MASTER OF TECHNOLOGY

COMMUNICATION SYSTEMS

(ELECTRONICS AND COMMUNICATION ENGINEERING)

Syllabi

Scheme of instructions

I Semester

Course No.	Name of Course	Scheme of Instruction		Credits	Scheme of Valuation						
					Sessional Marks				End Exam		TOTAL
	THEORY	Theory Hrs.	Practical Hrs.		I – Test		II – Test				
					Duration Hrs.	Max. Marks	Duration Hrs.	Max. Marks	Duration Hrs.	Max. Marks	
ECCSC 101 A	Digital Communication Techniques	4	-	4	2	20	2	20	3	60	100
ECCSC 102 A	Advanced Digital Signal Processing	4	-	4	2	20	2	20	3	60	100
ECCSC 103	Communications Networks	4	-	4	2	20	2	20	3	60	100
ECCSC 104	Radiation Systems	4	-	4	2	20	2	20	3	60	100
ECCSE 107	Modern Radar systems	4	-	4	2	20	2	20	3	60	100
ECCSE 108	Adaptive Arrays	4	-	4	2	20	2	20	3	60	100
	PRACTICALS										
ECCSC 101 B	Digital Communication Techniques Lab	-	2	1	Class Work	20	Test	20	3	60	100
ECCSC 102 B	Advanced Digital Signal Processing Lab	-	2	1	Class Work	20	Test	20	3	60	100
	Seminar	-	2	1	-	-	-	-	-	-	100

II Semester

Course No.	Name of Course	Scheme of Instruction		Credits	Scheme of Valuation						
					Sessional Marks				End Exam		TOTAL
					I – Test		II – Test				
	THEORY	Theory Hrs.	Practical Hrs.		Duration Hrs.	Max. Marks	Duration Hrs.	Max. Marks	Duration Hrs.	Max. Marks	
ECCSC 201 A	Image Processing	4	-	4	2	20	2	20	3	60	100
ECCSC 202 A	Microwave Circuits	4	-	4	2	20	2	20	3	60	100
ECCSC 203	Optical Communication Network	4	-	4	2	20	2	20	3	60	100
ECCSC 204	Wireless Communication	4	-	4	2	20	2	20	3	60	100
ECCSE 206	Neural & Fuzzy Control Systems	4	-	4	2	20	2	20	3	60	100
ECCSE 210	Radar Signal Processing	4	-	4	2	20	2	20	3	60	100
	PRACTICALS										
ECCSC 201 B	Image Processing Lab	-	2	1	Class Work	20	Test	20	3	60	100
ECCSC 202 B	Microwave Circuits Lab	-	2	1	Class Work	20	Test	20	3	60	100
	Seminar	-	2	1	-	-	-	-	-	-	100

LIST OF ELECTIVES

ELECTIVE – I & II		ELECTIVE – III & IV	
Code	**Subject**	**Code**	**Subject**
ECCSE 101	Reliability Engineering in Electronics	ECCSE 201	EMI & EMC
ECCSE 102	Remote Sensing	ECCSE 202	Expert Systems
ECCSE 103	DSP System Design	ECCSE 203	Pattern Recognition
ECCSE 104	Detection & Estimation of Signals	ECCSE 204	Solid state Microwave Devices
ECCSE 105	Nano Electronics and MEMS	ECCSE 205	Speech Processing
ECCSE 106	Coding Techniques	ECCSE 206	Neural & Fuzzy Control Systems
ECCSE 107	Modern Radar Systems	ECCSE 207	Embedded Systems
ECCSE 108	Adaptive arrays	ECCSE 208	Satellite Communication Systems
ECCSE 109	DSP algorithm & Architecture	ECCSE 209	Network routing Algorithms
ECCSE 110	RFID (Radio Frequency Identification)	ECCSE 210	Radar Signal Processing

ECCSC 101 A
DIGITAL COMMUNICATION TECHNIQUES

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Probability Statistics and Stochastic Process
2. Basics of Digital Communication.

Course Educational Objectives:

- To make the students familiarize with vector and signal space concepts and memory less modulation methods.
- To make the students familiarize with vector, signal space concepts and signaling along with comprehensive about the different digital modulation techniques.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.
- To impart the knowledge about spread spectrum modulation, its significance and its applications.

Course outcomes:

- Gain knowledge to map the vector concepts to signal space.
- Able to design advanced digital modulation circuits in the area of BPSK, DPSK.
- Capacity to design M-ary systems.
- Analyze the channel coding aspects like linear block codes, cyclic codes and convolution codes.
- Understand and analyze the broad band communication systems.

UNIT I

Characterization of Communication Signals and Systems- Signal space representations- Vector Space Concepts, Signal Space Concepts, Orthogonal Expansion of Signals. Representation of Digitally Modulated Signals-Memory less Modulation Methods.

UNIT II

Base Band Digital Transmission: Digital PAM signals, Matched Filter, Optimum Filter. Binary Phase Shift Keying (BPSK), Differential Phase shift Keying (DPSK), Differentially Encoded PSK (DEPSK) and Quadrature Phase Shift Keying.

UNIT III

M-ary Phase Shift Keying, Quadrature Phase Shift Keying (QPSK),Binary Phase Shift Keying (BPSK),M-ary FSK, Minimum Shift Keying (MSK),Amplitude Shift Keying, Comparison of Digital Modulation Techniques.

UNIT-IV

Error control Coding: Types of Codes, Linear block codes, cyclic codes, Convolution codes, Tree diagram, State diagram, Trellis diagram, Applications.

UNIT-V

Spread Spectrum Modulation: Pseudo-noise Sequences, Direct Sequence Spread Spectrum Modulation, Frequency HOP Spread Spectrum Modulation, Comparison of Spread Spectrum Modulation, Applications

Text Books:

1. Taub-Schilling and GoutamSaha, "Principles of Communication Systems", 3rd Edition, ,TATA McGraw-Hill.
2. J.S.Chitode, " Digital Communication" ,Technical Publications.
3. J.G. Proakis, "Digital Communication", MGH 4TH edition, 1995.

Reference Books:

1. Edward. A. Lee and David. G. Messerschmitt, "Digital Communication", Allied Publishers (second edition).
2. J Marvin. K.Simon, Sami. M. Hinedi and William. C. Lindsey, "Digital Communication Techniques", PHI.
3. William Feller, "An introduction to Probability Theory and its applications", Vol11, Wiley 2000.

ECCSC 102 A
ADVANCED DIGITAL SIGNAL PROCESSING

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signals & Systems
2. Digital Signal Processing

Course Educational Objectives:

The goal of the course is to introduce digital signal processing methods and to expose them to examples of applications.

- To study stability of the digital systems.
- To understand various schemes for digital filter implementations.
- To study of different DSP algorithms for computation of DFT.
- To learn the finite word length effects in signal processing.
- To understand various application areas using Signal processing methods.

Course outcomes:

- Gain knowledge on Digital Systems.
- Ability to design advanced FIR and IIR Digital filter algorithms.
- Capability to implement fast algorithms in the area of Digital Signal Processing.
- Ability to analyze and implement the algorithms in finite word length systems.
- Able to apply Digital Signal Processing knowledge in specific domains.

UNIT – I

LTI Discrete-Time Systems In The Transform Domain: Types of Linear-Phase transfer functions, Simple digital filters, Complementary Transfer Functions, Inverse Systems, System identification, Digital Two-Pairs, Algebraic Stability Test.

UNIT – II

Digital Filter Structure And Design: All pass filters,Tunable IIR Digital filter, IIR tapped Cascaded Lattice Structures, FIR Cascaded lattice Structures, Parallel All pass realization of IIR Transfer Functions, State Space Structures, Polyphase Structures, Digital Sine-Cosine generator, Computational Complexity of Digital filter Structures, Design of IIR filter using Pade' approximation, Least square design methods, Design of computationally Efficient FIR Filters.

UNIT – III

DSP Algorithms: Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT – IV

Analysis Of Finite Word Length Effects: The Quantization Process and errors, Quantization of fixed-point Numbers, Analysis of Coefficient quantization effects, A/D conversion Noise Analysis, Analysis of Arithmetic Round of errors, Dynamic range scaling, Signal to Noise ratio in Low-order IIR Filters, Low sensitivity Digital filters, Reduction of Product Round off Errors using error feedback, Limit cycle in IIR Digital filters, Round of errors in FFT algorithms.

UNIT-V

Applications Of Digital Signal Processing: Dual Tone Multi-frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non-stationary Signals, Musical Sound Processing, Over Sampling A/D Converter, Over Sampling D/A Converter, Discrete –Time Analytic Signal generation

TEXT BOOKS:

1. Digital Signal Processing by Sanjit K Mitra, Tata MCgraw Hill Publications
2. Digital Signal Processing Principles, Algorithms,Applications By J G Proakis,D G Manolokis, PHI.
3. Discrete-Time Signal Processing by A V Oppenhiem, R W Schafer , Pearson Education Asia.

ECCSC 103
COMMUNICATION NETWORKS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Communication Systems.
2. Computer Networks.

Course Educational Objectives:

- To be familiar with wireless networking concepts, contemporary issues in networking technologies, network tools
- Explain how the packets are passed around the Internet and how the traffic and errors are controlled and to describe application and application protocols.
- Students have experience in designing communication protocols and are exposed to the TCP/IP protocol suite.
- To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks, Identify security and privacy issues that relate to computer networks.

Course outcomes:

- Understand the various communication network topologies.
- Understand the Network layer concepts.
- Ability to design a communication network.
- Ability to incorporate protocols in computer communication networks.
- Ability to apply security algorithms for communication network.

UNIT – I

Introduction to communication networks: Introduction to communication networks, Efficient Transport of Packet Voice Calls, Achievable throughput in an Input-Queuing Packet switch. The Importance of Quantitative Modeling in the Engineering of, Telecommunication Networks**.**

Networking: Functional Elements and Current Practice, Networking as Resource Sharing. The Functional Elements, Current Practice.

UNIT – II

Communication Networks and Services: Networks and Services, Approaches to Network Design, Key Factors in Communication Network Evolution.Applications and Layered Architectures:Examples of Layering, The OSI Reference Model,

Overview of TCP/IP Architecture, The Berkeley API, Application Protocols and TCP/IP Utilities.

UNIT - III

Transmission Systems and the Telephone Network: Multiplexing, SONET, Wavelength-Division Multiplexing, Circuit Switches, The Telephone Network, Signaling, Traffic and Overload Control in Telephone Networks, Cellular Telephone Networks, Satellite Cellular Networks, Peer-to-Peer Protocols and Service Models, Data Link Controls

UNIT – IV

TCP/IP: The TCP/IP Architecture, The Internet Protocols, IPv6, User Datagram Protocol, Transmission Control Protocol, DHCP and Mobile IP, Internet Routing Protocols, Multicast Routing.

TM Networks: Why ATM?, BISDN Reference Model, ATM Signaling, IP Forwarding Architectures, Integrated Services in the Internet.

UNIT-V

Security Protocols: Security and Cryptographic Algorithms, Security Protocols, Cryptographic Algorithms, RSA.

Multimedia Information and Networking: Lossless Data Compression, Digital Representation of Analog Signals, Techniques for Increasing Compression. The Real-Time Transport Protocol, Session Control Protocols

TEXT BOOKS:

1. COMMUNICATION NETWORKING An Analytical Approach, by Anurag Kumar, D. Manjunath, and Joy Kuri.
2. COMMUNICATION NETWORKS AND COMPUTER SYSTEMS Tribute to Professor Erol Gelenbe by Javier A Barria.

REFERENCE BOOKS:

1. Communication Networks-Fundamental Concepts and Key Architectures Alberto Leon-Garcia & Indra.
2. D Bertsekas and R Gallager, 'Data Networks', Prentice Hall, 1992.

ECCSC 104
RADIATION SYSTEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

- Fundamentals of Electromagnetic analysis, Maxwell's equations, radiation.
- Antenna fundamentals, antenna arrays, basic idea on mobile communication.

Course Educational Objectives:

- Understand Electromagnetic Theorems.
- To know about Aperture Antennas.
- To know about Microstrip Antennas.
- Understand the basic elements of Phased Arrays.
- Explore the basic concepts about Mobile Communication Antennas.

Course outcomes:

- Understand the basics of Electromagnetics for near and Far fields.
- Ability to understand and design Aperture Horn antennas.
- Ability to analyze and design Microstrip antennas.
- Ability to design phase antenna array and feeding mechanism.
- Ability to understand and implement smart antennas for communication.

UNIT – I

Electromagnetic Theorems: Duality theorem, field equivalence principle, Babinet's principle. Vector potentials and Electromagnetic fields for near and Far-field radiation.

UNIT – II

Aperture Antennas: Radiation equations. Rectangular apertures –uniform and TE10 mode distributions. Circular apertures- uniform and TE11 mode distributions. E-plane and H-Plane sectoral horns. Pyramidal horn. Conical horn.

UNIT – III

Micro strip Antennas: Advantages and disadvantages. Different forms of patches. Methods of excitation. Field analysis methods – Transmission line method and caving method, Application to rectangular and circular patches. Input impedance, Bandwidth, and polarization.

UNIT – IV

Phased Arrays: Radiation pattern of phased arrays. Beam steering. Basic components of a phased array. Types of radiators – Dipole, open-ended waveguide, waveguide slot, and Micro strip radiators. Phase shifters – Diode phase shifters and ferrite phase shifters. Feed networks – space feeds and constrained feeds.

UNIT – V

Mobile Communication Antennas: Base station antenna requirements. X-POL antenna. Panel antenna. Beam tilting. Smart antennas- Switched beam and adaptive beam forming concepts.

Text Books:

1. Constantine A. Balanis, "Antenna theory analysis and design", John wiley& sons, Inc., New York, 2nd Edn. 2004.
2. Merrill I. Skolnik, "Introduction to Radar Systems", Tata Mc.Graw-Hill Publishing co. Limited, New Delhi, 3rd Edn. 2001.

Reference Books:

1. Y.T.Lo, and S.W. Lee, "Antenna Handbook Theory Applications, and Design", Van Nostrand Reinhold co., New York, 1988.
2. Electromagnetic waves and radiation systems by Edward C. Jordankeeth G. Balmain

ECCSE 107
MODERN RADAR SYSTEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Radar Systems
2. Microwave Engineering

Course Educational Objectives:

- To provide an introduction to the basics of radar operation.
- To explore various Radar range detection techniques.
- To provide the concepts of Radar measurement and tracking techniques.
- To make the students get familiarized with advanced radar systems.
- To provide the knowledge of Radar electronic counter measures.

Course Outcomes:

- Understand the basics of RADAR configurations.
- Analyze the different RADAR detection techniques.
- Acquaint with knowledge on RADAR system measurements and error analysis.
- Gain knowledge on advanced RADAR configurations.
- Gain knowledge on Electronic counter measures.

UNIT- I

Radar configurations and operational concepts: Basic function, frequency bands and applications, Range equation, Receiver noise, Signal to noise ratio, Search radar, Range with active jamming, radar with clutter, detection range with combined interference. Radar cross section of simple objects and complex targets, bi-static cross section.

UNIT - II

Radar detection techniques: Coherent and non coherent detection, matched filters, different methods of integration of pulse trains, Detection of fluctuating targets-fluctuation loss, diversity gain, binary integration of fluctuating targets, cumulative integration on fluctuating targets. Sequential detection with rapid confirmation, Constant false alarm rate detection-Cell averaging, two parameter, Time averaging and non parametric.

UNIT - III

Radar measurement and tracking techniques: Radar measurement characteristics: sensitivity, angle measurement, conical scan, sector scan. Mono-pulse radar, range tracking, Doppler measurement. Radar error analysis.

UNIT- IV

Special radar configurations and their applications: Bi-static radar, Synthetic aperture radar, HF over the horizon radar, air surveillance radar, height finder and 3D radar

UNIT - V

Radar electronic countermeasures (ECM) and electronic counter-countermeasures (ECCM): Noise jamming of surveillance radar, detection range in noise jamming, Electronic counter counter measures (ECCM)provisions for surveillance radar. Objective of ECM against tracking radar, prevention and delay of acquisition, denial of range and Doppler data.

TEXTBOOKS:

- Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition)
- David K. Barton, Modern radar systems analysis, Artech House, Inc. 1988.
- B, Edde, Radar: Principles, Technology, Applications, Prentice Hall, 1993.

Reference Books:

- Hamish D. Meikle, Modern Radar Systems.
- David K. Barton, " Radra system analysis and modeling",Artech house House,INC

ECCSE 108
ADAPTIVE ARRAYS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signal Processing.
2. Antennas and Wave Propagation.

Course Educational Objectives:

- To adjust the radiation maximum and null positions in desired direction.
- To estimate the signal in the presence of noise.
- To maximize Signal to Noise ratio (SNR) using different types of algorithms.
- To search the signal in the presence of noise using random search algorithms.
- To have knowledge of different recursive methods in array processing.

Course Outcomes:

- Understand the basics of various adaptive array systems.
- Design and develop optimal arrays for different propagation conditions.
- Analyze the various adaptive processing algorithms.
- Understand and apply algorithms for non stationary environment.
- Understand and apply optimization algorithms based on probability.

UNIT – I

Introduction: Motivation for using adaptive arrays, principal system elements, signal environment, array element spacing considerations, array performance, narrow band and broadband signal processing considerations, adaptive array performance measure, coverage improvement factor.

UNIT - II

Optimum array processing: Signal descriptions for conventional and signal aligned arrays, optimum array processing for narrowband applications, optimum array processing for broadband applications, optimum array processing for perturbed propagation conditions, polarization sensitive arrays.

UNIT- III

Adaptive Algorithm: Gradient-Based Algorithms, Introductory concepts, The LMS Algorithms, The Howells-Applebaum Adaptive Processor, Introduction of main beam constraints, Constraint for the case of known desired signal power level, the DSD

Algorithm, The Accelerated Gradient Approach (AG), Gradient Algorithm with Constraints, Simulation results, phase-only adaptive nulling using steepest descent.

UNIT – IV

Recursive Methods for Adaptive Array Processing: The weighted least square error processor, updated covariance matrix inverse, Kalman Filter methods for adaptive array processing, the minimum variance processor, simulation results.

UNIT – V

Random Search Algorithms: Linear random search, Accelerated random search, Guided accelerated random search, Generic algorithm, Comparison of Random search algorithm, problems.

Text Books:

1. Introduction to Adaptive Arrays by Robert A. Monzingo, Randy L. Haupt, Thomas W. Miller. 2nd Edition YES DEE Publications, Chennai.
2. T.S. Rappaport & J.C.Liberti, Wireless Communication, Prentice Hall (PHI), 1999.

ECCSC 101 A
DIGITAL COMMUNICATION TECHNIQUES LABORATORY

Practical	2 Hrs/ Week	**Internal Assessment:**	20
Credits :	1	**Final Examination:**	30

Prerequisites:

Course outcomes:

- Gain knowledge to measure noise power and noise spectral density.
- Able to design advanced digital modulation circuits
- Analyze the process of Sampling and Reconstruction
- Understand and analyze the Base band Digital transmission.

List of Experiments:

Experiment No.	**Name of the Experiment**
1	Measurement of Noise power and Noise Power Spectral Density
2	Binary Phase Shift Keying Modulation Technique
3	Analog Signal Sampling and Reconstruction
4	Quadrature Phase Shift Keying Modulation Technique
5	Base band Digital Transmission System a) Delta Modulation and De-modulation
6	Adaptive Delta Modulation and De-modulation
7	Pulse code Modulation
8	Phase Modulation and Demodulation

ECCSC201B

IMAGE PROCESSING LABORATORY

Practical	2 Hrs/ Week	**Internal Assessment:**	20
Credits :	1	**Final Examination:**	30

Course outcomes:

- Understanding the basic principles of Image processing
- Gain knowledge of the images in transform domains
- Apply pre-processing algorithms on images
- Understand and develop algorithms for image segmentation, classification and interpretation Develop various data reduction algorithms for images

List of Experiments:

Name of the Experiment

- Flip an image
- Image Cropping
- Mean, Variance and Histogram of an Image
- Square Root, Rounding, Normalization of an Image
- Logarithm and Normalization of an Image
- Computation of Transform of image by different Transforms
- Computation of 2D DFT
- Computation of Hadamard Matrix
- Computation of KL Transform
- Verification of Unitary Matrix
- Computation of 2D Haar Transform
- Spatial Transformations

SEMINAR

Practical :	2 Hrs/ Week	**Continuous Assessment:**	**100**
Credits :	1		

Course Outcomes:

Upon completion of the course, the student will be able to

- Identify and analyze the real world problems
- Get awareness on current trends in specific area of interest
- Write technical reports

The following guidelines should be fulfilled:

- Students should work individually for pursuing the Seminar.
- Student should select a technical topic beyond the curriculum related to area of specialization.
- Student should submit an abstract of the seminar topic at the beginning of the semester.
- Student should prepare a comprehensive report on the seminar topic under the guidance of the supervisor and submit it at the end of the semester.
- The student should put an effort of at least 2hrs/week.
- The student should give the presentation on the seminar topic at the end of the semester.
- The student should follow the guidelines specified by the Department while preparing their seminar report.

ECCSC201A

IMAGE PROCESSING

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signals and Systems.
2. Probability Theory and Stochastic Process.

Course Educational Objectives:

- To describe and explain basic principles of digital image processing;
- To cover the basic analytical methods such as image enhancement, restoration, segmentation and compression techniques which are widely used in image processing.
- Give the students a taste of the applications of the theories taught in the subject.
- This will be achieved through the project and some selected lab sessions

Course Outcomes:

- Understanding the basic principles of Image processing.
- Gain knowledge of the images in transform domains.
- Apply pre-processing algorithms on images.
- Understand and develop algorithms for image segmentation, classification and interpretation.
- Develop various data reduction algorithms for images.

UNIT - I

DIGITAL IMAGE FUNDAMENTALS: Elements of digital image processing systems- An image model, basic relationships between pixels and basic transformation, Image acquisition and sampling, quantization, image file formats, two dimensional convolution, correlation and frequency responses.

UNIT - II

IMAGE TRANSFORMS: Study analysis with examples of 2D transforms – DFT, DCT Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, Radon, Hough and wavelet transform.

UNIT - III

IMAGE ENHANCEMENT AND RESTORATION : Histogram modification and specification techniques, Noise distributions, spatial averaging, Median, Geometric mean, Harmonic mean, contra harmonic filters, Homomorphic filtering, colour image enhancement, Image restoration- degradation model, unconstrained and constrained restoration, inverse filtering, Wiener filtering.

UNIT - IV

IMAGE SEGMENTATION AND RECOGNITION: Edge detection. Image segmentation by region growing, region splitting and merging, edge linking. Morphological operations: dilation, erosion, opening, and closing. Image Recognition-patterns and pattern classes, matching by minimum distance classifier, statistical classifier, matching by correlation. Neural network application for image recognition

UNIT-V

IMAGE COMPRESSION: Need for image compression, Huffman, Run length encoding, Arithmetic encoding, Vector quantization, Block truncation coding. Transform coding- DCT and Wavelet. Image compression standards.

TEXT BOOKS:

1. Lim J S, 'Two dimensional signal and Image Processing', Prentice- Hall, New Jersey, 1990
2. Sid Ahmed M A, 'Image Processing Theory, Algorithms and architectures', Mc. Graw Hill , 1995
3. J T. Tou and R. C. Gonzalez, 'Pattern recognition Principles', Addison Wesley Publishing company.
4. E. Gose and R. Johnson Bough, 'Pattern Recognition and Image analysis', Prentice Hall of India

REFERENCE BOOKS:

1. Rafeel C Gonzalez, Richard E Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.
2. Anil K Jain, 'Fundamentals of Digital image Processing', Prentice Hall of India
3. William K Pratt, 'Digital Image Processing', John Wiley, Newyork,2000.

ECCSC202A
MICROWAVE CIRCUITS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

Course Educational Objectives:

- The student should gain proficiency in using s-parameters in designing passive and active microwave circuits.
- The student should be able to use microwave CAD tools and understand their limitations.
- The student should understand the function, design, and integration of the major components in a wireless transceiver: oscillator, modulator, power amplifier, antenna, low-noise amplifier, filter, and mixer.
- At least one of these components is fabricated and characterized, so the student should become familiar with basic network analyzer usage in the lab.
- The student should also be able to work in a team and to communicate the work orally and in writing.

Course Outcomes:

- Develop parametric representation of two-port microwave networks.
- Able to design matching networks for Microwave circuits.
- Ability to design of amplifiers at microwave frequencies.
- Understanding and implementation of oscillators at microwave frequencies.
- Designing circuits for frequency conversion in millimeter range.

UNIT - I

Two port microwave networks: High frequency parameters, S-parameters, properties of S-parameters, Transmission matrix, signal flow graphs, signal flow graph reduction, Applications of Signal flow graphs.

UNIT - II

Design of matching networks : Impedance matching, selection of matching networks, Design of matching networks using lumped elements, Design of matching networks using distributed elements – Short or open circuit stubs, stub realization using micro strip circuits, Design of single stub and Double stub-matching

UNIT - III

Amplifier Design: Small signal amplifiers – DC bias circuit design, RF/MW circuit design, Design of different types of amplifiers – Narrowband amplifier. High-gain amplifier, maximum-gain amplifier, Low-noise amplifier, Minimum-noise amplifier, Broad-band amplifier, High power amplifiers-Class A, AB, B and C amplifier design.

UNIT - IV

Oscillator design: Oscillator versus amplifier design, Oscillator conditions-two port NR oscillations, design of transistor oscillators, general tuning networks- fixed frequency oscillators, frequency tunable oscillators

UNIT-V

Mixer design: Mixer types-Up-converters, Down-converts, Harmonic mixers, conversion loss-diode loss, mismatch loss, Harmonic loss, SSB mixers versus DSB Mixers, One-diode mixers, Two-diode mixers; Pin diodes-switch design, phase shifters and diode attenuators.

TEXT BOOKS:

1. Radio frequency and microwave electronics By, Mattew M. Radmanesh, pearson Education.
2. Foundations of microwave Engineering, RE Collins, Mcgraw Hill, 1992.
3. Computer aided Desing of microwave circuits, K.C. Gupta, Ramesh Garg & Rakesh chadha, Artech house, Inc. 1981.
4. Introduction to microwave circuits, Devices and antennas, M.L. sisodia and vijayalakshmi, New Age Publications, 2001.

ECCSC203
OPTICAL COMMUNICATION AND NETWORKS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Mathematics
2. Physics
3. Communication System

Course Educational Objectives:

- To understand the evolution of fiber optic system and elements of optical transmission link.
- To understand the optical fibers structure, modes and configurations, mode theory,
- Quantum efficiency.
- To understand optical fibers fabrication, cabling and installation.
- To understand generations of optical fiber link and description of 8 Mb/s and 2.5 Gb/s Optical fiber communication link.
- To understand operation of different blocks of optical communication systems such as Laser Semiconductor transmitter.
- To understand the operation and construction of components of fiber optic networks such as Tranreceiver, Optical amplifiers, couplers / splicers, filters, isolators, optical switches.
- To understand the principle and operation of wavelength division multiplexers and demultiplexers.
- To understand the structure of basic fiber optic networks such as SONET/SDIT, WDM Networks, Optical CDMA, Wavelength routed networks.

Course Outcomes:

- Understand the mode theory in optics.
- Gain knowledge on fiber cables.
- Analyze and design optical communication networks.
- Gain knowledge on various components of optical fiber networks.
- Gain knowledge on advanced optical networks.

UNIT – I

Evolution of fiber optic systems, Elements of optical transmission link, Advantages and applications of fiber optic Communication. Optical fibers – structures, quantum efficiency, modulation capability, optical fiber modes and configurations, mode theory of circular waveguides.

UNIT – II

Fabrication, cabling and installation, fiber optic cables, Installation – splicing the cable.

UNIT – III

Optical communication systems – Block diagrams, direct intensity modulation, digital communication systems, laser semiconductor transmitter, Generations of optical fiber link, description of 8 Mb/S optical fiber communication link, description of 2.5 Gb/S optical fiber communication link.

UNIT – IV

Components of fiber optic networks- Overview of fiber optic networks, Tranreceiver, Semiconductor optical amplifiers, couplers/splicers, wavelength division multiplexers and de-multiplexers, filters, isolators and optical switches.

UNIT-V

Fiber optic networks - Basic networks, SONET/SDIT, Broadcast and select WDM networks, Wavelength routed networks, optical CDMA.

Text Books:

1. Optical fiber communications, G. Keiser, 3rd Edition Mcgraw Hill.
2. Fiber optic communication Technology – Djafark. Mynbaev and Lowell. Scheiner, perason Education, Asia.
3. Fiber Optic Communications – D.C. Agrawal, S.Chand& Publications.
4. WDM Optical networks, C.SivanandaSwamy and Mohan Guruswamy, PHI.
5. Optical fiber communications and its applications S.C. Gupta, PHI.

ECCSC204
WIRELESS COMMUNICATIONS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Basics of Communication Systems.
2. Signals & Systems.

Course Educational Objectives:

The objectives of the course Wireless and Mobile Cellular Communications are

- To enable the student to synthesis and analyze wireless and mobile cellular communication systems over a stochastic fading channel.
- To provide the student with an understanding of advanced multiple access techniques.
- To provide the student with an understanding of diversity reception techniques.
- To give the student an understanding digital cellular systems (GSM, CDMAOne, GPRS, EDGE, cdma2000, W-CDMA, and LTE).

Course Outcomes:

1. Understand the evolution of cellular systems.
2. Design the link budget for wireless networks.
3. Understanding the channels in mobile communication.
4. Develop equalization algorithms to combat channel effect.
5. Gain knowledge on advanced wireless networks.

UNIT-I

WIRELESS COMMUNICATIONS & SYSTEM FUNDAMENTALS: Introduction to wireless communications systems, examples, Comparisons & trends. 2nd and 3rd generation wireless networks. Cellular concepts-frequency reuse, strategies, interference & system capacity, trunking & grade of service, improving coverage &capacity in cellular systems.

Modern wireless communication systems: Blue tooth, Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

UNIT – II

MOBILE RADIO PROPAGATION: Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field. The Three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model. Diffraction. Scattering. Practical Link Budget Design Using Path Loss Models. Outdoor Propagation Models. Indoor Propagation Models. Signal Penetration into Buildings. Ray Tracing and Site Specific Modeling.

UNIT – III

MOBILE RADIO PROPAGATION: Small-Scale Fading and Multipath. Small-Scale Multipath Propagation. Impulse Response Model of a Multipath Channel. Small-Scale Multipath Measurements. Parameters of Mobile Multipath Channels. Types of Small-Scale Fading. Rayleigh and Ricean Distributions. Statistical Models for Multipath Fading Channels. Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels.

UNIT – IV

EQUALIZATION and DIVERSITY: Fundamentals of Equalization. Training A Generic Adaptive Equalizer. Equalizers in a Communications Receiver. Survey of Equalization Techniques. Linear Equalizers. Nonlinear Equalization. Algorithms for Adaptive Equalization. Fractionally Spaced Equalizers. Diversity Techniques. RAKE Receiver, Packet Radio, Capacity of Cellular Systems

UNIT – V

WIRELESS NETWORKING: Introduction, Differences Between Wireless and Fixed Telephone Networks. Traffic Routing in Wireless Networks. Wireless Data Services. Common Channel Signaling (CCS). Integrated Services Digital Network (ISDN). Personal Communication Services/Networks. Protocols for Network Access. Network Databases. Universal Mobile Telecommunication System (UMTS).
Global System for Mobile (GSM). CDMA Digital Cellular Standard

TEXT BOOKS:

1. Wireless communications Technology By Roy Blake , Thomson Learning Publications.
2. Mobile and Personal Communication System and Services By Raj Pandya , PHI.

REFERENCE BOOKS:

1. Wireless Communication and Networking – William Stallings, PHI, 2003.
2. Wireless Communications By Theodore Rappaport , Pearson Publications.

ECCSE 206
NEURAL AND FUZZY CONTROL SYSTEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Course Educational Objectives:

- To provide an introduction to biological neuron, construction of artificial neuron from Biological Neurons, neural network topologies and various learning rules.
- Know the Concepts of Neural networks for non-linear systems & the applications of neural networks.
- To provide an introduction to fuzzy set theory and various operations of fuzzy sets.
- To make the students to get familiarized with the design of fuzzy logic system with examples.
- To know the concepts of adaptive fuzzy controllers.

Course Outcomes:

- Understand the Biological neural systems, construction of artificial neural systems and different learning rules.
- Acquired the knowledge about neural networks for non-linear systems and explored the neural network applications.
- Independently understand the Fuzzy set theory and fuzzy set operations.
- Gained the knowledge of the components and design, of fuzzy logic system.
- Know about different adaptive fuzzy controllers.

UNIT – I

Biological Neurons and their artificial models, Models of artificial neural networks, Neural Processing, Learning and adaptation, Neural networks learning rules. Single-layer Perception networks, Multi layer feed forward networks, Single layer feedback networks: Back propagation, Learning and training, Hopfield network.

UNIT – II

Neural networks for non-linear systems, Schemes of neuro control, system identification, Forward model and inverse model, Indirect learning neural network control applications, Case studies.

UNIT – III

Fuzzy sets, Fuzzy operation, Fuzzy relations, Fuzzy relational equations, Fuzzy measure, Fuzzy functions, Appproximate reasoning, Fuzzy propositions, Fuzzy quantifiers, If-then rules.

UNIT – IV

Structure of Fuzzy Logic Controller, Fuzzification models, Database, Rulebase, Inference Engine, Defuzzication modules, Fuzzy Control Applications, Case studies..

UNIT-V

Adaptive Fuzzy Controllers: Design and Performace Evolution, Membership simctiontining, Self organising Controllers, Modelbased Controller, Stability of Fuzzy Control systems**.**

TEXT BOOKS:

1. Jacker.M.Zurada, "Introduction to Artificial Neural Systems". Jaico Publishing House,1999.
2. Kosko.B, "Neural Networks and Fuzzy Systems", PHI,1994.

REFERENCE BOOKS:

1. Drainkov,Hellendroon,Reinfran, "Introduction to Fuzzy Control", Narosa Publishers.
2. John Yen and RejaLangari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education,2003.

ECCSE 210
RADAR SIGNAL PROCESSING

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Radar Engineering
2. Digital Communication

Course Educational Objectives:

- Understanding of the components of a radar system and their relationship to overall system and measure of performance.
- Understanding the concepts of the matched filter, ambiguity functions, and other aspects of waveform and signal processor design.
- Understanding basic detection theory as applies to radar.
- Introductions are provided to the advanced topics of synthetic aperture radar and synthetic aperture imaging.

Course Outcomes:

- Know the fundamental concepts of radar signal processing and the concepts of matched filters.
- Familiarized ambiguity function and basic radar signals.
- Acquired the knowledge about various codes and MTI.
- Understand the advanced topics of synthetic aperture radar and synthetic aperture imaging.
- Analyzed various methods of detection and recognition.

UNIT – I

Introduction: basic radar equation, range delay, velocity delay, Doppler effect, accuracy, resolution and ambiguity. Trade-offs and penalties in waveform design .Significance of matched filter in radar signal analysis: complex representation of band-pass signal, matched filter response to Doppler shifted signal.

UNIT – II

Ambiguity function: main properties of ambiguity function, cuts through ambiguity function, periodic ambiguity functions .Basic radar signals: constant frequency pulse, linear frequency modulated pulse, Costas frequency modulated pulse, nonlinear frequency modulation.

UNIT – III

Phase coded pulse: Barker code, chirp-like phase code, asymptotically perfect codes, Huffman code, and bandwidth considerations in phase-coded signals. Diverse pulse repetition interval (PRI) pulse trains: introduction to moving target indication (MTI) radar, blind speed, MTI radar performance analysis, optimal MTI weights, diversifying the PRI.

UNIT – IV

Multi carrier phase coded signal in radar signals.Bistatic radar: advantages of a bistatic configuration, bistatic RCS, bistatic range-ambiguity function, multistatic radar configuration. Synthetic aperture radar (SAR): SAR principle, k-space understanding of SAR, different compensation techniques, sparse SAR, nonlinear SAR, apodization.

UNIT-V

Detection and recognition using radar: detection and recognition using 1-D range profile, detection and recognition using SAR image. Space time adaptive processing (STAP): understanding STAP, uses of STAP, bistatic STAP .Civilian uses of radar: space based SAR, segmentation of SAR images from satellite.

TEXT BOOKS

1. N. Levanon, and E. Mozeson, Radar Signals, Wiley-Interscience, 2004.
2. P. Z. Peebles, Radar Principles, John Wiley, 2004.

REFERENCE BOOKS

1. M. I. Skolnik, Introduction to Radar Systems, Tata McGraw Hill, 2001.
2. D. K. Barton, Radar System Analysis and Modeling, Artech House, 2005
3. IEEE standards on radar related areas, IEEE Explorer.

ELECTIVES I & II

ECCSE 101
RELIABILITY ENGINEERING IN ELECTRONICS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signals & Systems.
2. Digital signal Processing
3. Fundamentals of Matrices

Course Educational Objectives:

- To make student familiar with the fundamentals in Reliability Engineering.
- To make student know about the types of system and device reliability.
- The student should understand the available reliability techniques and design of maintainability.

Course Outcomes:

To understand the

- Fundamental aspects of reliability.
- Types of systems reliability and device reliability.
- Available reliability techniques and guidelines for design of maintainability.

UNIT-I

Introduction: Quality and reliability, importance of reliability, reliability parameters, Methods of achieving reliability, Reliability fundamentals and bath tub curve, Reliability measures and parameters, Electronic system reliability, Hazard rate model, Probability concepts and failure time distribution.

UNIT-II

System Reliability: System reliability modeling, v-out of 'n' system, Analysis of complex reliability structures, System reliability estimation.Measure of central tendency and dispersion system reliability with constant and variable failure rates.

UNIT-III

Device Reliability: Accelerated life testing, Early life reliability, Long term device reliability, Electrostatic discharge, Electrical stress, Steady state hazard rate.

UNIT-IV

Reliability Techniques: Reliability prediction, Cut set, Tie set, FME set, PTA, Markov, Monte Carlo Simulation, Application to electronic systems.VLSI reliability: reliability screening and modeling, electrostatic discharge damage, Metal Electro-migration phenomena, dielectric breakdown, instabilities in ICs

UNIT-V

Maintainability and Availability concepts: Guidelines for design for maintainability, MITR, BIT / BITE facility, Spares provisioning, Electronics system, packaging and interconnections. Serial and parallel reliability maintainability and availability failure mechanisms, reliability data and analysis, Reliability improvement methods.

TEXTBOOKS:

1. Charles E. Ebeling, "An introduction to Reliability and Maintainability Engg", Tata Mc-Graw-hill, 2000.

REFERENCE BOOKS :

1. David J. Klinger, YoshinaoNakada and Maria A. Menendez, " AT& T Reliability Manual ", Von Nostrand Reinhold, New York, 5th Edition, 1998.
2. Gregg K. Hobbs, " Accelerated Reliability Engineering - HALT and HASS ", John Wiley & Sons,New York, 2000.
3. Lewis, " Introduction to Reliability Engineering ", 2nd Edition, Wiley International, 1996.
4. O' Connor, P.D.T., " Practical Reliability Engineering ", Hayden Book Company, New Jersey, 1981.

ECCSE102
REMOTE SENSING

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Physics
2. Satellite Communication.

Course Educational Objectives:

- To understand the components of remote sensing, active and passive remote sensing and its platforms such as aerial and space.
- To understand Electro Magnetic Radiation (EMR) spectrum, Microwave black body radiation, plank's law, Stefan-Boltzman law.
- To understand atmospheric characteristics, scattering, EMR Interaction with atmosphere and earth materials.
- To understand the classification of satellites, satellite sensors.
- To understand multi spectral scanning, along and across track scanners, sonar remote sensing systems, radar.
- To understand working of components of Geographic Information System (GIS).
- To understand visual interpretation of satellite images, elements of interpretation, characteristics of digital satellite images, image enhancement, filtering.
- To understand the process of integration of GIS and Remote Sensing and its applications, GPS System.

Course outcomes:

- Understand the basics of Remote Sensing.
- Know Electro Magnetic Radiation Spectrum and its interaction with atmosphere and earth materials.
- Gain knowledge on remote sensing using satellites, radars and sonar.
- Analyze Geographic Information System concepts and its integration with remote sensing.
- Understand modern imaging concepts.

UNIT I:

REMOTE SENSING: Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

UNIT II:

EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS: Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces-Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface:Imaging spectrometry and spectral characteristics.

UNIT III:

OPTICAL AND MICROWAVE REMOTE SENSING: Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

UNIT IV:

GEOGRAPHIC INFORMATION SYSTEM: GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

UNIT-V

MISCELLANEOUS TOPICS: Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – thermal infra-red and microwave data , applications, Application of Remote Sensing and GIS – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Resources Information Systems. Global positioning system –an introduction

TEXT BOOKS:

1. M.G. Srinivas, Remote Sensing Applications, Narosa Publishing House, 2001.
2. Jensen, J.R., Remote sensing of the environment, Prentice Hall, 2000.
3. Lillesand T.M. and Kiefer R.W., “Remote Sensing and Image Interpretation.
4. John Wiley and Sons, Inc, New York, 1987.
5. Janza.F.J., Blue, H.M., and Johnston, J.E., "Manual of Remote Sensing Vol. I., American Society of Photogrammetry, Virginia, U.S.A, 1975.
6. Burrough P A, “Principle of GIS for land resource assessment”, Oxford.
7. MischaelHord, "Remote Sensing Methods and Applications", John Wiley & Sons, New York, 1986.
8. Singal, "Remote Sening", Tata McGraw-Hill, New Delhi, 1990.

ECCSC104
DETECTION AND ESTIMATION OF SIGNALS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signals and Systems
2. Probability Theory and Stochastic Process
3. Communication System

Course Educational Objectives:

- To understand simple discrete time signals and its fourier transform.
- To obtain transfer function, amplitude and phase spectrum, frequency response of discrete time signals.
- To understand the concepts of probability, Autocorrelation and power spectral density, random data, sampling band.
- To generate pseudo random noise and filtering.
- To understand different criterion for detecting signals in noise such as Neyman Pearson criterion, Minimum probability of error criterion.
- To understand different methods employed to estimate signals in noise such as linear mean squared estimation, Non linear estimates (MAP and ML), Maximum likelihood estimate of parameters of linear system.
- To estimate time varying signals parameters.
- To understand kalman filtering and to know how to filter signals in noise.

Course Outcomes:

- Understand concepts of discrete time signals, fourier transform, amplitude, phase spectrum and frequency response.
- Gain knowledge on discrete signals.
- Gain knowledge on processing of received data.
- Understand the knowledge on Receiver components.
- Analyze the Received data.

UNIT I

Introduction to Discrete-time signals: - Simple signals – Fourier Transform of a discrete-time signal – Amplitude and phase spectrum – Frequency content and sampling rates – Transfer function – Frequency response.

UNIT II

Random-Discrete-time signals: - Review of probability – Random data – Generation of Pseudo-random noise – Filtered signals – Autocorrelation and power spectral density – Sampling band – Limited random signals.

UNIT III

Detection of signals in noise: - Minimum probability of Error Criterion – Neyman – Pearson criterion for Radar detection of constant and variable – amplitude signals – Matched filters – Optimum formulation – Detection of Random signals – Simple problems thereon with multisample cases

UNIT IV

Estimation of signals in noise: - Linear mean squared estimation – Non linear estimates – MAP and ML estimates – Maximum likelihood estimate of parameters of linear system – Simple problems theoreon.

UNIT-V

Recursive linear mean squared estimation: - Estimation of a signal parameter – Estimation of time-varying signals – Kalman filtering – Filtering signals in noise – Treatment rescricted to two variable case only – Simple problems

TEXT BOOKS:

1. Signal processing : Discrete Spectral analysis, Detection and Estimation, Mischa Schwartzand Leonard Shaw, Mc-Graw Hill Book Company, 1975.
2. H.L.Van Trees, Detection, Estimation and Modulation Theory, Wiley, New York, 1968.
3. Shanmugam and Breipohl, 'Detection of signals in noise and estimation', John Wiley &Sons, New York, 1985.
4. Srinath, Rajasekaran&Viswanathan, Introduction to statistical Signal processing with Applications, Prentice Hall of India, New Delhi – 110 001, 1999

ECCSE105
NANOELECTRONICS & MEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Basics of Nanotechnology.
2. VLSI Design
3. Electronic Devices.

Course Educational Objectives:

- To understand various microscopies and study the configuration and properties of carbon nanotubes (CNTs).
- To understand the formation of self-assembled monolayers (SAMs) and clusters and to study their features.
- To study the electronic structure of nano sized particles and shells.
- To understand the basic configurations Quantum cellular Automata.
- To study the concept of miniaturization and technological processes in following the MEMS.

Course Outcomes:

Upon completion of the course, the student will be able to

- To gain the knowledge in the selection of microscopy for a specific task and group the design and features of CNTs.
- To identify the types of clusters and SAMs.
- To acquire the knowledge of the materials used for nanoparticles and to assess their performance.
- To familiar in applying SET's for specific applications.
- To apply the knowledge about scaling and miniaturization and how it affects the performance of the devices.

UNIT – I

Microscopies and Carbon Nanotubes :

Nano – The Beginning – Electron microscopies – Scanning probe microscopies Optical microscopies for Nanoscience and Technology – Other kinds of Microscopies. Carbon Nanotubes : Synthesis and purification – Filling of Nanotubes Mechanism of growth – Electronic structure – Transport, Mechanical and physical properties – Applications.

UNIT – II

Self assembled Monolayers and Gas phase clusters :

Monolayers on Gold – Growth process – phase Transitions – patterning monolayers – mixed monolayers – SAMS and Applications.Cluster formation – Cluster growth – Detection and analysis of gas phase clusters – Types of clusters – properties of clusters – bonding in clusters.

UNIT – III

Semiconductor Quantum Dots and Nanoparticles :

Synthesis of Quantum dots – Electronic structure of Nanocrystals – Correlation of properties with size –uses.

Monolayer - protected metal Nanoparticles – method of preparation characterization - Functionalized Metal Nanoparticles – Applications – superlattices.

Core-shell Nanoparticles – Types of systems – characterization – properties – Applications.Nanoshells – Types of Nanoshells – properties – characterization – Applications

UNIT – IV

Quantum Electronics and SET:

Quantum Electronic Devices – short – channel MOS transistor – split – gate transistor – Electron-wave transistor – Electron – spin Transistor – Quantum cellular Automata – Quantum dot array performance of single – Electron Transistor – Technology – SET circuit design – wiring and drivers – logic and memory circuits SET adder as an example of a distributed circuit – Comparison between FET and SET circuit design

UNIT – V

Microelectronic and Mechanical systems (MEMS):

Different types of transistor integration – Technological process for microminiaturization – Methods and limits of microminiaturization in silicon – Technology of Micromechanics – Micromechanics for Nanoelectronics

TEXT BOOKS:

1. T.Pradeep, ‘Nano : The Essentials’, TMH Edition (2008)

REFERENCE BOOKS:

1. K.Goser, P.Glosekotter, J.Dienstuhl, ‘Nanoelectronics and Nanosystems’, Springer Edition (2004).

ECCSE 109
DSP ALGORITHMS AND ARCHITECTURES

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

1. Signals & Systems.
2. Digital Signal Processing
3. Micro processor & Micro controller.

Course Educational Objectives:

- To make the students familiar with DSP Algorithm and Architecture.
- To make students capable of synthesizing DSP according to desired specifications.
- To introduce the applications of DSP algorithms such as system timing, delay operator and to mapping algorithm.

Course Outcomes:

Upon completion of the course, the student will be able to

- Students will gain knowledge about DSP algorithm design –fixed point DSP, behavioural and system modelling.
- Students will be capable of designing DSP architecture for the applications like fast filtering, pipelining, block processing, folding etc.
- Students will be able to synthesize DSP for the required applications such as distributed arithmetic, LFSR, high performance arithmetic units, VHDL modelling.
- Students will learn DSP algorithms applications like system timing, delay operator, Z-transforms etc.
- Students will be capable implementing algebraic techniques for mapping algorithms such as scheduling and projection functions, data broadcast and pipelining.

UNIT -I

DSP Algorithm Design : DSP representations (data-flow, control-flow, and signal-flow graphs, block diagrams), fixed-point DSP design (A/D precision, coefficient quantization, round-off and scaling),filter structures (recursive, nonrecursive and lattice), algorithmic simulations of DSP systems in C , behavioral modeling in HDL, System modeling and performance measures.

UNIT - II

Circuits and DSP Architecture Design: Fast filtering algorithms (Winograd's, FFT, short- length FIR), retiming and pipelining, block processing, folding, distributed arithmetic architectures, VLSI performance measures (area, power, and speed), structural modeling in VHDL, Analog signal processing for fast operation, Impact of non-ideal characteristics of analog functional blocks on the system performance.

UNIT -III

DSP Synthesis: Distributed arithmetic (DA), Advantageous of using DA, Size reduction of look-up tables. Canonic signed digit arithmetic, Implementation of elementary functions Table-oriented methods, Polynomial approximation Random number generators. Linear feedback shift register. High performance arithmetic unit architectures (adders, multipliers, dividers), bit-parallel, bit-serial, digit-serial, carry-save architectures, redundant number system, modeling for synthesis in HDL, synthesis place-and-route.

UNIT - IV

Applications to some common DSP algorithms, System timing using the scheduling vector, Projection of the dependence graph using a projection direction, The delay operator and z-transform techniques for mapping DSP algorithms onto processor arrays.

UNIT-V

Algebraic technique for mapping algorithms, The computation domain, The dependence matrix of a variable, The scheduling and projection functions, Data broadcast and pipelining, Applications using common DSP algorithms.

TEXT BOOKS :

1. Digital Signal Processors: Architectures, Implementations, and Applications Sen
   M.Kuo ,Woon-Seng S. Gan Prentice Hall 2004.
2. DSP Principles, Algorithms and Applications, John G. Proakis, DimitrisManolakis K -Prentice Hall 1995.

REFERENCE BOOKS :

1. VLSI Signal Processing Systems, Design and Implementation.Keshab K. Parhi, John Wiley &Sons,1999.
2. Digital Signal Processing with Field Programmable Gate Array, Uwe Meyer-Baese, Springer- Verlag 2001.
3. Architectures for Digital Signal Processing, Pirsch, John Wiley and Sons, 1998.
4. DSP Integrated Circuits, Lars Wanhammar, Academic Press, 1999.

ECCSE110

RADIO FREQUENCY IDENTIFICATION (RFID)

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Course Educational Objectives:

- Understand RFID Technology.
- To know a history of the EPC
- To know about RFID, Global privacy policy.
- Understand the RFID, privacy and Regulation.
- Applications of RFID.

Course Outcomes:

Upon completion of the course, the student will be able to

- Know fundamental of RFID Technology.
- Know about functions and responsibilities for chips.
- Understanding the privacy policy and regulation.
- Understanding about different Impact factors.
- Applications of RFID in different fields

UNIT-I

Understanding RFID Technology: Introduction, RFID Technology, The Elements of an RFID system, Coupling, Range, and Penetration, RFID Applications,VeriChip and Mark of the Beast.

UNIT - II

A History of the EPC: Introduction, The Distributed Intelligent Systems Center, Meanwhile, at Procter & Gamble, "Low-Cost" RFID Protocols, "Low-cost" Manufacturing, The Software and the Network, Privacy, Harnessing the Juggernaut, The Six Auto-ID Labs, The Evolution of the Industry, The Creation of EPC global.

UNIT-III

RFID and Global Privacy Policy : Introduction, Definitions of Privacy, Definitions of Personal Information, History of Current Privacy Paradigm, Mapping the RFID Discovery process, Functions and Responsibilities for chips, Readers, and Owners, Privacy as a Fundamental Human Right, Constitutional Rights.

UNIT-IV

RFID, Privacy, and Regulation : Introduction, Understanding RFID's Privacy Threats. RFID and the United States Regulatory Landscape : Introduction, Current State of RFID Policy, Individuals, Business, Government, Miscellaneous,Integrity and Security of the System, Government Access, Health Impact, Labor Impact

UNIT-V

Applications: RFID Payments at ExxonMobil , ExxonMobil Corporation, Transforming the Battlefield with RFID, Logistics and the Military, RFID in the Pharmacy , CVS and Auto-ID, Project Jump Start, RFID in the Store.

TEXT BOOKS:

1. RFID Applications, Security, and privacy by SimsonGarfinkel and Beth Rosenberg, Pearson Education
2. Radio Frequency Identification by Steven Shepard, McGraw-Hill Professional; 1 edition

REFERENCE BOOKS:

1. RFID and Auto-ID in planning and logistics:A practical guide for military UID applications by Erick C.Jones,ChristopherA.Chung.
2. Global RFID:The value of the EPC global network for supply chain management by Edmindw.Shester,stuartJ.Allen;DavidL.Brock
3. RFID: A guide to radio frequency identification.

ELECTIVE III & IV

ECCSE201
ELECTROMAGNETIC INTERFERENCE/ ELECTROMAGNETIC COMPATIBILITY

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

CourseEducational Objectives:

- To make student familiar to sources of EMI and learn the available radiated Interference measurements.
- To make students familiarize with types of interferences in EM and its measurement.
- To make students know about the safety aspects of EMC.

Course Outcomes:

To understand the

- Sources of EMI and properties and available radiated interference measurement.
- Types of interferences in EM, detectors & measurement.
- Safety aspects in practice analysis of EMC modelling and simulation.

UNIT – I

Electromagnetic environment, overview of EMI and EMC, sources of EMI – Lighting discharge, Electrostatic discharge, Electromagnetic pulse, Noise from relays and switches, Nonlinearities in circuits – Intermodulation, cross modulation, Radiation coupling and conduction coupling

UNIT – II

Radiated interference measurements – Anechoic chamber, Measurements using an Anechoic chamber, TEM cell, Measurements using TEM cell, Reverberating chamber, Measurements using a Reverberating chamber, Comparison of test facilities, Measurement uncertainties.

UNIT – III

Conducted Interference measurements – Characterization of conduction currents/voltages, common-mode and differential mode interferences, conducted EM noise on power supply lines, conducted EMI from equipments, Immunity to

conducted EMI, Detectors and measurement, Power line filter design – common mode filter, Differential mode filter, combined CM and DM filter.

UNIT – IV

Grounding – Principle and practice of Earthing, Precautions in Earthing, Measurement of ground resistance, system grounding for EMC, Cable shield grounding. Shielding-Shielding materials, Shielding integrity at discontinuities, conductive coatings, cable shielding, shielding effectiveness measurements, Electrical bonding.

UNIT-V

EMC computer modeling and simulation – A generalized and comprehensive assessment methodology, EMC analysis of complex systems, modeling techniques, Electromagnetic analysis and prediction codes, Numerical code exterior system modeling, Interior system modeling using numerical codes, modeling and analysis procedure, EMC standards, - IEEE standards, Standards and Test procedures.

TEXT BOOKS:

1. Bernhard Keiser, " Principles of Electromagnetic Compatibility ", Artech house, 3rd Ed, 1986.
2. Henry W.Ott, " Noise Reduction Techniques in Electronic Systems ", John Wiley and Sons, 1988.
3. V.P. Kodali, " Engineering EMC Principles, Measurements and Technologies ", IEEE Press, 1996

REFERENCE BOOKS:

1. EMC education manual, prepared by the education committee of the IEEE EMC society.

ECCSE 202

EXPERT SYSTEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

Course Educational Objectives:

- To provide an introduction to Knowledge representation and issues.
- Know the Concepts of Genetic algorithms.
- To provide an introduction to Logical reasoning and Probabilistic reasoning.
- To make the students to get familiarized with learning and common sensane reasoning.
- To know the concepts of Neural networks Expert systems.

Course Outcomes:

At the end of the course the student will be able to

- Understand the Knowledge representation and issues.
- Understand the Concepts of Genetic algorithms
- Independently understand the Logical reasoning and Probabilistic reasoning.
- Have a detailed knowledge of the learning and common sensane reasoning.
- Understand the concepts of Neural networks Expert systems.

UNIT I:
Knowledge Representation and Issues:
Notational systems: Trees, graphs, hierarchies, propositional and predicate logics, frames, semantics networks, constraints, conceptual dependencies, database, knowledge discovery in databases (KDD).

UNIT II:
Search:State-space representations, Depth-first, breadth-first, heuristic search, Planning and game playing, Genetic algorithms.

UNIT III:
Logical Reasoning and Probabilistic Reasoning : Predicate, Calculus resolution, completeness, and strategies, Unification, Prolog, monotonic and non-monotonic reasoning, Probabilistic inference networks, Fuzzy inference rules, Bayesian rules.Dempster-Shafer Calculus.

UNIT IV

Learning and Common SensaneReasoning : Robot actions, strips, triangle tables, case based reasoning, spatial and temporal formalisms.Knowledge acquisition, classification rules, self directed systems.

UNIT-V

Neural Networks and Expert systems :Principles, biological analogies, Training (techniques and errors), Recognition, Expert Systems, Organization, tools, limits, examples.

TEXT BOOKS:

1. Charniak .E,And McDermott .D.,"Intoduction to Artificial intelligence", Adiison-Wesley, 1987.
2. Giarratano.J.,And Riley G.,"Expert Systems principles an Programming" PWS-KENT,1989

REFERENCE BOOKS:

1. Bratko.I. Prolog, 2nd Ed., Addision-Wesley, 1990.

ECCSE 208
SATELLITE COMMUNICATION SYSTEMS

Lecture	4 Hrs/ Week	**Internal Assessment**	40M
Tutorial	-	**Final Examination**	60M
Practical	-	**Credits**	4

Prerequisites:

2. Communication Systems
1. Mobile Communication

Course Educational Objectives:

- To enable students to understand the fundamentals of satellite and orbital mechanics.
- To enable students understand the space craft subsystems and effects of attitudes power system
- To make student to analyse the design of satellite space links.
- To make student to learn the different multiple access schemes.

Course Outcomes:

To understand the

- Role of orbital mechanics in Satellite Communication.
- Effect of attitude, power systems and Antennas on Earth station and satellite.
- Design of satellite link, noise, temp, G/T ratio.
- Properties of different multiple access techniques and mobile safe service

UNIT – I

ORBITAL MECHANICS : Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating theSatellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, LaunchVehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT – II

SPACECRAFT SUB SYSTEMS AND EARTH STATION : 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 : 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: 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: Fixed and mobile services - Multimedia satellite services - Advanced applicationsbased 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**.**

TEXT BOOKS:

1. Dennis Roddy, "Satellite Communications", 3rd Edition, Mc Graw Hill International Editions, 2001.
2. Bruce R.Elbert, "Introduction to Satellite Communication". ArtechHouse Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, "Satellite Communications", 2nd Edition, Wiley, John & Sons, 2002

REFERENCE BOOKS:

1. Wilbur L.Pritchard, HendriG.Suyderhood, Robert A.Nelson, "Satellite Communication Systems Engg.", 2nd Edition, Prentice Hall, New Jersey, 1993.
2. TriT.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, Newyork. 1990