

ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli - 620 024
Curriculum 2007

M.E. Communication Systems

SEMESTER I

S No.	Subject code	Subject	L	T	P	Max. Marks
Theory						
1	MA5131	Applied Mathematics for Electronics Engineers	3	1	0	100
2	CO5101	Advanced Radiation Systems	3	0	0	100
3	CO5102	Modern Digital Communication Techniques	3	0	0	100
4	AN 5101	Advanced Digital Signal Processing	3	1	0	100
5	CO5103	Optical Communication Networks	3	0	0	100
6	E1****	Elective I	3	0	0	100
Practical						
7	CO 5104	Communication System Laboratory I	0	0	4	100

SEMESTER II

S No.	Subject code	Subject	L	T	P	Max. Marks
Theory						
1	CO5151	Mobile Communication Networks	3	0	0	100
2	WS5001	Multimedia Compression Techniques	3	0	0	100
3	CO5152	Microwave Integrated Circuits	3	0	0	100
4	CO5153	Satellite Communication	3	0	0	100
5	E2****	Elective II	3	0	0	100
6	E3****	Elective III	3	0	0	100
Practical						
7	CO5154	Communication System Laboratory II	0	0	4	100

SEMESTER III

S No.	Subject code	Subject	L	T	P	Max. Marks
Theory						
1	E4****	Elective IV	3	0	0	100
2	E5****	Elective V	3	0	0	100
3	E6****	Elective VI	3	0	0	100
Practical						
4	CO 5251	Project Work Phase I	0	0	12	–

SEMESTER IV

S No.	Subject code	Subject	L	T	P	Max. Marks
Practical						
1	CO 5251	Project Work Phase II	0	0	24	600

LIST OF ELECTIVES

S No.	Subject code	Subject	L	T	P	Max. Marks
Theory						
1	CO5001	RF System Design	3	0	0	100
2	CO5002	Advanced Microwave Systems	3	0	0	100
3	CO5003	Communication protocol Engineering	3	0	0	100
4	CO5004	DSP Processor Architecture and programming	3	0	0	100
5	CO5005	Wavelets and Multi resolution Processing	3	0	0	100
6	CO5006	Speech and Audio Signal Processing	3	0	0	100
7	CO5007	Network Routing Algorithms	3	0	0	100
8	CO5008	Simulation of Communication Systems and Networks	3	0	0	100
9	CO5009	Global Positioning Systems	3	0	0	100
10	CO5010	Communication Network Security	3	0	0	100
11	CO5011	Soft Computing	3	0	0	100
12	CO5012	Digital Communication Receivers	3	0	0	100
13	AN5104	Advanced Microprocessors and Microcontrollers	3	0	0	100
14	AN 5001	Digital Image Processing	3	0	0	100
15	AN5008	Internetworking multimedia	3	0	0	100
16	AN5009	Electromagnetic Interference and Compatibility in System Design	3	0	0	100
17	AN5010	High Performance Communication Networks	3	0	0	100
18	AN5154	Embedded systems	3	0	0	100
19	DC5001	High Speed Switching Architecture	3	0	0	100

ANNA UNIVERSITY TIRUCHIRAPPALLI

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Regulations 2007

Syllabus

M.E.COMMUNICATION SYSTEMS

SEMESTER I

MA5131 – APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS

	L	T	P
	3	1	0
UNIT I LINEAR ALGEBRAIC EQUATIONS & EIGEN VALUE PROBLEMS			9
System of Equations – Solutions by Gauss Elimination Methods – Gauss Jordan and LU Decomposition Method Jacobi – Gauss Seidel Method – Eigen Values of Matrix by Jacobi and Power Method.			
UNIT II THE WAVE EQUATIONS			9
Solution of Initial and Boundary Value Problems – Characteristics–D'Alembert's Solution– Significance of Characteristic Curves – Laplace Transform Solutions – for Displacement in a Long String – A long String under its Weight – Longitudinal Vibration of a Elastic 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 Variables – Moments and Moment Generating Function –Binomial Poisson– Uniform – Exponential Normal and Weibull Distribution – Two Dimensional Random Variables Marginal and Conditional Distribution Covariance – Correlation Coefficient – Function of One Dimensional and Two Dimensional Random Variables.			
UNIT V QUEUING THEORY			9
Single and Multiple Server Markovian Queuing Models – Steady State System Size Probabilities– Little's Formula – Customer Impatience Priority Queues – M/G/1 Queuing System – PK Formula .			

L: 45 T: 15 Total: 60

TEXT BOOKS

1. S. Narayanan T. K. Manichvachagam Pillay and G. Ramanaiah, “Advanced Mathematics for Engineering Students”, S.Viswanathan Pvt Ltd, Vol 2, 1986.
2. Taha H. A., “Operations Research An Introduction”, Sixth Edition, PHI, 1997.

REFERENCES

1. Sankara Rao K, “Introduction to Partial Differential Equation”, PHI, 1995.
2. Churchi R. V., “Operational Mathematics”, McGraw Hill, 1972.
3. Richard A. Johnson, “Miller and Freund's Probability and Statistics for Engineers”, Fifth Edition, PHI, 1994.

CO5101 – ADVANCED RADIATION SYSTEMS

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UNIT I CONCEPTS OF RADIATION 9

Retarded Vector Potentials – Heuristic Approach and Maxwell's Equation Approach – The Lorentz Gauge Condition – Vector Potential in Phasor Form – Fields Radiated by an Alternating Current Element Total Power Radiated and Radiation Resistance – Radiation from Half Wave Dipole from assumed Current Distribution – Power Radiated in the Far Field – Electric Vector Potential F for a Magnetic Current Source M – Far Zone Fields due to Magnetic Source M .

UNIT II ANTENNA ARRAYS 9

N Element Linear Arrays – Uniform Amplitude and Spacing – Phased Arrays, Directivity of Broadside and End Fire Arrays, Three Dimensional Characteristics, Binomial Arrays and Dolph Tchebycheff Arrays – Circular Array – Antenna Synthesis – Line Source and Discretization of Continuous Sources – Schelkunoff Polynomial Method Fourier Transform Method .

UNIT III APERTURE ANTENNAS 9

Magnetic Current – Duality, Electric and Magnetic Current Sheets as Sources– Huyghens Source – Radiation through an Aperture in an Absorbing Screen – Fraunhofer and Fresnel Diffraction – Cornu Spiral Complimentary Screens and Slot Antennas – Slot and Dipoles as Dual Antennas, Babinet's principle Fourier Transform in Aperture Antenna Theory .

UNIT IV HORN MICROSTRIP REFLECTOR ANTENNAS 9

E and H Plane Sectoral Horns – Pyramidal Horns – Conical and Corrugated Horns – Multimode Horns Phase Center – Microstrip Antennas Feeding methods – Rectangular Patch – Transmission Line model Parabolic Reflector Antennas – Prime Focus and Cassegrain Reflectors, Equivalent Focal Length of Cassegrain Antennas – Spillover and Taper Efficiencies – Optimum Illumination .

UNIT V ANTENNA POLARIZATION 9

Simple Relationship Involving Spherical Triangles – Linear Elliptical and Circular Polarization Development of the Poincare Sphere – Representation of the State of Polarization in the Poincare Sphere – Random Polarization – Stokes Parameters .

Total: 45

TEXT BOOKS

1. Balanis , E.C. , “Antenna Theory ”, Wiley 2003.
2. Krauss, “ Radia Astromy”, Mc Graw Hill 1966.

REFERENCES

1. Jordan E. C., “Electromagnetic waves and Radiating systems”, PHI, 2003.
2. Krauss J. D., Fleisch D. A., “Electromagnetics”, McGraw Hill, 1999.

CO5102 – MODERN DIGITAL COMMUNICATION TECHNIQUES

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UNIT I POWER SPECTRUM AND COMMUNICATION OVER MEMORYLESS CHANNEL 9

PSD of a Synchronous Data Pulse Stream – M-ary Markov Source – Convolutionally Coded Modulation– Continuous Phase Modulation Scalar and Vector Communication over Memoryless Channel – Detection Criteria .

UNIT II COHERENT AND NON COHERENT COMMUNICATION 9

Coherent Receivers – Optimum Receivers in WGN – IQ Modulation & Demodulation– Non-Coherent Receivers in Random Phase Channels– M FSK Receivers– Rayleigh and Rician Channels– Partially Coherent Receivers– DPSK, M PSK, M–DPSK – BER Performance Analysis.

UNIT III BANDLIMITED CHANNELS AND DIGITAL MODULATIONS 9

Eye Pattern– Demodulation in the Presence of ISI and AWGN– Equalization Techniques –IQ Modulations – QPSK, QAM, QBOM– BER Performance Analysis, Continuous Phase Modulation– CPM, CPFSK, MSK ,OFDM.

UNIT IV BLOCK CODED DIGITAL COMMUNICATION 9

Architecture and Performance Binary Block Codes, Orthogonal, Biorthogonal, Transorthogonal Shannon's Channel Coding Theorem, Channel Capacity, Matched Filter– Concepts of Spread Spectrum Communication – Coded BPSK and DPSK Demodulators, Linear Block Codes– Hamming, Golay, Cyclic, BCH, Reed–Solomon Codes.

UNIT V CONVOLUTIONAL CODED DIGITAL COMMUNICATION 9

Representation of Codes using Polynomial State Diagram, Tree Diagram, and Trellis Diagram – Decoding Techniques using Maximum Likelihood –Viterbi Algorithm –and Threshold Methods –Error Probability Performance for BPSKand Viterbi Algorithm – Turbo Coding.

Total: 45

TEXT BOOKS

1. Bernarl Sklar, Digital Communications, Pearson Education, Asia.
2. M.K. Simon, S.M. Hinedi and W.C. Lindsey, “Digital Communication Techniques, Signalling and Detection “, Prentice Hall of India, 1995.

REFERENCES

1. Simon Haykin, “Digital communications”, John Wiley and sons, 1998.
2. Wayne Tomasi, “Advanced electronic communication systems”, 4th Edition, Pearson Education, Asia, 1998.
3. B.P. Lathi, “Modern digital and analog communication systems”, 3rd Edition, Oxford University Press, 1998.

AN5101 – ADVANCED DIGITAL SIGNAL PROCESSING

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[Review of discrete time signals and systems– DFT and FFT, Z –Transform, Digital Filters is recommended]

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.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Monson H Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons Inc., 2002.
2. Dimitris GManolakis et al, “Statistical and adaptive signal processing”, McGraw Hill,2000.

REFERENCES

1. John G. Proakis Dimitris G. Manolakis, “Digital Signal Processing”, Pearson Education, 2002.
2. John GProakis et al, “Algorithms for Statistical Signal Processing”, Pearson Education, 2002.
3. Rafael C Gonzalez and Richard E Woods, “Digital Image Processing”, Second Edition, Pearson Education, Inc, 2004 (For Wavelet Transform Topic).

CO5103 – OPTICAL COMMUNICATION NETWORKS

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UNIT I OPTICAL NETWORKING COMPONENTS 9

First and Second Generation Optical Networks – Components – Couplers – Isolators, Circulators – Multiplexers – Filters – Amplifiers – Switches and Wavelength Converters.

UNIT II SONET and SDH NETWORKS 9

Integration of TDM Signals – Layers – Framing – Transport Overhead – Alarms, Multiplexing – Network Elements – Topologies – Protection Architectures – Ring Architectures – Network Management.

UNIT III BROADCAST AND SELECT NETWORKS 9

Topologies, Single-hop, Multihop, and Shufflenet Multihop Network – Media – Access control Protocols – Test Beds.

UNIT IV WAVELENGTH ROUTING NETWORKS 9

Node Design – Issues In Network Design and Operation – Optical Layer Cost Tradeoffs – Routing and Wavelength Assignment – Wavelength Routing Test Beds.

UNIT V HIGH CAPACITY NETWORKS 9

SDM, TDM, and WDM Approaches – Application Areas – Optical TDM Networks – Multiplexing and Demultiplexing – Synchronization – Broadcast Networks – Switch Based Networks – OTDM Test Beds.

Total: 45

TEXT BOOKS

1. Rajiv Ramaswami and Kumar Sivarajan, “Optical Networks: A practical perspective”, Morgan Kaufmann, 2nd edition, 2001.
2. Biswanath Mukherjee, “Optical Communication Networks”, McGraw Hill, 1997

REFERENCES

1. Vivek Alwayn, “Optical Network Design and Implementation”, Pearson Education, 2004.
2. Hussein T. Mouftab and Pin-Han Ho, “Optical Networks: Architecture and Survivability”, Kluwer Academic Publishers, 2002.

CO5104 – COMMUNICATION SYSTEM LABORATORY I

L	T	P
0	0	4

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.

SEMESTER II

CO5151 – MOBILE COMMUNICATION NETWORKS

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UNIT I OPERATION OF MOBILE COMMUNICATION NETWORKS 9

Operation Of First Second and Third Generation Wireless Networks – Cellular Systems Medium Access Techniques – Mobile Networks – Elementary Principles of Cellular Telephony – Channel Division Techniques (TDMA FDMA CDMA) – Cellular Coverage Methods Network Planning and Resource Allocation – Network Dimensioning – Mobility Management Procedures.

UNIT II PROPAGATION MODELS AND AIR PROTOCOLS 9

Radio Propagation Models – Error Control Techniques – Handoff Power Control – Soft Handover – Forward Link – Reverse Link – Common Air Protocols (AMPS IS 95 IS 136 GSM GPRS EDGE WCDMA Cdma2000 Etc).

UNIT III MOBILE NETWORK ARCHITECTURE 9

General Architecture Definition – Mobile Terminals (MT – SIM) Radio Section (BTS – BSC)– Core Network (MSC , G –MSC , VLR HLR– Auc) User and Control Plane Protocol Stack, MAP & SS#7 – The Key Role of Signaling Interfaces And Network Entities Relation the Physical Channel – The Logical Channels Terminal – Call and Network Management Procedures – Network Planning

UNIT IV WIRELESS LOCAL AREA NETWORKS 9

Wireless Local Area Networks – General Characteristics of the Hyper LAN System – 802.11 Standard – Basic DCF Access Scheme – DCF Access Scheme With Handshaking – PCF Access Scheme – The 802.11a Standard – Mobile Ad Hoc Networks – Wireless Sensor Networks – Routing Energy Efficiency Localization – Clustering .

UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 9

Security in Wireless Networks – Secure routing – Key Pre–Distribution and Management – Encryption and Authentication – Security in Group Communication – Trust Establishment and Management – Denial of Service Attacks– Energy Aware Security Mechanisms Location Verification – Security on Data Fusion.

Total: 45

TEXT BOOKS

1. Leon Garcia and I Widjaja, “Communication Networks Fundamental Concepts and Key Architectures”, McGraw Hill, 2000.
2. T S Rappaport, “Wireless Communications Principles & Practice”, 2nd Edition, Prentice Hall, 2002.

REFERENCES

1. W. Stallings, “Wireless Communications and Networks”, Prentice Hall, 2002.
2. V. K. Garg, “IS 95 CDMA and CDMA 2000”, Prentice Hall, PTR, 2000.
3. J Schiller, “Mobile Communications”, Addison Wesley, 2000.
4. Fred Halsall, “Multimedia Communications Applications Networks Protocols and Standards”, Addison Wesley, 2001.

WS5001 – MULTIMEDIA COMPRESSION TECHNIQUES

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UNIT I FUNDAMENTALS 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 – Huffman Coding – Adaptive Huffman Coding– Arithmetic 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

TEXT BOOKS

1. Khalid Sayood, “Introduction to Data Compression”, 2nd Edition, Morgan Kauffman Harcourt, India, 2000.
2. Watkinson J., “Compression in Video and Audio”, Focal Press, London, 1995.

REFERENCES

1. David Salomon, “Data Compression The Complete Reference”, 2nd Edition, Springer Verlag, New York Inc., 2001.
2. Peter Symes , “Digital Video Compression” , McGraw Hill Pub, 2004.
3. Mark Nelson, “Data compression BPB”, Publishers, New Delhi, 1998.
4. Yun Q. Shi Huifang, “Sun Image and Video Compression for Multimedia Engineering Fundamentals Algorithms & Standards”, CRC press, 2003.

CO5152 – MICROWAVE INTEGRATED CIRCUITS

L	T	P
3	0	0

UNIT I TECHNOLOGY OF HYBRID MICS 9

Dielectric Substrates – Thick Film Technology and Materials – Thin Film Technology and Materials – Methods of Testing – Encapsulation of Devices for Mics – Mounting of Active Devices .

UNIT I TECHNOLOGY OF MONOLITHIC MICS 9

Processes Involved In Fabrication – Epitaxial Growth of Semiconductor Layer – Growth of Dielectric Layer – Diffusion Ion Implantation – Electron Beam Technology.

UNIT III ANALYSIS OF MICROSTRIP LINE 9

Methods of Conformal Transformation – Numerical Method for Analysis – Hybrid Mode Analysis – Coupled Mode Analysis – Method of Images – Losses in Microstrips .

UNIT IV COUPLED MICROSTRIPS SLOT LINE AND COPLANAR WEGUIDES 9

Coupled Microstrips – Even and Odd Mode Analysis – Microstrip Directional Couplers – Branch Line Couplers – Periodic Branch Line Couplers – Synchronous Branch Line Couplers.

UNIT V LUMPED ELEMENTS AND NON RECIPROCAL COMPONENTS 9

Design and Fabrication Using Microstrips – Flat Resistors – Flat Inductors – Interdigital Capacitors – Sandwich Capacitors – Ferromagnetic Substrates For Non – Reciprocal Devices– Microstrip Circulators – Latching Circulators – Isolators – Phase Shifters.

Total: 45

TEXT BOOKS

1. Gupta K. C. and Amarjit Singh, “Microwave Integrated Circuits”, John Wiley and sons Wiley Eastern Reprint, 1978.
2. Hoffmann R. K., “Handbook of Microwave Integrated Circuits”, Artech House, 1987.

CO5153 – SATELLITE COMMUNICATION

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3 0 0

UNIT I ORBITAL MECHANICS 9

Kepler's Laws of Motion Orbits – Orbit Equations – Orbit Description – Locating the Satellite in the Orbit and With Respect to Earth – Orbital Elements Look Angle Determination and Visibility – Orbital Perturbations – Orbit Determination – Launch Vehicles – Orbital Effects in Communication System – Performance Attitude Control– Satellite Launch Vehicles – Spectrum Allocations for Satellite Systems .

UNIT II SPACECRAFT SUB SYSTEMS AND EARTH STATION 9

Spacecraft Subsystems – Altitude and Orbit Control – Telemetry and Tracking – Power Systems – Communication Subsystems – Transponders – Antennas – Equipment Reliability – Earth Stations – Example of Payloads of Operating and Planned Systems .

UNIT III SPACE LINKS 9

The Space Link – Satellite Link Design – Satellite Uplink – Down Link Power Budget– Basic Transmission Theory – System Noise Temp – G/T Ratio – Noise Figure – Downlink Design – Design Of Satellite Links for Specified C/N – Microwave Propagation on Satellite Earth Paths – Interference Between Satellite Circuits – Energy Dispersal – Propagation Characteristics of Fixed and Mobile Satellite Links .

UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS 9

Single Access Vs. Multiple Access (MA) – Classical MA Techniques – FDMA – TDMA Single Channel per Carrier (SCPC) Access – Code Division Multiple Access (CDMA) Demand Assignment Techniques – Examples of MA Techniques For Existing and Planned Systems (E.G. The Satellite Component of UMTS) – Mobile Satellite Network Design – ATM Via Satellite TCP/IP Via Satellite – Call Control – Handover and Call Set up Procedures Hybrid Satellite – Terrestrial Networks

UNIT V SERVICES AND APPLICATIONS 9

Fixed And Mobile Services – Multimedia Satellite Services – Advanced Applications Based on Satellite Platforms – INTELSAT Series – INSAT – VSAT – Remote Sensing Mobile Satellite Service – GSM – GPS INMARSAT – Navigation System – Direct to Home Service (DTH) – Special Services : E Mail, Video Conferencing And Internet Connectivity.

Total: 45

TEXT BOOKS

1. Dennis Roddy, “Satellite Communications”, 3rd Edition, Mc Graw Hill International Editions, 2001.
2. Tri T. Ha, “Digital satellite communication”, 2nd Edition, McGraw Hill, New York, 1990.

REFERENCES

1. Bruce R. Elbert, “The Satellite Communication Applications Hand Book”, Artech House Boston, 1997.
2. Wilbur L. Pritchard Hendri G Suyderhood Robert A Nelson, “Satellite Communication Systems Engineering”, 2nd Edition, Prentice Hall, New Jersey 1993

CO5154 – COMMUNICATION SYSTEM LABORATORY II

L	T	P
0	0	4

1. Simulation of Audio and Speech Compression Algorithms.
2. Simulation of EZW / SPIHT Image Coding Algorithm.
3. Simulation of Microstrip Antennas.
4. S parameter estimation of Microwave Devices.
5. Study of Global Positioning System.
6. Performance Evaluation of Simulated CDMA System.
7. Design and testing of a Microstrip coupler.
8. Characteristics of $\lambda/4$ and $\lambda/2$ Transmission Lines.

ELECTIVES

CO5001 – RF SYSTEM DESIGN

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UNIT I RF ISSUES **9**

Importance of RF Design – Electromagnetic Spectrum – RF behaviour of Passive Components – Chip components and Circuit Board Considerations – Scattering Parameters – Smith Chart and Applications.

UNIT II RF FILTER DESIGN **9**

Overview – Basic Resonator and Filter Configuration – Special Filter Realizations – Filter Implementations – Coupled Filter.

UNIT III ACTIVE RF COMPONENTS & APPLICATIONS **9**

RF Diodes – BJT, RF FETs – High Electron Mobility Transistors, Matching and Biasing Networks – Impedance Matching using Discrete Components – Microstrip Line Matching Networks – Amplifier Classes of Operation and Biasing Networks.

UNIT IV RF AMPLIFIER DESIGNS **9**

Characteristics – Amplifier Power Relations – Stability Considerations – Constant Gain Circles – Constant VSWR Circles– Low Noise Circuits – Broadband – High Power and Multistage Amplifiers

UNIT V OSCILLATORS MIXERS & APPLICATIONS **9**

Basic Oscillator Model – High Frequency Oscillator Configuration – Basic Characteristics of Mixers – Phase Locked Loops – RF Directional Couplers and Hybrid Couplers – Detector and Demodulator Circuits.

Total: 45

TEXT BOOKS

1. Reinhold Ludwig and Powel Bretchko “RF Circuit Design Theory and Applications”, 1st Edition, Pearson Education Asia, 2001.
2. Ulrich L. Rohde and David P. NewKirk, “Microwave Circuit Design”, John Wiley and Sons USA, 2000.

REFERENCES

1. Joseph J. Carr, “Secrets of RF Circuit Design”, 3rd Edition, McGraw Hill Publishers 2000.
2. Mathew M. Radmanesh, “Radio Frequency & Microwave Electronics”, 2nd Edition, Pearson Education Asia, 2002.
3. Roland E., “Best Phase Locked Loops Design simulation and applications”, 5th edition, McGraw Hill Publishers, 2003.

CO5002 – ADVANCED MICROWAVE SYSTEMS

	L	T	P
	3	0	0
UNIT I FIELD ANALYSIS OF PLANAR TRANSMISSION LINES			9
Microstrip Transmission Lines – Attenuation – High frequency properties of Microstrip lines – Coupled Microstrip lines – Even and Odd Modes – Strip Transmission Lines – Coupled Strip Lines Fin Lines.			
UNIT II CIRCUIT THEORY FOR WAVE GUIDE SYSTEMS			9
Equivalent Voltages and Currents – Impedance Description of Waveguide Elements and Circuits – One Port Circuit – Foster's Reactance Theorem. N–Port Circuits – Two Port Junctions, Excitation of Waveguides – Probe Coupling in Rectangular Waveguide – Radiation from Linear Current Elements and Current Loops – Waveguide Coupling by Apertures.			
UNIT III PERIODIC STRUCTURES AND FILTERS			9
Wave Analysis of Periodic Structures – Periodic Structures Composed of Unsymmetrical Two Port Networks – Terminated Periodic Structures – Matching of Periodic Structures– Floquet's Theorem and Spatial Harmonics– Microwave Filters – Image Parameter Method – Filter Design by Insertion Loss Method – Low pass Filter Design – Microstrip Parallel Coupled Filter .			
UNIT IV MICROWAVE SOLID STATE AMPLIFIERS			9
S–Parameters – Unilateral Design of Amplifiers – Simultaneous Conjugate Match – Bilateral Design of Amplifiers – Amplifier Stability – Conditional and Unconditional Stability Criteria – Amplifier Power Gain – Constant Gain Circles – Noise Temperature Concept – Noise Factor and Noise Figure – Noise Temperature for Cascaded Stages – Constant Noise Figure Circles – Design of Single Stage Microwave Amplifiers .			
UNIT V MICROWAVES AND OPTICS			9
Geometrical Optics as a Limiting Case of Wave Optics – Ray Matrices for Paraxial Ray Optics Gaussian Beams – Generation of Gaussian Beams at Microwave Frequencies – The Beam Waist – Propagation of Gaussian Beams in Homogeneous Medium – Transformation of Gaussian Beams With Lenses.			
			Total : 45

TEXT BOOKS

1. E Collin, “Foundations for Microwave Engineering”, McGraw Hill, 1992.
2. Ramo Whinnery and Van Duzer, “Fields and Waves in communication electronics”, 3rd Edition, Wiley, 1997.

CO5003 – COMMUNICATION PROTOCOL ENGINEERING

L T P
3 0 0

UNIT I NETWORK REFERENCE MODEL 9

Communication Model – Software, Subsystems, Protocol – Protocol Development Methods, Protocol Engineering Process – Layered Architecture – Network Services and Interfaces – Protocol Functions – OSI Model – TCP/IP Protocol Suite

UNIT II PROTOCOL SPECIFICATIONS 9

Components of Protocol – Specifications of Communication Service – Protocol Entity– Interface – Interactions – Multimedia Protocol – Internet Protocol – SDL, SDL Based Protocol – other Protocol Specification Languages.

UNIT III PROTOCOL VERIFICATION/VALIDATION 9

Protocol Verification – Verification of a Protocol Using Finite State Machines – Protocol Validation – Protocol Design Errors – Protocol Validation Approaches – SDL Based Protocol Verification and Validation.

UNIT IV PROTOCOL CONFORMANCE/PERFORMANCE TESTING 9

Conformance Testing Methodology and Frame Work – Conformance Test Architectures – Test Sequence Generation Methods – Distributed Architecture by Local Methods – Conformance Testing With TTCN – Systems with Semi Controllable Interfaces – RIP, SDL Based Tools for Conformance Testing – SDL Based Conformance Testing of MPLS Performance Testing – SDL Based Performance Testing of TCP and OSPF – Interoperability Testing – SDL Based Interoperability Testing of CSMA/CD And CSMA/CA Protocol Using Bridge – Scalability Testing.

UNIT V PROTOCOL SYNTHESIS AND IMPLEMENTATION 9

Protocol Synthesis – Interactive Synthesis Algorithm – Automatic Synthesis Algorithm – Automatic Synthesis of SDL From MSC– Protocol Re Synthesis, Requirements of Protocol – Implementation – Object Based Approach to Protocol Implementation – Protocol Compilers – Tool for Protocol Engineering.

Total: 45

TEXT BOOKS

1. Pallapa, Venkataram and Sunilkumar S. Manvi, “Communication protocol Engineering”, Eastern Economy edition, 2004.
2. V Ahuja, “Design and Analysis of Computer Communication networks”, McGraw Hill, London, 1982.

REFERENCES

1. Richard Lai and Jirachiefpattana, “Communication Protocol Specification and Verification”, Kluwer Publishers, Boston, 1998.
2. Tarnay K., “Protocol Specification and Testing”, Plenum New York, 1991.
3. Mohamed G. Gouda, “Elements of Network Protocol Design”, John Wiley and Sons Inc, New York USA, 1998.
4. G. J. Holtzmann, “Design and validation of Computer protocols”, Prentice Hall, New York, 1991.

CO5004 – DSP PROCESSOR ARCHITECTURE AND PROGRAMMING

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UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

Multiplier and Multiplier Accumulator – Modified Bus Structures and Memory Access in P–Dsps – Multiple Access Memory – Multi Port 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 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 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

TEXT BOOKS

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

CO5005 – WAVELETS AND MUTI RESOLUTION PROCESSING

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UNIT I FUNDAMENTALS 9

Vector Spaces – Properties– Dot Product – Basis – Dimension, Orthogonality and Orthonormality – Relationship Between Vectors and Signals – Signal Spaces – Concept of Convergence – Hilbert Spaces for Energy Signals– Generalised Fourier Expansion

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 TRANSFORM 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 Polyphase Matrix Factorization – Geometrical Foundations of Lifting Scheme – Lifting Scheme in Z –Domain.

UNIT V APPLICATIONS 9

Signal Compression – Image Compression Techniques: EZW–SPHIT Coding – Image De–Noising Techniques: Noise Estimation – Shrinkage Rules – Shrinkage Functions – Edge Detection and Object Isolation, Image Fusion, and Object Detection – Curve and Surface Editing – Variational Modeling and Finite Element Method Using Wavelets .

Total: 45

TEXT BOOKS

1. Rao R M and A S Bopardikar, “Wavelet Transforms Introduction to theory and Applications”, Pearson Education, Asia, 2000.
2. Strang Q Nguyen T, “Wavelets and Filter Banks”, Wellesley Cambridge Press, 1996.

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1. K P Soman and K I Ramachandran, “Insight into Wavelets From Theory to practice”, Prentice Hall, 2004.
2. Vetterli M Kovacevic J, “Wavelets and Sub band Coding”, Prentice Hall, 1995.
3. Mallat S, “Wavelet Signal Processing”, Academic, Press, 1996.

CO5006 – SPEECH AND AUDIO SIGNAL PROCESSING

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UNIT I MECHANICS OF SPEECH 9

Speech Production Mechanism – Nature of Speech Signal – Discrete Time Modelling of Speech Production – Representation of Speech Signals – Classification of Speech Sounds – Phones – Phonemes – Phonetic and Phonemic Alphabets– Articulatory Features – Music Production – Auditory Perception – Anatomical Pathways from the Ear to the Perception of Sound – Peripheral Auditory System Psycho Acoustics.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

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 FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

Short Time Fourier Analysis – Filter Bank Analysis – Formant Extraction – Pitch Extraction – Analysis by Synthesis – Analysis Synthesis Systems – Phase Vocoder– Channel Vocoder – Homomorphic Speech Analysis: Cepstral Analysis of Speech– Formant and Pitch Estimation – Homomorphic Vocoders .

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

Formulation of Linear Prediction Problem in Time Domain – Basic Principle – Auto Correlation Method – Covariance Method – Solution of LPC Equations – Cholesky Method – Durbin's Recursive Algorithm – Lattice Formation and Solutions– Comparison of Different Methods – Application of LPC Parameters – Pitch Detection using LPC Parameters – Formant Analysis – VELP – CELP

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9

Algorithms: Spectral Estimation, Dynamic Time Warping, Hidden Markov Model – Music Analysis – Pitch Detection – Feature Analysis for Recognition – Music Synthesis – Automatic Speech Recognition – Feature Extraction for ASR– Deterministic Sequence Recognition – Statistical Sequence Recognition – ASR Systems – Speaker Identification and Verification – Voice Response System – Speech Synthesis: Text to Speech – Voice Over IP .

Total: 45

TEXT BOOKS

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.

REFERENCES

1. Quatieri, “Discrete time Speech Signal Processing”, Prentice Hall 2001.
2. J L Flanagan, “Speech analysis Synthesis and Perception”, 2nd edition, Berlin 1972.
3. I H Witten, “Principles of Computer Speech”, Academic Press, 1982.

CO5007 – NETWORK ROUTING ALGORITHMS

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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 Inter-Domain 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: 45

TEXT BOOKS

1. William Stallings, “High Speed Networks TCP/IP and ATM Design Principles”, Prentice, Hall International, New York, 1998.
2. Sumit Kasera and Pankaj sethi, “ATM Networks”, Tata McGraw Hill Publishing, Company limited, New Delhi, 2001.

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1. M Steen strub, “Routing in Communication networks”, Prentice Hall, International, New York, 1995.
2. Mohammad Ilyas, “The Handbook of Ad hoc Wireless Networks”, CRC Press, 2002.
3. Behrouz A Forouzan, “Data Communications and Networking (3/e) T MH 2004.
4. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM” PHI, New Delhi, 2004.

CO5008 – SIMULATION OF COMMUNICATION SYSTEMS AND NETWORKS

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UNIT I MODELLING OF COMMUNICATION SYSTEM 9

Model of Speech and Picture Signals – Pseudo Noise Sequences – Non Linear Sequences, Analog Channel Model – Noise and Fading, Digital Channel Model – Gilbert Model Of Bursty – Channels – HF, Troposcatter and Satellite Channels – Switched Telephone Channels – Analog and Digital Communication System Models – Light Wave System Models

UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and Multivariate 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 III ESTIMATION OF PERFORMANCE MEASURES 9

Quality of an Estimator – Estimator for SNR – Probability Density Functions of Analog Communication System – BER of Digital Communication Systems – Monte Carlo Method and Importance of Sampling Method – Estimation of Power Spectral Density.

UNIT IV COMMUNICATION NETWORKS 9

Queuing Models– M/M/I and M/M/I/N Queues – Little Formula– Burke’s Theorem –M/G/I Queue – Embedded Markov Chain Analysis of TDM Systems – Polling, Random Access Systems.

UNIT V NETWORK OF QUEUES 9

Queues in Tandem – Store and Forward Communication Networks – Capacity Allocation – Congestion and Flow Chart – Routing Model – Network Layout and Reliability

Total: 45

TEXT BOOKS

1. M C Jeruchim Philip Balaban and K Sam Shanmugam, “Simulation of communication systems”, Plenum Press, New York 1992.
2. J F Hayes, “Modelling and Analysis of Computer Communication networks”, Plenum Press, New York, 1984.

REFERENCES

1. A M Law and W David Kelton, “Simulation Modelling and analysis”, Mc Graw Hill Inc, New York, 1991.
2. Jerry Banks and John S Carson, “Discrete event System Simulation”, Prentice Hall Inc, New Jersey 1984.

CO5009 – GLOBAL POSITIONING SYSTEMS

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UNIT I

9

History of GPS – BC-4 System – HIRAN – NNSS – NAVSTAR GLONASS and GNSS Systems – GPS Constellation – Space Segment – Control Segment – User Segment– Single and Dual Frequency – Point – Relative – Differential GPS – Static and Kinematic Positioning – 2D and 3D – Reporting Anti Spoofing (AS)– Selective Availability (SA) – DOP Factors .

UNIT II

9

Coordinate Systems – Geo Centric Coordinate System – Conventional Terrestrial Reference System – Orbit Description – Keplerian Orbit – Kepler Elements – Satellite Visibility – Topocentric Motion – Disturbed Satellite Motion – Perturbed Motion – Disturbing Accelerations – Perturbed Orbit – Time Systems – Astronomical Time System – Atomic Time – GPS Time – Need for Coordination – Link to Earth Rotation – Time and Earth Motion Services .

UNIT III

9

C/A Code, P-code, Y code, L1, L2 Carrier frequencies – Code Pseudo Ranges – Carriers Phases – Pseudo Ranges – Satellite Signal Signature – Navigation Messages and Formats – Un differenced and Differenced Range Models – Delta Ranges – Signal Processing and Processing Techniques – Tracking Networks – Ephemerides – Data Combination – Narrow Lane– Wide Lane – OTF Ambiguity .

UNIT IV

9

Propagation Media – Multipath – Antenna Phase Centre – Atmosphere in brief – Elements of Wave Propagation – Ionospheric Effects on GPS Observations – Code Delay– Phase Advances – Integer Bias – Clock Error – Cycle Slip – Noise Bias – Blunders – Tropospheric Effects on GPS Observables – Multipath Effect – Antenna Phase Centre Problems and Correction .

UNIT V

9

Inter Disciplinary Applications – Crystal Dynamics – Gravity Field Mapping un – Atmospheric Occultation – Surveying – Geophysics – Air Borne GPS – Ground Transportation – Space Borne GPS – Metrological and Climate Research using GPS .

Total: 45

TEXT BOOKS

1. B Hoffman, Wellenhof H, Lichtenegger and J Collins, “GPS Theory and Practice”, 4th revised edition, Springer, Wein, New york 1997.
2. B Parkinson J Spilker Jr (Eds), “GPS Theory and Applications”, Vol I & Vol II AIAA 370 L'Enfant Promenade, SW Washington, DC 20024, 1996.

REFERENCES

1. A Leick, “GPS Satellites Surveying”, 2nd edition, John Wiley & Sons, NewYork, 1995.
2. A Kleusberg and P Teunisen(Eds), “GPS for Geodesy”, Springer Verlag Berlin 1996.
3. L Adams, “The GPS A Shared National Asset”, Chair National Academy Press, Washington, DC 1995.

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[http //www navcen uscg mil](http://www.navcen.uscg.mil)

CO5010 – COMMUNICATION NETWORK SECURITY

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UNIT I SYMMETRIC CIPHERS (Techniques and Standards) I 9

Services – Mechanisms and Attacks – OSI security Architecture – Model for Network Security – Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines– Stenography – Block Ciphers and Data Encryption Standard – Simplified DES – Block Cipher Principles, Data Encryption Standard – Strength of DES – Differential and Linear Crypt Analysis, Block Cipher Design Principles – Block Cipher Modes of Operation.

UNIT II SYMMETRIC CIPHERS (Techniques and Standards) II 9

Advanced Encryption Standard – Evaluation Criteria for AES, AES Cipher– Contemporary Symmetric Ciphers – Triple DES, Blowfish, RC5 – Characteristics of Advanced Symmetric Block Ciphers – RC4 Stream Cipher – Confidentiality using Symmetric Encryption – Placement of Encryption Function – Traffic Confidentiality – Key Distribution and Random Number Generation.

UNIT III PUBLIC KEY ENCRYPTION AND HASH FUNCTIONS 9

Public Key Cryptography and RSA – Principles of Public Key Cryptosystems – RSA Algorithm– Key Management and other public key cryptosystems – Key Management– Diffie–Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Functions and MACs; Hash Algorithms – 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 – IP Security Overview– IP Security 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: 45

TEXT BOOKS

1. William Stallings, “Network Security Essentials”, 2nd edition, Prentice Hall of India New Delhi, 2004.
2. Charlie Kaufman, “Network Security Private Communication in Public World” 2nd edition, Prentice Hall of India New Delhi, 2004.

REFERENCES

1. William Stallings, “Cryptography and Network Security”, 3rd edition, Prentice Hall of India, New Delhi, 2004.

CO5011 – SOFT COMPUTING

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UNIT I ARTIFICIAL NEURAL NETWORKS 9

Basic concepts – Single Layer Perception – Multi Layer Perception – Adaline – Madaline – Learning Rules – Supervised Learning – Back Propagation Networks – Training Algorithm – Practical Difficulties – Advanced Algorithms – Adaptive Network – Radial Basis – Network – Modular Network – Applications.

UNIT II UNSUPERVISED NETWORKS 9

Unsupervised Learning – Competitive Learning Networks – Kohonen self organising networks – Learning Vector Quantization – Hebbian Learning – Hopfield Network –Content Addressable Nature – Binary Hopfield Network – Continuous Hopfield Network Traveling Salesperson Problem – Adaptive Resonance Theory – Bidirectional Associative Memory – Principle Component Analysis

UNIT III FUZZY SYSTEMS 9

Fuzzy Sets–Fuzzy Rules: Extension Principle, Fuzzy Relation – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Model – Sugeno Model – Tsukamoto Model– Fuzzy decision Making – Multiobjective Decision Making – Fuzzy Classification– Fuzzy Control Methods – Application.

UNIT IV NEURO FUZZY MODELLING 9

Adaptive Neuro Fuzzy Based Inference Systems – Classification and Regression Trees: Decision Tress – Cart Algorithm – Data Clustering Algorithms: K Means Clustering, Fuzzy C Means Clustering, Mountain Clustering, Subtractive Clustering, Rule Base Structure Identification – Neuro Fuzzy Control – Feedback Control Systems– Expert Control – Inverse Learning – Specialized Learning – Back Propagation Through Real Time Recurrent Learning .

UNIT V GENETIC ALGORITHM 9

Fundamentals of Genetic Algorithm – Mathematical Foundations – Genetic Modeling –Survival of The Fittest – Crossover – Inversion and Deletion – Mutation – Reproduction Generational Cycle – Rank Method – Rank Space Method – Other Derivative Free Optimization – Simulated Annealing – Random Search – Downhill Simplex Search – Application .

Total: 45

TEXT BOOKS

1. Jang J S R Sun C T and Mizutani E, “Neuro Fuzzy and Soft computing”, Pearson Education, (Singapore) 2004.
2. Timothy J Ross, “Fuzzy Logic Engineering Applications”, McGrawHill NewYork, 1997

REFERENCES

1. David E Goldberg, “Genetic Algorithms in Search Optimization and Machine Learning”, Pearson Education, Asia, 1996.
2. Laurene Fauseett, “Fundamentals of Neural Networks” Prentice Hall, India, New Delhi, 1994.
3. S Rajasekaran and G A Vijayalakshmi Pai, “Neural networks Fuzzy logics and Genetic algorithms”, Prentice Hall of India, 2003.
4. George J Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic”, Prentice Hall Inc, New Jersey, 1995.

CO5012 – DIGITAL COMMUNICATION RECEIVERS

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UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Base Band and Band Pass Communication – Signal Space Representation – Linear and Non-Linear Modulation Techniques – Spectral Characteristics Of Digital Modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation Demodulator – Matched Filter – Maximum Likelihood Sequence Detector – Optimum Receiver For CPM Signals – M–Ary Orthogonal Signals – Envelope Detectors for M–Ary and Correlated Binary Signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of Fading Multiple Channels – Statistical Models – Slow Fading – Frequency Selective Fading – Diversity Technique – RAKE Demodulator – Coded Waveform for Fading Channel.

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and Symbol Synchronization – Carrier Phase Estimation PLL, Decision Directed Loops – Symbol Timing Estimation, Maximum Likelihood And Non–Decision Directed Timing – Estimation – Joint Estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero Forcing Algorithm – Lms Algorithm, Adaptive Decision – Feedback Equalizer and Equalization of Trellis–Coded Signals – Kalman Algorithm – Blind Equalizers and Stochastic Gradient Algorithm – Echo Cancellation.

Total: 45

TEXT BOOKS

1. John G Proakis, “Digital Communication”, 4th Edition, McGraw Hill, New York, 2001.
2. Heinrich Meyer Mare Moeneclacy and Stefan A Fechtel, “Digital Communication Receivers”, Vol 1 & 2 John Wiley, New York 1997.

REFERENCES

1. E A Lee and D G Messerschmitt, “Digital Communication”, 2nd Edition Allied Publishers, New Delhi, 1994.
2. Simon Marvin, “Digital Communication Over Fading channel– An unified approach to performance Analysis”, John Wiley, New York, 2000.
3. Bernard Sklar, “Digital Communication Fundamentals and Applications”, Prentice Hall, 1998.

AN5104 – ADVANCED MICROPROCESSORS AND MICRO CONTROLLERS

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UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction Set – Data Formats – Instruction Formats – Addressing Modes – Memory Hierarchy – Register File – Cache – Virtual Memory And Paging – Segmentation – Pipelining – The Instruction Pipeline – Pipeline Hazards – Instruction Level Parallelism – Reduced Instruction Set – Computer Principles – RISC versus CISC – RISC properties RISC evaluation – On chip register Files Versus Cache Evaluation .

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE PENTIUM 9

The Software Model – Functional Description– CPU Pin Descriptions – RISC Concepts – Bus Operations – Super Scalar Architecture – Pipe Lining – Branch Prediction – The Instruction And Caches – Floating Point Unit – Protected Mode Operation – Segmentation – Paging – Protection – Multitasking – Exception and Interrupts – Input /Output – Virtual 8086 Model – Interrupt Processing– Instruction Types – Addressing Modes – Processor Flags – Instruction Set – Programming The Pentium Processor .

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE ARM 9

The ARM Architecture – ARM Assembly Language Program – ARM Organization And Implementation – The ARM Instruction Set – The Thumb Instruction Set – ARM CPU Cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions And Addressing Modes – Operating Modes – Hardware Reset – Interrupt System – Parallel I/O Ports – Flags – Real Time Clock – Programmable Timer – Pulse Accumulator – Serial Communication Interface – A/D Converter – Hardware Expansion – Assembly Language Programming .

UNIT V PIC MICRO CONTROLLER 9

CPU Architecture – Instruction Set – Interrupts – Timers – I/O Port Expansion – I²C Bus For Peripheral Chip Access – A/D Converter – UART.

Total: 45

TEXTBOOKS

1. Daniel Tabak, “Advanced Microprocessors”, McGraw Hill Inc , 1995.
2. Steve Furber, “ARM System On Chip architecture”, Addison, Wesley, 2000.

REFERENCES

1. James L Antonakos , “An Introduction to the Intel family of Microprocessors”, Pearson Education, 1999.
2. Barry B Breg , “The Intel Microprocessors Architecture Programming and Interfacing”, PHI, 2002.
3. James L Antonakos, “The Pentium Microprocessor”, Pearson Education, 1997.
4. John B Peatman, “Design with PIC Microcontroller”, Prentice hall, 1997.

Web links

[www ocw nit edu](http://www.ocw.nit.edu)

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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

TEXT BOOKS

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.

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1. Jon Crowcroft Mark Handley Ian, “Wakeman Internetworking Multimedia” Harcourt, Singapore, 1998.
2. Tay Vaughan, “Multimedia Making it to work”, 4th edition Tata McGraw Hill, NewDelhi, 2000.

AN5009 – ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN

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UNIT I EMI ENVIRONMENT 9

EMI/EMC Concepts and Definitions – Sources of EMI, Conducted and Radiated EMI – Transient EMI – Time Domain Vs Frequency Domain EMI – Units of Measurement Parameters – Emission and Immunity Concepts – ESD .

UNIT II EMI COUPLING PRINCIPLES 9

Conducted, Radiated and Transient Coupling – Common Impedance Ground Coupling – Radiated Common Mode and Ground Loop Coupling – Radiated Differential Mode Coupling – Near Field Cable to Cable Coupling – Power Mains and Power Supply Coupling .

UNIT III EMI/EMC STANDARDS AND MEASUREMENTS 9

Civilian Standards – FCC, CISPR, IEC, EN, Military Standards – MIL, STD 461D/462 – EMI Test Instruments /Systems – EMI Shielded Chamber – Open Area Test Site – TEM Cell – Sensors/Injectors/Couplers – Test Beds for ESD And EFT– Military Test Method and Procedures (462) .

UNIT IV EMI CONTROL TECHNIQUES 9

Shielding – Filtering – Grounding – Bonding – Isolation Transformer – Transient Suppressors – Cable Routing Signal – Control Component Selection and Mounting

UNIT V EMC DESIGN OF PCBs 9

PCB Traces Cross Talk – Impedance Control – Power Distribution Decoupling –Zoning – Motherboard Designs And Propagation Delay Performance Models .

Total: 45

TEXT BOOKS

1. V P Kodali, “Engineering EMC Principles Measurements and Technologies” IEEE Press, 1996.
2. C R Paul, “Introduction to Electromagnetic Compatibility”, John Wiley and Sons, Inc., 1992.

REFERENCES

1. Henry W. Ott, “Noise Reduction Techniques in Electronic Systems”, John Wiley and Sons, New York, 1988.
2. Bernhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Edition, Artech house, 1986.

AN5010 – HIGH PERFORMANCE COMMUNICATION NETWORKS

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UNIT I PACKET SWITCHED NETWORKS 9

OSI and IP Models Ethernet (IEEE 802.3) – Token Ring (IEEE 802.5) – Wireless LAN (IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS .

UNIT II ISDN AND BROADBAND ISDN 9

ISDN – Overview – Interfaces and Functions – Layers and Services – Signaling System 7 (SS7) Broadband ISDN Architecture and Protocols .

UNIT III ATM AND FRAME RELAY 9

ATM: Main Features – Addressing Signaling and Routing – ATM Header Structure Adaptation Layer – Management and Control – ATM Switching and Transmission – Frame Relay: Protocols and Services – Congestion Control – Internetworking with ATM, Internet and ATM – Frame Relay Via ATM .

UNIT IV ADVANCED NETWORK ARCHITECTURE 9

IP forwarding architectures overlay model – Multi Protocol Label Switching (MPLS) – Integrated Services in the Internet – Resource Reservation Protocol (RSVP) – Differentiated Services

UNIT V BLUE TOOTH TECHNOLOGY 9

The Blue Tooth Module – Protocol Stack Part I : Antennas – Radio Interface – Base Band the LINK Controller – Audio – The Link Manager – The Host Controller Interface – The Blue Tooth Module – Protocol Stack Part I: Logical Link Control and Adaptation Protocol – RFCOMM – Service Discovery Protocol – Wireless Access Protocol – Telephony Control Protocol .

Total: 45

TEXT BOOKS

1. Leon Gracia Widjaja, “Communication networks”, Tata McGraw Hill New Delhi, 2000.
2. Sumit Kasera Pankaj Sethi , “ATM Networks”, Tata McGraw Hill, New Delhi 2000.

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1. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, 4th edition, Pearson Education, Asia, 2002.
2. Jennifer Bray and Charles F Sturman, “Blue Tooth”, Pearson Education, Asia, 2001
3. Jean Walrand and Pravin varaiya, “High Performance Communication networks”, 2nd edition, Harcourt and Morgan Kauffman, London, 2000.
4. William Stallings, “High speed Networks and Internets”, 2nd edition, Pearson Education, Asia, 2003.

UNIT I EMBEDDED ARCHITECTURE 9

Embedded Computers – Characteristics of Embedded Computing Applications – Challenges in Embedded Computing System Design – Embedded System Design –Process Requirements – Specification – Architectural Design – Designing Hardware and Software Components – System Integration – Formalism for System Design – Structural Description, Behavioral Description – Design Example: Model Train Controller.

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 – Component Interfacing – Designing with Microprocessor Development and Debugging – 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, Network – Based Design – Communication Analysis – System Performance Analysis – Hardware Platform Design – Allocation and Scheduling – 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 – Challenges in Validating Timing Constraints in Priority Driven Systems – 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 – System Architecture – Ink Jet printer – Hardware Design and Software Design – Personal Digital Assistants – Set top Boxes

Total: 45

TEXT BOOKS

1. Wayne Wolf, “Computers as Components Principles of Embedded Computing System Design”, Morgan Kaufman Publishers, 2001.
2. Frank Vahid and Tony Givargi, “Embedded System Design A Unified Hardware/Software”, John Wiley & Sons, 2000.

REFERENCES

1. Jane W S Liu, “Real Time systems”, Pearson Education, Asia, 2000.
2. C M Krishna and K G Shin, “Real Time Systems”, McGraw Hill 1997.

CO1621 – HIGH SPEED SWITCHING ARCHITECTURE

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UNIT I HIGH SPEED NETWORK			9
Concepts of LAN, WAN, Network Evolution through ISDN to B-ISDN – Transfer Mode and Control of B-ISDN – 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 Model, Blocking Networks – Basic and Enhanced Banyan Networks – Sorting Networks – Merge Sorting – Re Arrangable Networks – Full and Partial Connection Networks – Non Blocking Networks – Recursive Network Construction – Comparison of Non-Blocking Network – Switching With Deflection Routing – Shuffle Switch – Tandem Banyan .			
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
Addressing model – IP Switching Types – Flow Driven and Topology Driven Solutions – IP Over ATM Address and next hop Resolution – Multicasting, Ipv6 over ATM.			

Total: 45

TEXT BOOKS

1. Achille Pattavina Swtching, “Theory Architectures And Performance In Broadband ATM Networks”, John Wiley & Sons Ltd, New York, 1998.
2. Rainer Handel Manfred N. And Huber Stefan Schroder, “ATM Networks Concepts Protocols Applications” 2nd Edition, Addison Wesley, New York 1999.

REFERENCES

1. Christopher Y Metz, “Switching protocols & Architectures” McGraw Hill, Professional Publishing, New York, 1998.
2. John A Chiong, “Internetworking ATM for the internet and enterprise networks” McGraw Hill, New York, 1998.