ECT-401

Spread Spectrum Technology 4(3L+1T)

Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping system, pulse FM (chirp) system, hybrid systems.

Coding for communication and ranging- Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composites codes, code selection and signal spectra, error detection and correlation codes.

Modulation and demodulation- Balance modulator, quadriphase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, costas loop, FM.

Need for synchronization, types of synchronizers, RF link- Noise figure, co channel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.

Test and evaluation of spread spectrum system- selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.

Reference Books :

1. R. C. Dixen, “Spread Spectrum Systems with commercial application”, John Wiley, 3rd Ed.

2. H. Taube. And D. L. Schilling, “Principle of Communication Systems”. Tata Mc graw Hill, 2nd Ed. Reprint 2007.

ECT-403/ECT663

Syllabus from MTech (ECE)

ECT404/ECT 670

Satellite communication & RADAR Engg.

Syllabus from MTech scheme

EC-405

Image Processing 4(3L+2P)

Image Processing: Acquiring of Images using Video Camera. Digital Representation of Binary & Gray Scale Images, Linear operations on pictures. Two dimensional Discrete Fourier transform and Hadamard transforms & their applications to image processing. Sampling of pictures using an Array of points, Aliasing problem & its solution. Image Enhancement Techniques:- Gray scale modification Gray level correction, Gray scale transformation, Histogram modification, sharpening of Images using differentiation, the Laplaciam, High Emphasis filtering, sobel & kirsch operators. Smoothening:- Noise Removal, Averagins, Median, Min/Max. Filtering

Image Segmentation & Thresholding:- Thresholding, Multiband Thresholding, Thresholding from Textures, Selective histogram Technique, Boundary Lines & Contours. Image Compression:- Compression Techniques using K-L Transform, Block Truncation Compression. Error free Compression using Huffman coding & Huffman shift coding.

Reference:

1. Signals and Systems- Oppenheim A.V., Willsky A.S. and Young I.J. PHE.
2. Digital Signal Processing- Oppenheim A.V. & Schafer R.W. PHI.
3. Digital Signal Processing- by LYONS, (Pearson Education)
4. Digital Signal Processing-by Mitra- (TATA McGraw Hill) Publications.
5. Digital Image Processing- by Gonzalez / Woods, (Pearson Education)
6. Digital Image Processing- by A.K. Jain
7. Digital Picture Processing- by Rosenfield & Kak

EC-406/ECT607

CAD Algorithms for VLSI Physical Design

Syllabus from MTech scheme

EC-407/ECT603

CAD Algorithms for synthesis of Digital Systems

Syllabus from MTech scheme

ECT408/ECT616

Syllabus from MTech (VLSI Design)

ECT409/ECT622
System Level Design & Modelling

Syllabus from MTech scheme

ECT411

Neural Networks

Introduction:- Biological basis for NN, background and brief history, various NN models.
Single neuron/ Perceptron networks:- training methodology, typical application to linearly separable problems.
Multilayer Perceptron (MLP) :- Back propagation algorithm, virtues and limitation of BP algorithm, modifications to back-propagation.
Functional Link Artificial Neural Network (FLANN) : introduction to single layer structure, Trigonometric expansion, Polynomial expansion, Chebyshev expansion, FLANN learning algorithms.
Radial-basis function Networks : interpolation problem, Covers theorem, learning algorithm, applications.
Recurrent Neural Networks : Fully Recurrent Network, Hopfield Network.
Wavelet Neural Network : Introduction to wavelet functions, learning of WNN.
Performance Analysis : minimum mean square error, normalized error, robust functions analysis.
Applications : Function Approximation, Nonlinear System Identification, Time Series Prediction, Multi-class Classifications, Optimization.

References:

1. M.T. Hagan, Howard B. Demuth, Mark H. Beale; *Neural Network Design*; (ISBN: 0-9717321-0-8); Thomson, 2002.
2. S. Haykin, *Neural Networks - A Comprehensive Foundation;* Pearson Education, India (The book is also published by Prentice Hall of India), 2008 (ISBN- 81-203-2373-4).
3. Neural Networks: Algorithms, Applications, And Programming Technique by Freeman, Pearson Education. (ISBN- 9788131708088)

ECT412

Advance Microprocessors & Microcontrollers

8086/8088 microprocessor: Hardware specifications, clock generator (8284A), bus interface & latching, bus timings, ready & wait states, minimum mode & maximum mode.
8088 based assembly language programming: linking & execution of a program, defining & moving data, COM programs, program logic & control, MACRO programming, linking to sub-programs.
Memory interfaces: Memory devices, address decoding, 8088 memory interface, 8086, 80286, 80386Sx,
80386DX, 80486 memory interface, dynamic RAM.
Basic I/O interface: 1/O port address decoding, programmable preiferal interface, 8079 programmable keyboard/display interface, 8254 programmable interval timer, 8251A porgrammable communication interface, A/D and D/A converters.
Interrupts: Basic interrupt processing, hardware interrupts, 8259 A programmable interrupt controller, real clock.
Direct memory access & DMA-controlled I/O; Basic DMA Controller, shared bus systems, Video systems.
Arithmetic coprocessors: Data formats, 80□87 architecture, Processor interface, Instruction set.
80186/80188 & 80286 Microprocessors: the 80186/80188 architecture, 80188-example interface, Introduction 80286.
80386 & 80486 Microprocessors: Introduction to 80386 architecture & its register structure. 80386 instruction set. 80386-memory management, Introduction to 80486 microprocessors & its architecture, 80486 instruction set.
Microcontrollers.

References:

1. HALL, PHI
2. LIU & GIBSON, PHI
3. BREY, PHI

ECT413

Computer Networks

Syllabus

Introduction: Network structure, network architectures. The OSI reference model, services, standardization, example networks.
The Physical Layer: physical characteristics ,Data Link Layer protocols-MAC,DLL, Ethernet, LAN, VLAN, ARP , Bridges and routers. Network layer protocols, IPv4, IPv6, sub/supper netting, VLSM, ICMP, IGMP, Routing Algorithms. Transport layer protocols-TCP, UDP, Congestion control Algorithms. Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP. Security and encryption.

References:

1. Kurose and Ross :computer networks, pearson-india
2. Peterson and Devie : Computer Network, elsiever india
3. Tanenbaum : Computer Networks , PHI/pearson-india
4. Stallings: Data communication & Networking , PHI/pearson-india
5. Leon-Garcia,Widjaja: Communication Networks, TMH.

ECT451/ECT665

Advanced Microwave Engineering

Syllabus from MTech scheme

ECT452/ECT676

Microstrip Antennas

Syllabus from MTech scheme

ECT453 **Advanced Antenna Systems**

Introduction: CAD of antennas, techniques for antenna analysis such as MOM, FDTD, Antenna Matching Techniques, smith chart

Antennas for Mobile Systems: introduction, mobile terminal antennas, Performance Requirements Dipoles, Helical Antennas, Inverted-F Antennas, Mean Effective Gain (MEG), Human Body Interactions and Specific Absorption Rate(SAR), Mobile Satellite Antennas, Base Station Antennas

Adaptive Antennas: basic concepts, applications, MIMO systems, Adaptive antenna in practical system

Smart antennas: Introduction, Need for Smart Antennas, Configuration and architecture

UWB Antennas: requirement, radiation mechanism, analysis, antenna mismatch

References:

1. Antennas Theory & Practice- By Balani
2. Antennas & wave Propagation - By K.D. Prasad
3. Wireless Communications: Principles & Practice - By Theodore S. Rappaport.
4. RE Collin

ECT454

Microwave Integrated Circuits

Introduction: Substrate Materials, Conductor materials, Dielectric materials, Mask Layouts & mask fabrication., Hybrid Microwave Integrated circuits, overview of Passive elements., R,L,C & Microstriplines, Active Components-Ga As MESFETS, HEMT, Equivalent circuits, PIN & Schottky Diodes.

Monolithic Microwave Integral Circuits: GaAs for MMICs, Design Considerations, procedure MMIC fabrication, Examples of MMICs. Hybrid Versus Monolithic MICs. Power MMICs.

Microwave Optic, Acoustic and Magnetostaic Circuits, Microwave Modulation of optical sources, fiber optic RF links, RF/optical interaction, optical control of Microwave Devices. Switching Application, oscllicator tuning, Injection Locking, optical techniques for Millimeter wave circuits.

Future trend in Microwave circuits: MMIC systems, Millimeter wave MICs., optics for Microwave Applications., Microwave Acoustic technology, Magnetostatic Wave Technology.

References:

1. Microwave Solid state circuits Design by Inder Bahl & Prakash Bhartia Wiley-Interscience & Publication.

2. MMICs by S.K. Kaul & B. Bhat.

3. MMIC Design GaAs FETs and HEMTs by Peter H. Lad brooke Artech house Boston &London.

ECT455

Power Electronics

Introduction to Solid State Power Devices & Operation : SCR, G.T.O., Power transistor, Classification of SCR triggering methods, design and operation of triggering circuits, commutation methods, pulse transfer and isolation scheme, protection of power devices. Series & parallel operation of SCRs.

Phase Controlled Converters : Single phase uncontrolled, half-controlled and fully controlled converters. Three-phase half-controlled and full controlled bridge converters.

Choppers : Different schemes and circuit configurations.

Regulators : Single phase A.C. Regulators-different circuit configurations and their operation.

Inverters : Single-phase and Three-phase bridge converter operating as line-commutated inverters, force commutated inverters, pulse width modulated inverters.

Cycloconverters : Three-phase to single-phase and three-phase to three-phase configurations.

References:

1. M. Ramamoorty: An Introduction to Thyristors and their Applications, East West Press Pvt Ltd.

2. Mohammad H. Rashid : Power Electronics Circuits, Devices and Applications, Prentice Hall of India Pvt Ltd.

3. B.R. Pelly : Thyristor Phase Controlled Converters and Cycloconverters, John Wiley & Sons.

4. P.C. Sen : Thyristor DC Drives, John Willey & Sons .

5. G.K. Dubey and etal : Thyristorized Power Controllers, Cenrro Wille Eastern.

6. Murphy & Turnbull : Power Electric Control of A.C. Motors, Pergawen Press

ECT456

Semiconductor Opto-Electronics

Introduction to semiconductors, heterostructures, carrier transport, Semiconductor photoconductors for visible to far-infrared generation and detection, Radiation sources, Lasers—structures and properties, Edge emitting and vertical cavity lasers, LED designs, Nitride light emitters, light detectors, optical sensors and opto-couplers, optical amplifiers – SOA, EDFA, Raman amplifiers.

References:

(1) Semiconductor Optoelectronic Devices – P. Bhattacharya, Pearson,

(2) Fiber Optics and Optoelectronics- R.P. Khare, Oxford University Press,

(3) Optoelectronics—Endel Uiga, Prentice Hall

(4) Photodetectors and Fiber Optics—HS Nalwa, Elsevier.

ECT457/ECT628

Memory Design & Testing

Syllabus from MTech scheme

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ECT459/ECT640

Electronic manufacturing Technology

Syllabus from MTech scheme

ECT60/ECT626

Formal Verification of Digital Hardware & Embedded Software

Syllabus from MTech scheme

ECT462

Artificial Intelligence & Expert Systems

Introduction to AI knowledge:- Importance of AI, Knowledge Base System, Knowledge organization & manipulation, LISP and other AI programming Languages.

Knowledge Representation:- Syntax Semantics, Inference Rules, Non-deductive Inference methods, representations using rules, Fuzzy Logic & Natural language computations. Probabilistic Reasoning. Object Oriented Representations.

Knowledge Organization & Manipulation:- Search & control strategies, matching techniques, knowledge organization & management.

Knowledge Systems Architecture:- Rule based, non-production, uncertainty knowledge system building tools.

Knowledge Acquisition:- General concepts, learning by induction.

References:

1. AI & ES, by Dan W. Patterson, PHI Ltd.
2. Artificial Intelligence by Luger (Pearson Education)
3. Introduction Expert Systems- By Jackson (Pearson Education)

ECT463

Parallel computing architecture

Introduction: Synchronous and asynchronous paradigms of parallel computing.

Hardware taxonomy: Flynn's classification, Handler's classification; Software taxonomy: Kung's taxonomy, SPMD.

Abstract parallel computational models: combinational circuits, sorting networks, PRAM models, interconnection RAMs.

Parallel programming languages.

Performance metrics: laws governing performance measurements; metrics- speed up, efficiency, utilization, communication overheads, single/multiple program performances, benchmarks.

Processor arrays.

Scheduling.

Basic algorithms: Fast Fourier transform, Linear system solution, sorting etc.

References:

1. Quinn, M. Parallel computing theory and practice. Mc Graw Hill (International Student Edition), 1994.

2. Hwang, K., Briggs, F. A. Computer architecture & parallel processing. McGraw hill.

3. Kumar, V., Grama, A., Gupta, A. and Karypis, G. An introduction to parallel computing. Addison Wesley, 2001. (Low price edition from Pearson Education, India), 2001.

4. Hwang, K. Advanced computer architecture- parallelism, scalability and programmability. McGraw hill, 2000

ECT464 Biomedical Engineering

Basic Concepts of Medical Instrumentation

Basic sensors used in Bioinstrumentation, Sources of bioelectric potentials – resting and action potentials, the bioelectric potentials. Electrodes for measurement of bio-potentials.

Cardiovascular Systems

The Heart blood pressure, Characteristics of blood flow, Heart sounds, Electrocardiography, Measurement of blood pressure, Measurement of blood flow and Cardiac output, Plethysmography, Measurement of Heart sounds.

Chemical Biosensors

Blood gas and Acid base Physiology, Electrochemical sensors, Chemical fibro-sensors, Ion-selective Field Effect Transistors (ISFET), Immunologically sensitive FET, Non invasive blood gas monitoring, Blood Glucose Sensors.

Electrical Safety

Physiological effects of electricity.Macro-shock hazards, Micro-shock hazards, Electrical Safety codes and standards, Basic approaches to protection against shock. Electrical Safety analyses, Tests for electrical systems and appliances.

References:

1. Leslie Cromwell, Fred J. Weibell& Enrich A. Pfeiffer, *Biomedical Instrumentation and Measurements*, 2nd edition, PHI.
2. John G. Webster, *Medical Instrumentation, Applications & Design*, 3rd edition, Wiley & Sons.

ECT465/ECT658 Current-Mode Analog Signal Processing

Syllabus from MTech (VLSI Design) scheme

ECT466/ECT655 Optical Codes and Applications

Subject will be floated for First Year M. Tech. students and Final Year B. Tech. students.

Syllabus from MTech (ECE/VLSI)

ECT467/ECT656 Adaptive Signal Processing

Syllabus from MTech

Prerequisites:

Signal and Systems : Third Semester Program Core
Digital Signal and Image Processing : Sixth Semester Program Core

Books and Materials

[1] B. Widrow and S. D. Stearns : Adaptive Signal Processing, Prentice Hall.

[2] D. G. Manolakis, V. K. Ingle, S. M. Kogon : Statistical and Adaptive Signal Processing, McGraw Hill.

[3] S. S. Haykin : Adaptive Filter Theory, 4th Edition, Prentice Hall.

[4] A. H. Sayed : Fundamentals of Adaptive Filtering, John Wiley & Sons.

[5] H. G. Stark : Wavelets and Signal Processing, Springer.

[6] S. Mallat, A Wavelet tour of Signal Processing, Academic Press.

[7] Rabi Polikar, The wavelet Tutorial, Part I-IV, Online available by Rowan University, Glassboro, NJ 08028.

[8] R. G. Stockwell, L. Mansinha, and R. P. Lowe, Localization of the Complex Spectrum : The *S* Transform, IEEE Transactions On Signal Processing, Vol. 44, No. 4, April 1996.

ECT468/ECT657 VLSI Signal Processing Architectures

Syllabus from MTEch (VLSI Design)

ECT478/ECT642 VLSI Signal Processing Architectures

Syllabus from MTEch. (VLSI Design)

ECT479/ECT614 VLSI Technology

Syllabus from MTEch. (VLSI Design)

UG/PG UG	**Department: ECE**
Course Code: ECT 480	**Course Name: Information Theory & Coding**
Credit: 3	**L-T-P: 3-0-0**
Version: 18 Nov 2013	**Approved on:**
Pre-requisite course:	

Syllabus

Introduction to coding theory, channel capacity and channel Coding theorems, concepts of finite fields, Linear Block Codes, standard array, Syndrome decoding, Cyclic codes. Polynomial representation of codes. Error detection and correction capability of block codes . Reed Muller Codes, BCH codes, concatenated codes. Convolution codes; representation, coding and decoding. Introductin to Turbo Codes.

Books:

1. Information theory Coding and cryptography by Ranjan Bose, TMH
2. Modulation & Coding by Stephen G. Wilson. Prentice Hall Inc.
3. Digital Communication by – Bernard Sklar, Pearson Education Asia
4. Digital communication by- J.G. Proakis TMH

UG/PG UG	**Department: ECE**
Course Code: ECT 481	**Course Name: System Design using FPGA**
Credit: 3	**L-T-P: 3-0-0**
Version: 18 Nov 2013	**Approved on:**
Pre-requisite course:	

Syllabus

Introduction: Evolution: PROM, PLA, PAL, Architecture of PAL's, Applications, Programming PLD's., Design Flow, Programmable Interconnections, Complex PLD's: CPLD, Why FPGA ?, Applications, CAD Tools.

Digital system Design: Top down Approach to Design, Bootom up approach,Case study, Data Path, Control Path, Controller behavior and Design, Case study Mealy & Moore Machines, Timing of sequential circuits., Pipelining, Resource sharing, FSM issues (Starring state, Power on Reset, State diagram optimization, State Assignment, Asynchronous Inputs, Output Races, fault Tolerance).

FPGA Architecture: FPGA family, FPGA architectures, Logic Block Architecture., Routing Architecture, Placement of blocks.

FPGA implementation: Synthesis of design, Hardware debugging using Chipscope PRO, Power control/ process control systems using FPGA's, Design optimizations using Xilinx Plan ahead, DSP design flow using Xilinx FPGA's.

FPGA based Testing and Verification: Testing and Verification concept, Different level of verification, System level verification with system Verilog, Attributes of system Verilog, Fault coverage and ATPG based Testing, Boundary Scan and BIST based Testability

Books:

1. Digital Design using Field Programmable Gate array by P.K.Chan,Samiha mourad, Printice Hall Series

2. Digital System Designs And Practices: Using Verilog Hdl And FPGAs by Ming Bo lin, Wiley India Edition.

UG/PG UG	Department: ECE
Course Code: ECT 482	Course Name: Instrumentation and Control
Credit:3	L-T-P:3-0-0
Version: 18 Nov 2013	Approved on:
Pre-requisite course:	

Syllabus

Electronic Instrumentation:
Definitions of Accuracy, Precision, Resolution, Sensitivity and Linearity, Standards of Resistance and EMF, Classification of Measuring Instruments. Theory and Constructional Details of PMMC Instruments, Moving Iron Instruments, Electrodynamometer Type Instruments, Electronic Voltmeter and its special features, Measurement of DC, RMS and Peak values of AC voltages by Electronic Voltmeter.

Different Methods for the Measurement of Resistance, Inductance and Capacitance, Theory of Q-Meters and their Applications. Different Types of Transducers. Measurement of Linear Displacement, Strain, Temperature, Pressure and fluid flow.

Control Systems:
Classification of control systems, Control system components, BIBO stability, methods of determining stability: Routh-Hurwitz criterion, Bode's Plot, gain and phase margins, Root-locus, Nyquist stability criterion.

Concepts of compensation, Steady state errors, Design of phase lead and phase lag compensators, Effects of compensation on the systems performance. Industrial Controllers: P, PI, PD and PID controllers.

Representation of state equations, Relationship between state equations and differential equations and transfer functions, solution of state equations, state transition matrix, state transition equation. Controllability and observability of control systems.

Books:

1. W.D. Cooper and A.D. Helfrick, *Electronic Instrumentation and Measurement Techniques*, Prentice Hall of India, 2005.
2. I. J. Nagrath and M. Gopal, *Control System Engineering*, New Age Int., 2007.
3. B.C. Kuo, *Automatic Control Systems*, Prentice Hall of India, 2004.
4. K. Ogatta, *Modern Control Engineering*, Prentice Hall of India, 2002.