effects; Solitons - Optical Network Components - Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks: SONET / SDH standards, Metropolitan Area Networks, Layered Architecture - Broadcast and Select Networks - Topologies for Broadcast Networks, Media Access Control Protocols, Test beds for Broadcast & Select WDM; Outline of Wavelength Routing Architecture

UNIT III MIMO COMMUNICATIONS 9

Propagation of EM signals in wireless channel – Reflection, diffraction and Scattering-Small scale fading- channel classification- channel models – COST -231 Hata model, Longley-Rice Model,NLOS Multipath Fading Models: Rayleigh, Rician, Nakagami, Composite Fading –shadowingDistributions, Link power budget Analysis.

UNIT IV BROADCAST SYSTEMS 9

Narrowband MIMO model, Parallel decomposition of the MIMO channel, MIMO channel capacity, MIMO Diversity Gain:Beamforming, Diversity-Multiplexing trade-offs, Space time Modulation and coding : STBC,STTC, Spacial Multiplexing and BLAST Architectures.

UNIT V WIRELESS NETWORKS 9

3G Overview, Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture,4G features and challenges, Technology path, IMS Architecture - Introduction to wireless LANs -IEEE 802.11 WLANs - Physical Layer- MAC sublayer.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Recall knowledge of basic optical components for realizing any optical function
CO2: Discuss and formulate different networking Topologies.
CO3: Design and analyze about MIMI communication system and Broadcast system
CO4: Summarize the functioning of wireless networks
CO5: Understand about wireless networks

REFERENCE BOOKS

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pvt. Ltd., Second Edition 2004.
2. Biswanath Mukherjee, "Optical Communication Networks", Mc-GrawHill ©1997, First Edition ISBN 0-07-044435-8
3. Rappaport. T.S., "Wireless communications", Pearson Education, 2003

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4. KavethPahlavan,. K. PrashanthKrishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
5. Clint Smith. P.E., and Daniel Collins, "3G Wireless Networks", 2nd Edition, Tata McGraw Hill, 2007
6. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, http://books.elsevier.com/9780123735805:, 2007
7. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India,2nd Ed., 2007

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Recall knowledge of basic optical components for realizing any optical function	3	2	3	1	3	1			1		3	1		1
Co2	Discuss and formulate different networking Topologies	3	2	3	1	3	1			1		3	1		1
Co3	Design and analyze about MIMI communication system and Broadcast system	3	2	3	1	3				1		3	1		1
Co4	Summarize the functioning of wireless networks	3	2	3	1	3	1			1		3	1		1
Co5	Understand about wireless networks	3	2	3	1	3	1			1		3	1		1

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118COT05	Advanced Radiation Systems	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- Understand the concept of Retarded vector potential with Heuristic and Maxwell's equation approach.
- Describe the concept of Antenna Arrays with different types and their pattern multiplication
- Examine the different Antenna synthesis method
- Design different types of Antennas with their characteristic
- Compare all the special antennas with their applications.

UNIT I ANTENNA FUNDAMENTALS 9

Antenna fundamental parameters, Radiation integrals, Radiation from surface and line current distributions -Introduction to numerical techniques- FEM, FDTD, MoM. Linear array -uniform array, end fire and broad side array, gain, beam width, side lobe level- Two dimensional uniform array- Phased array, beam scanning, grating lobe, feed network

UNIT II RADIATION FROM APERTURES 9

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna-Reflector antenna, aperture blockage, and design consideration.

UNIT III ANTENNA SYNTHESIS 9

Synthesis problem-Line source based beam synthesis methods - Fourier transform and Woodward-Lawson sampling method – Linear array shaped beam synthesis method – Low side lobe, narrow main beam synthesis methods - discretization of continuous sources. Schelkunoff polynomial method

UNIT IV MICRO STRIP ANTENNA 9

Radiation Mechanism from patch - Excitation techniques; Microstrip dipole; Rectangular patch, Circular patch, and Ring antenna - radiation analysis from cavity model - input impedance of rectangular and circular patch antenna - Microstrip array and feed network - Application of microstrip array antenna.

UNIT V SPECIAL ANTENNAS 9

Need of metamaterial structures, Advantages of metamaterial structures. Design of the metamaterial antennas, Fractal antennas, polarization sensitive antenna design, sinuous antennas, EBG structure, PBG structures. CNT antennas.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Calculate the Power radiated in far field and also familiar with Polarization concept.
CO2: Apply Antenna Arrays with N elements for specified Application
CO3: Summarize the Antenna based on their Specification and Performance, for various Applications
CO4: Categorize the micro strip antennas for different applications.
CO5: Understand about Special antennas

REFERENCE BOOKS

1. Balanis, C.A., "Antenna Theory" Wiley,2003
2. Warren L. Stutzman and Gary A. Thiele," Antenna theory and design"John Wiley and sons 1998

3. Jordan, E.C., " Electromagnetic waves and Radiating systems". PHI 2003
4. Krauss, J.D., " Radio Astronomy" McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D.,, Fleisch,D.A., "Electromagnetics" McGraw-Hill,1999

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Calculate the Power radiated in far field and also familiar with Polarization concept	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co2	Apply Antenna Arrays with N elements for specified Application	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co3	Summarize the Antenna based on their Specification and Performance, for various Applications	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co4	Categorize the micro strip antennas for different applications	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**
Co5	Understand about Special antennas	**3**	**2**	**1**	1		1			**1**		**3**	**1**		**1**

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118COP01 **COMMUNICATION SYSTEMS LABORATORY- I** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Determine and analyse the radiation pattern of the various antenna.
- Explain the design and simulation of the modulation and coding
- Analyse the various applications of the optical communication.
- Create and analyse channel equalizer and OFDM transceivers using MATLAB.

LIST OF EXPERIMENTS

1. Antenna Radiation Pattern measurement.
2. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
3. Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
4. Performance evaluation of Digital Data Transmission through Fiber Optic Link.
5. Study of Spread Spectrum Techniques.
6. Simulation of QMF using Simulation Packages.
7. Implementation of Video Link using Optical Fiber.
8. Implementation of Linear and Cyclic Codes.
9. OFDM transreceiver design using MATLAB
10. Channel equalizer design using MATLAB

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

CO1: Analyse the radiation pattern of various antenna's in the polar graphs.
CO2: Design the modulation and coding in different applications.
CO3: Discover the video links and digital data transmission using optical fibres.
CO4: Reproduce sim links models of the OFDM and channel equalizer.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyse the radiation pattern of various antenna's in the polar graphs.	3	2	3	1	3	1			1		3	1		1
Co2	Design the modulation and coding in different applications	3	2	3	1	3	1			1		3	1		1
Co3	Discover the video links and digital data transmission using optical fibres.	3	2	3	1	3	1			1		3	1		1
Co4	Reproduce sim links models of the OFDM and channel equalizer.	3	2	3	1	3	1			1		3	1		1

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118COE06	ADVANCED SATELLITE BASED SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- To Recite the performance of any satellite network
- To Discuss the orbital concepts in navigational systems
- To Complete the GEO sub systems
- To Illustrate the Remote Sensing Data
- To Interpret DTH Services and IPV6

UNIT I NAVIGATION, TRACKING AND SAFETY SYSTEMS 9

Global Navigation Satellite Systems - Basic concepts of GPS. Space segment, Control segment, User segment, GPS constellation, GPS measurement characteristics, Selective Availability (SA), Anti spoofing (AS). Applications of Satellite and GPS for 3D position, Velocity, determination as function of time, Interdisciplinary applications. Regional Navigation Systems - Distress and Safety- COSPAS-SARSAT - INMARSAT Distress System - Location - Based service.

UNIT II INERTIAL NAVIGATION AND DIFFERENTIAL GPS SYSTEMS 9

Introduction to Inertial Navigation - Inertial Sensors - Navigation Coordinates - System Implementations - System - Level Error Models - Introduction to Differential GPS - LADGPS - WADGPS-WAAS - GEO Uplink Subsystem (GUS) - GEO Uplink Subsystem (GUS) Clock Steering Algorithms - GEO Orbit Determination – Problems

UNIT III REMOTE SENSING SYSTEMS AND TECHNIQUES 9

Introduction - Commercial Imaging - DigitalGlobe - GeoEye - Meteorology - Meteosat - Land Observation - Landsat - Remote Sensing Data- Sensors- Overview - Optical Sensors: Cameras- Non-Optical Sensors- Image Processing - Image Interpretation- System Characteristics.

UNIT IV BROADCAST SYSTEMS 9

Introduction - Satellite Radio Systems - XM Satellite Radio Inc. - Sirius Satellite Radio -Worldspace - Direct Multimedia Broadcast- MBCO and TU Multimedia - European Initiatives - Direct-to-Home Television - Implementation Issues - DTH Services- Representative DTH Systems - Military Multimedia Broadcasts - US Global Broadcast Service (GBS)- Business TV(BTV), GRAMSAT, Specialized services - E -mail, Video conferencing, Internet.

UNIT V SATELLITE NETWORKING SYSTEM WITH IPV6 9

Overview of IPv6 and its benefits for Satellite Networks - Migration and Coexistence - IPv6 Addressing Mechanisms - Addresses for Hosts and Routers- IPv6 Infrastructure - Routing and Route Management- Configuration Methods - Dynamic Host Configuration Protocol for IPv6 - IPv6 and Related Protocols - IPv6 Header Format- Traffic Classes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Analyze different navigational services
CO2: Apply various remote sensing concepts for Safety of Life Services
CO3: Describe the performance of any satellite networks
CO4: Determine the image processing concepts on remote sensing data
CO5:Prescribe IPv6 Addressing Mechanisms

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REFERENCE BOOKS

1. Mohinder S. Grewal, "Global Positioning Systems, Inertial Navigation, and Integration." California State University at Fullerton, A John Wiley & Sons, Inc. Publication, First Edition, 2004
2. Madhavendra Richharia, "Satellite systems for personal Applications" , A John Wiley and Sons, Ltd., Publication, Third Edition, 2010
3. Daniel Minoli, "Satellite Systems Engineering in an IPv6 Environment", CRC Press, First Edition, 2009
4. Dennis Roddy, "Satellite Communication", McGraw Hill International, Forth Edition, 2006.
5. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall, First Edition, 2007.

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze different navigational services	3	2	3	1	3	1			1		3	2		1
Co2	Apply various remote sensing concepts for Safety of Life Services	3	2	3	1	3	1			1		3	2		1
Co3	Describe the performance of any satellite networks	3	2	3	1	3	1			1		3	2		1
Co4	Determine the image processing concepts on remote sensing data	3	2	3	1	3	1			1		3	2		1
Co5	Prescribe IPv6 Addressing Mechanisms	3	2	3	1	3	1			1		3	2		1

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218COT01	SOFTWARE RADIO ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Study about the Software Defined Radio Architecture.
- Learn the types of ADC and DAC for Software Radio.
- Understand the concepts of Digital Filters.
- Acquire the knowledge on Smart Antenna

UNIT I BASIC SOFTWARE DEFINED RADIO ARCHITECTURE 9

Software Defined Radio–A Traditional Hardware Radio Architecture–Signal Processing Hardware History–Software Defined Radio Project Complexity. 2G Radio Architectures- Hybrid Radio Architecture-Basic Software Defined Radio Block Diagram-System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

UNIT II ANALOG-TO-DIGITALAND DIGITAL-TO-ANALOG CONVERSION 9

Introduction–Digital Conversion Fundamentals-Sample Rate-Band pass Sampling-Oversampling- Anti alias Filtering– Quantization– ADC Techniques-Successive Approximation-Figure of Merit-DACs-DAC Noise Budget- ADC Noise Budget.

UNIT III DIGITAL FREQUENCY UP AND DOWN CONVERTERS 9

Introduction-Frequency Converter Fundamentals-Digital NCO-Digital Mixers-Digital Filters-Half band Filters-CIC Filters- Decimation, Interpolation and Multi-rate Processing-DUCs-Cascading Digital Converters and Digital Frequency Converters.

UNIT IV HARDWARE COMPONENTS AND SOFTWARE ARCHITECTURE 9

Introduction- SDR Requirements for Processing Power-DSPs-DSP Devices-DSP Compilers-Reconfigurable Processors- Major Software Architecture Choices–Hardware–SpecificSoftware Architecture

UNIT V SMART ANTENNAS USING SOFTWARE RADIO 9

Introduction-3G smart Antenna Requirements- Phased Antenna Array Theory-Applying Software Radio Principles to Antenna Systems- Smart Antenna Architectures-Optimum Combining/Adaptive Arrays-DOA Arrays-Beam Forming for CDMA-Downlink Beam Forming.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Conceptualize the SDR and implementation details
CO2: Design SDR for a specific application
CO3: Identify the challenges in the maintenance of SDR
CO4: Analyse the transmitter and receiver architectures
CO5: Understand about Smart Antennas using Software radio architecture

REFERENCE BOOKS

1. Paul Burns, SoftwareDefinedRadiofor3G,Artech House, 2002
2. TonyJRouphael, RF and DSPforSDR, ElsevierNewnesPress,2008
3. JoukoVanakka,DigitalSynthesizersandTransmitterforSoftwareRadio,Springer, 2005
4. PKenington,RF and Baseband Techniques forSoftwareDefined Radio,ArtechHouse,2005

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Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Conceptualize the SDR and implementation details	3	2	3	1	3	1			1		3	1		1
Co2	Design SDR for a specific application	3	2	3	1	3	1			1		3	1		1
Co3	Identify the challenges in the maintenance of SDR	3	2	3	1	3	1			1		3	1		1
Co4	Analyse the transmitter and receiver architectures	3	2	3	1	3	1			1		3	1		1
Co5	Understand about Smart Antennas using Software radio architecture	3	2	3	1	3	1			1		3	1		1

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218COT02	PHOTONIC AND MICROWAVE INTEGRATED CIRCUITS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Develop a deep insight into modern photonic devices and circuits through a thorough understanding of the underlying physics
- Learn about photonic Integrated circuits and its applications
- Study about the technologies involved in MICs.
- Learn the types and components of Micro-strip.

UNIT I INTRODUCTION TO PHOTONICS 9

Introduction to photonics-Optical waveguide theory- Photonic crystals, Metamaterials, Plosmonics-Photonic components switch ,couplers etc.

UNIT II PHOTONIC INTEGRATED CIRCUIT 9

Introduction to photonic integrated circuits-Fabrication techniques:Lithography,ion-exchange deposition, diffution process and device characteristics-Photonic Band Gap structure-Applications:Micro-Opto-Electro-Mechanical system(MOEMS).-Bio-Photonics.-VLSI Photonics

UNIT III MICROSTRIP COMPONENTS 9

Component using Microstrips: flat resistors – flat inductors – interdigital capacitors – sandwich capacitors – ferromagnetic substrates for non-reciprocal devices – microstrip circulators – latching circulators – isolators – phase shifters

UNIT IV ANALYSIS OF MICROSTRIP LINE 9

Coupled microstrips – even and odd mode analysis – Microstrip directional couplers – branch line couplers – periodic branch line couplers – synchronous branch line couplers. Losses in microstrip.

UNIT V TECHNOLOGY OF MICS 9

HYBRID MICs: Dielectric substrates - thick film technology and materials - thin film technology and materials – methods of testing – encapsulation of devices for MICs – mounting of active devices.

MONOLITHIC MICs: Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer – diffusion-ion implantation – electron beam technology.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design the Photonics components.
CO2: Acquire knowledge in the design and fabrication of the Photonic Integrated Circuits
CO3: Design and fabricate the hybrid MIC's in thick and thin film technology.
CO4: Analyse even and odd mode coupled microstrips.
CO5: Implement the different methods for the fabrication of the monolithic MICs.

REFERENCE BOOKS

1. Gupta,K.C, and Amarjitsingh – "Microwave Integrated Circuits" – John Wiley and sons – Wiley Eastern Reprint, 1978
2. Hoffmann, R.K – "Handbook of Microwave Integrated Circuits" – Artech House, 1987.
3. Ari T.Friberg,and Rene Dandliker-"Advances in Information Optics and photonics"-PHI,Eastern Economy Edition
4. "Integrated Photonics "by C.R.Pollack and M.Lipson

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Design the Photonics components.	3	2	3	1	3	1			1		3	1		1
Co2	Acquire knowledge in the design and fabrication of the Photonic Integrated Circuits	3	2	3	1	3	1			1		3	1		1
Co3	Design and fabricate the hybrid MIC's in thick and thin film technology.	3	2	3	1	3	1			1		3	1		1
Co4	Analyse even and odd mode coupled microstrips.	3	2	3	1	3	1			1		3	1		1
Co5	Implement the different methods for the fabrication of the monolithic MICs	3	2	3	1	3	1			1		3	1		1

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218COT03	MULTIMEDIA COMPRESSION TECHNIQUES	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Learn the basic concepts in the multimedia compression techniques.
- Learn the various algorithms and coding techniques of the text compression.
- Learn the audio compression techniques and its applications.
- Understand the predictive techniques and wavelet based image compressions

UNIT I INTRODUCTION 9

Special features of multimedia – Graphics & Image data representation-Compression techniques-Overview of Source coding-Unique decodable codes, prefix codes, Kraft McMillan inequality-Source modeling –physical model, Probability model, Markov model-Scalar and Vector quantization theory-Evaluation and Error analysis

UNIT II TEXT COMPRESSION 9

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmetic 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 – speech compression techniques – CELP Vocoders.

UNIT IV IMAGE COMPRESSION 9

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization– Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders.

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.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Understand the various requirements of the multimedia compression techniques.
CO2: Implement text compression using the LZW algorithms and coding techniques.
CO3: Acquire knowledge in the various audio compression techniques and its applications.
CO4: Design and analyze of images compression using wavelet based compression
CO5: Acquire knowledge in the various video compression techniques and its applications

REFERENCE BOOKS

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, HuifangSun : 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-NianLi : 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

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Understand the various requirements of the multimedia compression techniques.	3	2	3	1	3				1		3	1		1
Co2	Implement text compression using the LZW algorithms and coding techniques	3	2	3	1	3				1		3	1		1
Co3	Acquire knowledge in the various audio compression techniques and its applications	3	2	3	1	3				1		3	1		1
Co4	Design and analyze of images compression using wavelet based compression.	3	2	3	1	3				1		3	1		1
Co5	Acquire knowledge in the various video compression techniques and its applications	3	2	3	1	3				1		3	1		1

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218COP01 **COMMUNICATION SYSTEM LAB II** **L T P C**
0 0 3 1

COURSE OBJECTIVES

- Learn the characteristics of the Non-reciprocal components in micro strip lines.
- Perform image, audio and text compressions.
- Analyze the characteristic parameters of the fiber optic components.

LIST OF EXPERIMENTS

1. Characteristics of ring resonator(RING) in micro strip
2. Characteristics of a branch line coupler(BLC) in micro strip
3. Characteristics of power divider in micro strip
4. (a)Characteristics of a transformer fed patch antenna in micro strip
   (b)Characteristics of in inset fed patch antenna micro strip
5. Simulation of EZW / SPIHT Image coding algorithm.
6. Implementation of speech processing using Matlab Simulink and Texas instrument processors
7. Study of OTDR(Optical Time Domain Reflectometer)using source of 1550nm laser diode and PIN TIA photo detector.
8. Measurement of attenuation in fiber optic attenuator
9. Measurement of insertion losses and isolation rate in fiber optic isolator.
10. (i).Measurement of insertion losses and coupling co-efficient in fiber optic coupler.
    (ii). Measurement of insertion losses and coupling co-efficient in fiber optic multiplexer

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Acquire knowledge in various characteristics of the Non-reciprocal components in micro strip lines.
CO2: Implement the various compression techniques using MATLAB.
CO3: Measure the losses for the fiber optic components

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Acquire knowledge in various characteristics of the Non-reciprocal components in micro strip lines..	3	2	3	1	3	1			1		3	1		1
Co2	Implement the various compression techniques using MATLAB	3	2	3	1	3	1			1		3	1		1
Co3	Measure the losses for the fiber optic components.	3	2	3	1	3	1			1		3	1		1

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218COE07	NETWORK ROUTING ALGORITHMS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Learn the various routing techniques in the circuit switching and packet switching networks.
- Learn the algorithm for the ATM,PNNI and planet network.
- Acquire knowledge in the mobility management, routing algorithm for various packet radio networks.
- Learn different routing algorithms for the MANET.

UNIT I CIRCUIT SWITCHING NETWORKS 9

AT & T's Dynamic Routing Network, Routing in Telephone Network-Dynamic Non Hierarchical Routing-Trunk Status Map Routing-Real Time Network Routing, Dynamic Alternative Routing-Distributed Adaptive Dynamic Routing-Optimized Dynamic Routing.

UNIT II PACKET SWITCHING NETWORKS 9

Distance vector Routing, Link State Routing, Inter domain Routing-Classless Interdomain routing (CIDR), Interior Gateway routing protocols (IGRP) - Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Exterior Gateway Routing Protocol (EGRP) - Border Gateway Protocol (BGP), Apple Talk Routing and SNA Routing.

UNIT III HIGH SPEED NETWORKS 9

Routing in optical networks-The optical layer, Node Designs, Network design and operation, Optical layer cost tradeoffs, Routing and wavelength assignment, Architectural variations, Routing in ATM networks-ATM address structure, ATM Routing, PNNI protocol, PNNI signaling protocol, Routing in the PLANET network and Deflection Routing.

UNIT IV MOBILE NETWORKS 9

Routing in Cellular Mobile Radio Communication networks-Mobile Network Architecture, Mobility management in cellular systems, Connectionless Data service for cellular systems, Mobility and Routing in Cellular Digital Packet Data (CDPD) network, Packet Radio Routing-DARPA packet radio network, Routing algorithms for small, medium and large sized packet radio networks.

UNIT V MOBILE AD-HOC NETWORKS (MANET) 9

Internet based mobile ad-hoc networking, communication strategies, routing algorithms – Table-driven routing - Destination Sequenced Distance Vector (DSDV), Source initiated on-demand routing-Dynamic Source Routing (DSR), Ad-hoc On- demand Distance Vector (AODV), Hierarchical based routing- Cluster head Gateway Switch Routing (CGSR) and Temporally-Ordered Routing Algorithm (TORA), Quality of Service.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1:Analyze the data transmission with the various routing algorithm in circuit and packet switching networks.

CO2: Gain knowledge in packet switching networks with its algorithms

CO3: Design the secured data transmission based on the optical and ATM networks.

CO4: Design, operate and debug mobile network architecture.

CO5: Acquire knowledge in the different routing algorithms for the MANET

REFERENCE BOOKS

1. M. Steen strub, "Routing in Communication networks", Prentice Hall International, NewYork, 1995
2. "Internetworking Technologies Handbook", Fourth Edition, Inc. Cisco Systems, ILSG Cisco Systems, 2003
3. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", PHI, New Delhi, 2004.
4. Behrouz A Forouzan, "Data Communications and Networking (3/e), TMH, 2004
5. William Stallings, "High Speed Networks TCP/IP and ATM Design Principles", Prentice Hall International, New York, 1998.
6. Mohammad Ilyas, "The Handbook of Ad hoc Wireless Networks" CRC Press, 2002.
7. Vijay K.Garg, "Wireless Network Evolution: 2G to 3G", Pearson Education, New Delhi, India, 2003
8. Rajiv Ramaswami and Kumar N.Sivarajan, "Optical Networks",Morgan Kaufmann Publishers,1998
9. SumitKasera and Pankajsethi, "ATM Networks", Tata McGraw-Hill Publishing Company limited, New Delhi,2001
10. IEEE Journal on Selected Areas in Communications, Special issue on Wireless Ad-hoc Networks, Vol. 17, No.8, 1999

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Analyze the data transmission with the various routing algorithm in circuit and packet switching networks.	3	2	3	1	3	1			1		3	1	1	
Co2	Gain knowledge in packet switching networks with its algorithms	3	2	3	1	3	1			1		3	1	1	
Co3	Design the secured data transmission based on the optical and ATM networks.	3	2	3	1	3	1			1		3	1	1	
Co4	Design, operate and debug mobile network architecture	3	2	3	1	3	1			1		3	1	1	
Co5	Acquire knowledge in the different routing algorithms for the MANET	3	2	3	1	3	1			1		3	1	1	

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218COE14 DSP PROCESSOR ARCHITECTURE AND PROGRAMMING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Learn the architecture, pipelining and addressing modes of P-DSP's.
- Learn the architecture, addressing modes, instruction sets, operation and application of the TMS320C3X, ADSP, TMS320C54X,and TMS320C6X

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPS **9**

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C3X PROCESSOR **9**

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets - Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals – Generating and finding the sum of series, Convolution of two sequences, Filter design.

UNIT III 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 IV ADVANCED PROCESSORS I **9**

Architecture of TMS320C54X: Pipe line operation, Addressing modes and assembly language instructions Introduction to Code Composer studio

UNIT V ADVANCED PROCESSORS II **9**

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

TOTAL HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Acquire knowledge in the fundamentals of the P-DSP'S.
CO2: Implement the different processor for domestic and industrial applications
CO3: Knowledge in ADSP processors.
CO4: Acquire knowledge in the Architecture of TMS320C54X
CO5: Gain knowledge about DSP563XX processor

REFERENCE BOOKS

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003
2. User guides Texas Instrumentation, Analog Devices, Motorola

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O 2	PS O 3
Co1	Acquire knowledge in the fundamentals of the P-DSP'S.	3	2	3	1	3	1			1		3	1		1
Co2	Implement the different processor for domestic and industrial applications.	3	2	3	1	3	1			1		3	1		1

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Co3	Knowledge in ADSP processors.	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co4	Acquire knowledge in the Architecture of TMS320C54X	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**
Co5	Gain knowledge about DSP563XX processor	**3**	**2**	**3**	**1**	**3**	1			**1**		**3**	**1**		**1**

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218COE17	COGNITIVE RADIO	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Study the different techniques and computational methods for Cognitive Radio.
- Know the main rules underlying in Cognitive techniques.
- Address the difficulties related to the present day techniques.
- Adopt Cognitive techniques in solving problems in the real world

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO 9

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

UNIT II SDR ARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

Cognitive Radio – functions, components and design rules, Cognition cycle – orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architechture

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 HOURS : 45 PERIODS

COURSE OUTCOMES

CO1: Describe the basics of the software defined radios.
CO2: Design the wireless networks based on the cognitive radios.
CO3: Understand the Architecture of cognitive radio
CO4: Explain the concepts behind the wireless networks
CO5: Explain the concepts behind the next generation networks

REFERENCE BOOKS

1. Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009
4. 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

5. Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005

6. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications , Jan 2008
7. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
8. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Describe the basics of the software defined radios.	3	2	3	1	3	1			1		3	1		1
Co2	Design the wireless networks based on the cognitive radios.	3	2	3	1	3	1			1		3	1		1
Co3	Understand the Architecture of cognitive radio	3	2	3	1	3	1			1		3	1		1
Co4	Explain the concepts behind the wireless networks	3	2	3	1	3	1			1		3	1		1
Co5	Explain the concepts behind the next generation networks	3	2	3	1	3	1			1		3	1		1

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315COE01	EMBEDDED SYSTEMS FOR COMMUNICATION	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Understand about Embedded Architecture and to design of hardware and software components
- Study about the embedded processor and computing platform
- Learn the Embedded Networks
- Acquire the Embedded Real time characteristic and System design technique

UNIT I EMBEDDED ARCHITECTURE 9

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded System Design, Embedded System Design Process - Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration.

UNIT II EMBEDDED PROCESSOR AND COMPUTING PLATFORM 9

ARM processor- processor and memory organization, data operations, flow of control, SHARC processor- memory organization, data operations, flow of control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory Devices, Input / Output Devices. Design Example: Alarm Clock.

UNIT III NETWORKS 9

Distributed Embedded Architecture - Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet. Design Example: Elevator Controller.

UNIT IV REAL-TIME CHARACTERISTICS 9

Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, Off-line Versus On-line scheduling.

UNIT V SYSTEM DESIGN TECHNIQUES 9

Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example: Telephone PBX-Ink jet printer- Personal Digital Assistants, Set-top Boxes.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Design hardware and software components
CO2: Knowledge in Embedded processor and computing platform
CO3: Knowledge in Embedded Networks
CO4: Design the Real time Characteristic and System design for Embedded Systems
CO5: understand the system design techniques

REFERENCE BOOKS

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997

4. Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, s, John Wiley & Sons, 2000

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Design hardware and software components	3	2	1	1		1			1		3	3	2	
Co2	Knowledge in Embedded processor and computing platform	3	2	1	1		1			1		3	3	2	
Co3	Knowledge in Embedded Networks	3	2	1	1		1			1		3	3	2	
Co4	Design the Real time Characteristic and System design for Embedded Systems	3	2	1	1		1			1		3	3	2	
Co5	understand the system design techniques	3	2	1	1		1			1		3	3	2	

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315COE03	COMMUNICATION NETWORK SECURITY	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Understand about Symmetric CIPHERS
- Learn Advanced Encryption Standard (AES) for Network security
- Understand the Network Security Practice
- Study about system security

UNIT I SYMMETRIC CIPHERS **9**

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security; Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles, BlockCipher Modes of Operation,Stegnography

UNIT II ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS **9**

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5- Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution.

UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS **9**

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm; Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

UNIT IV NETWORK SECURITY PRACTICE **9**

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT V SYSTEM SECURITY **9**

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats, Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Familiar with Symmetric CIPHERS
CO2: Knowledge in ADVANCED ENCRYPTION STANDARD (AES) and implementing for Network security
CO3: Know more about encrypting techniques
CO4: Demonstrate Network security practice
CO5: Design work in system security

REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security", 3rdEdition. Prentice Hall of India, New Delhi ,2004
2. William Stallings, "Network Security Essentials", 2ndEdition. Prentice Hall of India, New Delhi, 2004

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3. Charlie Kaufman , "Network Security: Private Communication in Public World", 2nd Edition. Prentice Hall of India, New Delhi ,2004

Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Familiar with Symmetric CIPHERS	3	2	1	1		1			1		3	3	1	
Co2	Knowledge in ADVANCED ENCRYPTION STANDARD (AES) and implementing for Network security	3	2	1	1		1			1		3	3	1	
Co3	Know more about encrypting techniques	3	2	1	1		1			1		3	3	1	
Co4	Demonstrate Network security practice	3	2	1	1		1			1		3	3	1	
Co5	Design work in system security	3	2	1	1		1			1		3	3	1	

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315COE04	HIGH SPEED SWITCHING ARCHITECTURE	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Learn the switching concept of High Speed Networks
- Learn the concept of ISDN and B-ISDN with the functions, Layers and services
- Learn the ATM Architecture with different networks
- Analyze various Queuing in ATM and IP switching

UNIT I HIGH SPEED NETWORK **9**

LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN - SDH multiplexing structure - ATM standard; ATM adaptation layers.

UNIT II LAN SWITCHING TECHNOLOGY **9**

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

UNIT III ATM SWITCHING ARCHITECTURE **9**

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting - rearrangeable networks - full and partial connection networks - nonblocking networks – recursive network – construction and comparison of non-blocking network.

UNIT IV QUEUES IN ATM SWITCHES **9**

Internal queuing – Input, output and shared queuing - multiple queuing networks –combined input, output and shared queuing – performance analysis of queued switches.

UNIT V IP SWITCHING **9**

Architectures of Internet Switches and Routers-IP Over ATM address and next hop resolution –IPv6 over ATM - Optical Packet switching - Switching fabric on a chip.

TOTAL HOURS:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to :

CO1: Familiar with switching of High Speed Networks
CO2: Knowledge in ISDN and B-ISDN functions, Layers and services
CO3: Understand ATM architecture with different networks
CO4: Knowledge in Queues.
CO5: Learn concepts of IP switching.

REFERENCE BOOKS

1. Rich Siefert, Jim Edwards, "The All New Switch Book – The Complete Guide to LAN Switching Technology", Wiley Publishing, Inc., Second Edition, 2008
2. Elhanany M. Hamdi, "High Performance Packet Switching architectures", Springer Publications, 2007
3. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York.1998.
4. AchillePatavina, Switching Theory: Architectures and performance in Broadband ATM Networks. John Wiley & Sons Ltd., New York.1998
5. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications, 3rd Edition, Adisson Wesley, New York,1999.
6. JohnA.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, New York, 1998.

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Course Outcome		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
Co1	Familiar with switching of High Speed Networks	3	2	1	1		1			1		3	1		1
Co2	Knowledge in ISDN and B-ISDN functions, Layers and services	3	2	1	1		1			1		3	1		1
Co3	Understand ATM architecture with different networks	3	2	1	1		1			1		3	1		1
Co4	Knowledge in Queues	3	2	1	1		1			1		3	1		1
Co5	Learn concepts of IP switching	3	2	1	1		1			1		3	1		1

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