MEDC 101 Detection and Estimation Theory

Unit I

Review of random process, problem formulation and objective of signal detection and signal parameter estimation.

Unit II

Hypothesis testing: Neyman-Pearson, minimax, and Bayesian detection criteria; Randomized decision; Compound hypothesis testing; Locally and universally most powerful tests, generalized likelihood-ratio test; Chernoff bound, asymptotic relative efficiency;

Unit III

Sequential detection; Non-parametric detection, sign test, rank test. Parameter estimation: sufficient statistics, minimum statistics, complete statistics;

Unit IV

Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, Bhattacharya bound

Unit V

Linear models; Best linear unbiased estimation; Maximum likelihood estimation, invariance principle; Estimation efficiency; Least squares, weighted least squares; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

Text/References Books:

1. H. V. Poor, An Introduction to Signal Detection and Estimation, Springer, .
2. S. M. Kay, Fundamentals of Statistical Signal Processing: Detection Theory, Prentice Hall PTR.
3. S. M. Kay, Fundamentals of Statistical Signal Processing: Estimation Theory, Prentice Hall PTR.
4. H. L. Van Trees, Detection, Estimation and Modulation Theory, Part I, John Wiley.
5. D. L. Melsa and J. L. Cohn, Detection and Estimation Theory, McGraw Hill.
6. L. L. Scharf, Statistical Signal Processing: Detection, Estimation, and Time Series Analysis, Addison-Wesley.
7. V. K. Rohatgi and A. K. M. E. Saleh, An Introduction to Probability and Statistics, Wiley.

MEDC – 102 DIGITAL SIGNAL PROCESSING

Unit I

Review of Discrete time signals: sequences, representation. Discrete time systems: linear, time invariant, LTI systems, properties, and constant coefficients difference equations. Frequency Domain representation of discrete time signals and systems.

Unit II

Review of Z Transform – Properties, ROC, Stability, Causality, Criterion, Inverse Z-Transform, Recursive and Non Recursive systems, Realization of discrete time system.

Unit III

DFT: Properties, Linear and Circular convolution, Discrete Cosine Transform, Relationship between DFT and DCT. Computation of DFT: FFT/Decimation in Time and Decimation in Frequency.

Unit IV

FIR and IIR systems: Basic structure of FIR and IIR, Bilinear Transformation, Design of Discrete time IIR filter-Butterworth, Chebychev , Inverse Chebychev , Elliptic etc. Design of FIR filters by windowing – Rectangular, Bartlett, Hann, Hamming, Kaiser, Window filter, Design method relationship of Kaiser to other window. Application of MATLAB for Design of Digital filter, Effect of Finite register length in filter Design.

Unit V

Discrete time Random signals: Discrete time random process, Averages, Spectrum Representation of finite energy signals, response of linear systems to random signals. Power spectrum estimation: Basic principles of spectrum estimation, estimate of auto con variance, power spectrum, cross con variance and cross spectrum.

Advance signal processing technique and transforms: multi rate signal processing- down sampling/up sampling, introduction to discrete Hilberts Transform, Wavelet Transform, Haar Transform etc.

Text/References Books:

1. Discrete time signal Processing by Opperenheim & Schaffer PHI .

2. Digital Signal Processing using MATLAB by S.Mitra

3 Digital Signal Processing By Proakis Pearson Education

4. Theory & application of Digital Signal Processing by L.R.Rabiner & B. Gold PHI

MEDC – 103 (A) MICRO CONTROLLER SYSTEM DESIGN

Unit I

Review of 8-Bit and 16-bit microprocessor, support chips and interfacing techniques, single chip micro-computers, architecture, program and data memory, ports, input Output interfacing and programming,

Unit II

Single chip micro controllers- INTEL 8051/ 8751, MOTOROLA 68HC0/68HC11 architecture, instruction set and programming, Memory mapping, addressing modes, Registers, expanded modes. Interrupt handling timing and serial I / O.

Unit III

Software development Modular approach, integrated software development environment, Object oriented interfacing and programming, Recursion and debugging.

Unit IV

ATMEL 89C51 / 52 and PIC micro-Controllers- Case studies. Design and application of Micro-Controller in Data acquisition, Embedded controllers, Process control etc.

Unit V

DSP Processor architecture and sample design using TI – DSP.

Text/References Books:

1. Embedded Systems 8051 By Majidi & Majidi

2. Design With Micro-Controllers By John P. Peatman Tmh

3. Embedded Micro-Computers System By Jonathan W. Valvano

4. Data Manuals – Intel Motorola

MEDC – 103 (B) Wireless Sensor Networks

Unit I

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

Unit II

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

Unit III

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

Unit IV

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

Unit V

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

Text/References Books:

1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education.

2. Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication .

3. Jochen Schiller, "Mobile Communications", Pearson Education.

4.William Stallings, "Wireless Communications and Networks ", Pearson Education .

MEDC – 104 (A) DATA COMMUNICATION AND COMPUTER NETWORK

Unit I

Review of synchronous and asynchronous transmission, circuit switching, message switching, packet switching and their comparison, various detector techniques, parity check, vertical and longitudinal redundancy check and CRC code and their error detecting capabilities. RS-232 C and X.21 standards, modern operation, null model.

Unit II

Data link control, point-to-point and multi-point links, flow control, sliding window protocol, various ARQ technique for error control and their comparison and performance analysis, HDLC as a bit oriented link control protocol.

Unit III

Communication Network:- Virtual circuit and datagram, routing algorithm, dijkstera and Bellman ford least cost, algorithm, various routing protocol, congestion control technique, deadlock and its avoidance.

Unit IV

Local Area network:- Various topologies and medium access control schemes such as contention, polling, token parsing and performance analysis, various IEEE standards for LAN,UBS LANs, FDDI.

Unit V

Introduction to WAN packet switching technologies such as ATM and Frame relay. Introduction to TCP / IP protocols.

Reference Books:-

1. Data And Computer Communication By W. Stalling Phi

2. Computer Networks Y Tanenebaum Phi

3. Telecommunication Network, Protocols, Modelings And Analysis By M. Schwartz

4.Local Area Network By Keiser Tmh

MEDC – 104 (B) RF and Microwave Circuit Design

Unit I

Introduction to Ansys HFSS and Cadence AWR Microwave Office, Designing the Microwave Devices using HFSS and AWR.

Unit II

Microwave network analysis, scattering parameters, Lumped and distributed applications, Impedance matching, Lumped and distributed approach.

Unit III

Isolator-circulator, Power divider, Directional coupler, Lange Coupler Filterdesign using insertion loss method, Coupled Line Filters

Unit IV

PIN diodes and Varactor Diodes at RF frequencies, Phase Shifters.

Unit V

MICROWAVE AMPLIFIER DESIGN: Low-Noise Amplifier Design, Broadband Transistor Amplifier Design, Characteristics of Power Amplifiers and Amplifier Classes, Gain-Stability conditions, Design for maximum gain.

Text/References Books:

1. Michael Steer, Fundamentals of Microwave and RF Design,The University of North Carolina Press.

2. Reinhold Ludwig, RF circuit design, Prentice Hall.

3. Samuel Y. Liao, Microwave Devices and Circuits, Pearson.

4. David. M. Pozar, Microwave Engineering, John Wiley.

MEDC 105 RESEARCH METHODOLOGY AND IPR

UNIT I

Introduction To Research Methods:

Definition and Objective of Research, Various steps in Scientific Research, Types of Research, Criteria for Good Research, Defining Research Problem, Research Design , Case Study Collection of Primary and Secondary Data, Collection Methods: Observation, Interview, Questionnaires, Schedules,

UNIT II

 Sampling Design And Hypothesis Testing:

steps in Sampling Design, Types of Sample Designs, Measurements and Scaling Techniques - Testing of hypotheses concerning means (one mean and difference between two means -one tailed and two tailed tests), concerning variance – one tailed Chi-square test.

UNIT III

Interpretation And Report Writing:

Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report

UNIT IV

Introduction To Intellectual Property :

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.

UNIT V

Trade Marks, Copy Rights And Patents :

Purpose and function of trade marks, acquisition of trade mark rights, trade mark registration processes, trademark claims –trademark Litigations- International trademark law

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Text/Reference Books:

1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International Publishers.

2. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Delmar Cengage Learning.

3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", Tata Mc Graw Hill Education.

4. Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi.

5. Ranjith Kumar, Research Methodology – A step by step Guide for Begineers, Sage publisher.

6. D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell.

7. Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis.

8. Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press.

MEDC 106 Lab I Advanced Digital Signal Processing

List of Experiments

1 Generate various fundamental discrete time signals.

2 Basic operations on signals (Multiplication, Folding, Scaling).

3 Find out the DFT & IDFT of a given sequence without using inbuilt instructions.

4 Interpolation & decimation of a given sequence.

5 Generation of DTMF (Dual Tone Multiple Frequency) signals

6 Estimate the PSD of a noisy signal using periodogram and modified periodogram

7 Estimation of PSD using different methods (Bartlett, Welch, Blackman-Tukey).

8 Design of Chebyshev Type I, II Filters.

9 Cascade Digital IIR Filter Realization.

10 Parallel Realization of IIR filter.

11 Estimation of power spectrum using parametric methods (YuleWalker &Burg).

12 Time-Frequency Analysis with the Continuous Wavelet Transform.

13 Signal Reconstruction from Continuous Wavelet Transform Coefficients.

MEDC 107 Lab II Micro controller System Design/Wireless Sensor Network

Experiment List

1. Programming using arithmetic, logical and bit manipulation instructions of 8051.

2. Program and verify Timer/Counter in 8051.

3. Communication between 8051 kit and PC.

4. Write an ALP to generate square of 10Khz using Timer.

5. Write an ALP to display a string on LCD.

6. Write an ALP to interface seven segment with 8051 and display 0-9 on it.

7. Write an ALP to interface DC Motor with 8051.

8. Write an ALP to interface 4x4 keyboard with 8051.

9. Write an ALP to interface temperature sensor using 8051.

10. Write an ALP to interface the LCD 16x2 to P16f877A.