EC302

Course Objective

To understand the key modules of digital communication systems with emphasis on digital modulation techniques.

To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.

Digital Communication (3 – 0 - 0) 3

Base band transmission. Pulse Modulation techniques - PAM, PPM, PDM. Pulse code modulation (PCM), DM, Destination SNR in PCM systems with noise. Matched filter. Nyquist criterion for zero ISI. Optimum transmit and receive filters. Correlative coding, M-ary PAM. Equalization; zero-forcing and adaptive linear equalizers.

Digital modulation techniques – binary ASK, FSK, and PSK. Signal space diagram. Error probabilities.

M-ary PSK, FSK, QAM, MSK and GMSK. Optimum detector. Signal constellation, error probability.

Linear block codes, encoding and decoding. Cyclic codes. Convolutional codes. Viterbi decoding. TCM.

Spread spectrum (SS) techniques; direct S.S and frequency hop S.S. Processing gain and jamming margin. CDMA

Course Outcome

Identify, formulate and solve digital communication circuits and systems problems.

Acquire familiarity to understand the advanced topics on digital communication.

References:

J.G.Proakis, Digital Communication (4/e), McGraw – Hill

S.Haykin, Communication Systems (4/e), Wiley

EC304

Course Objective

To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards.

Mobile Communication (4 – 0 - 0) 4

Introduction. Cellular concept. System design fundamentals. Capacity improvement. Mobile radio wave propagation; reflection, diffraction, fading. Path loss prediction.

Mobile radio propagation and fading in mobile propagation. Multipath propagation. Statistical characterization of multipath fading. Diversity.

Link design. Design parameters for base station. Antenna location, spacing, heights and configurations.

Multiple access techniques; FDMA, TDMA and CDMA. Spread spectrum. Power control. WCDMA. CDMA network design.

GSM. 3G systems. WLAN technology. WLL. HiperLAN. Ad hoc networks. Bluetooth. OFDM and MC-CDMA

Course Outcome

Mathematical descriptions with intuitive explanations of the physical facts will assist the students in acquiring a deeper understanding of the area.

Students will be able to understand from very basic concepts to quite advanced topics in mobile communication and will be able to do research in this area.

References:

T.S.Rappaport, Wireless Communication Principles (2/e), Pearson.

W.C.Y.Lee, Mobile Communication Engineering. (2/e), McGraw- Hill,1998.

A.F.Molisch, Wireless Communications, Wiley, 2005.

EC306

Course Objective

The subject introduces the essential Microwave Circuit Theory and the design aspects of Microwave Integrated Circuit components.

Microwave Components and Circuits (3 – 0 - 0) 3

Scattering matrix formulation. Passive microwave devices; terminations, bends, corners, attenuators, phase changers, directional couplers and hybrid junctions. Ferrite devices.

Microwave measurements; frequency, wavelength, VSWR. Impedance determination. S-parameter measurements. Network analyzer.

Microwave network parameters. Basic circuit elements for microwaves. Transmission line sections and stubs. Richard transformation. Kuroda identities.

MIC filter design. Low pass to high pass, band pass and band stop transformations. Realization using microstrip lines and strip lines.

Design and realization of MIC components. 3 dB hybrid design. Directional coupler, circulator, power divider; realization using microstrip lines and strip lines.

Course Outcome

Know the applications and the characteristics of planar transmission lines.

Perform the complete design and layout of Microwave Integrated Circuit components.

Understand the concepts of Microwave Measurements.

References:

I.J.Bhal & P.Bhartia, Microwave Solid state Circuit Design, Wiley.

D.M.Pozar, Microwave Engineering (2/e), Wiley,1999.

EC308

Course Objective

To introduce various aspects of VLSI circuits and their design including testing.

VLSI System Design (3 – 0 - 0) 3

VLSI technology- NMOS, CMOS and BICMOS circuit fabrication. Layout design rules. Stick diagram. Latch up.

System design using HDL- circuit and system representation. Hierarchical representation of digital system. An overview of Verilog. Basics of verilog, operators, hierarchy, procedures and assignments. Timing controls, delay, tasks and functions. Control statements. Test benches.

VLSI logic circuits and analysis- MOS and CMOS switches. Implementation of logic circuits using MOS and CMOS technology, multiplexers and memory, MOS transistors, threshold voltage, MOS device design equations. MOS models, small-signal AC analysis. CMOS inverters, propagation delay of inverters, power dissipation.

Programmable logic devices- antifuse, EPROM and SRAM techniques. Programmable logic cells. Programmable inversion and expander logic. Design flow for VLSI circuits. Computation of interconnect delay.

VLSI testing -need for testing , manufacturing test principles, design strategies for test, chip level and system level test techniques.

Course Outcome

Implement the logic circuits using MOS and CMOS technology.

Write HDL program for any Digital and Analog circuits.

References:

N.H.E.Weste etal, CMOS VLSI design, (3/e), Pearson , 2005

J. Smith, Application Specific Integrated Circuits, Addison Wesley, 1997.

Uyemura, Introduction to VLSI Circuits and Systems, Wiley, 2002.

EC310

Course Objective

To introduce students to the modern embedded systems and to show how to understand and program such systems using a concrete platform built around.

A modern embedded processor like the Intel ATOM.

Embedded System Design (3-0-0) 3

Overview of various types of micro-controllers . Processor selection for embedded system. Selection of memory for embedded system. Devices and buses for device networks.

Motrola 68HC11/ 68HC12 family of microcontrollers. Internal architecture. Addressing modes and instruction set. Interrupts.

Software development. High speed I/O interfacing. Memory interfacing. Modem communication.

Real time operating systems. OS services. I/O subsystems. Network operating system. Real time embedded system OS. Interrupt routine in RTOS. OS security.

16 and 32 bit microcontrollers. 8096/80196 family. ARM processor.

Course Outcome

Students will be exposed to the key technology building blocks one need to master to design embedded systems.

Students will be trained to successfully take on the challenges of the changing landscape in embedded systems.

Text Books

Jonathan.W.Valvano, Embedded Microcomputer Systems, Real Time Interfacing, Published by Thomson Brooks/Col, 2002.
G.H. Miller, Microcomputer Engineering, 3d edition, Pearson Education.

Reference Books

S.Furbur, ARM system Architecture, Addition wesley, 1996.
Raj Kamal, Embedded Systems. Architecture, Programming and Design. Tata McGraw Hill. 2003.
Raj Kamal, Microcontrollers Architecture, programming, Interfacing and System Design, Pearson Education.

EC312

Communication Engineering Laboratory 0 - 0 - 3 – 2

EC314

VLSI Design Laboratory 0 - 0 - 3 – 2