EC301

Course Objective

The subject aims to make the students to understand the statistical theory of telecommunication, which are the basics to learn analog and digital telecommunication.

Statistical Theory of Communication (3 -1- 0) 4

Information measure. Discrete entropy. Joint and conditional entropies. Uniquely decipherable and instantaneous codes. Kraft-Mcmillan inequality. Noiseless coding theorem. Construction of optimal codes.

DMC. Mutual information and channel capacity. Shannon’s fundamental theorem. Entropy in the continuous case. Shannon-Hartley law.

Binary hypothesis testing. Baye’s, minimax and Neyman-Pearson tests. Random parameter estimation-MMSE,MMAE and MAP estimates. Nonrandom parameters – ML estimation.

Coherent signal detection in the presence of additive white and non-white Gaussian noise. Matched filter.

Discrete optimum linear filtering. Orthogonality principle. Spectral factorization. FIR and IIR Wiener filters.

Course Outcome

Apply the theory of probability and stochastic process in the field of telecommunication.

To understand how efficiently the data is transmitted through the telecommunication channel.

References:

R.B.Ash, Information Theory, Wiley

M.D.Srinath & P.K.Rajasekaran, Statistical Signal Processing with Applications, Wiley.

EC303

Digital Signal Processors and Applications (3 – 0 – 0) 3

Difference between DSP and other microprocessor architectures. An overview of Motorola and Analog Device DSPs.

TMS320C54X fixed point and TMS320C3X floating point DSP architectures, CPU, memory, buses and peripherals. Addressing modes, instruction sets , control operations, interrupts.

Repeat operations.Pipeline operation. Pipeline conflics and programming concepts.

Interfacing, serial interface, parallel interface, DMA operations, A/D and D/A converter interfaces.

DSP tools. DSP applications. MAC, filter design, implementation of DFT, echo cancellation, spectrum analyzer. Speech and video processing. Architecture of other DSPs

References:

B.Venkataramani & M.Bhaskar, Digital Signal Processors, Architecture, Programming and Applications, TMH, 2003

S.Srinivasan & A. Singh, Digital Signal Processing, Thomson, 2004

EC305

Course Objective

To develop a fundamental understanding on communication systems with emphasis on analog modulation techniques.

EC305 Communication Theory (3 – 0 – 0) 3

Basic blocks of communication system. Linear modulation - AM, DSB-SC, SSB and VSB signals. Methods of generation and detection.

Angle modulation- Frequency and Phase modulation. Methods of generation and detection. Superheterodyne receiver.

RF power amplifiers- Design of class A, B, AB, C, D, E and F power amplifiers. Modulation of power amplifiers.

Circuits for generation and detection of AM, DSBSC, SSBSC, FM signal.

Noise in CW modulation systems- SNR calculations for synchronous detection of DSB and SSB and envelope detection of AM.SNR calculations for angle modulation systems. Pre-emphasis and de-emphasis. Threshold effect. Noise in Communication subsystems- Internal and external noise.

Course Outcome

Ability to evaluate fundamental communication system parameters such as bandwidth, power, signal to noise ratio, figure of merit.

Design analog communication circuits and systems to meet predefined specifications.

References:

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

B.Carlson, Introduction to Communication Systems (4/e), McGraw-Hill

J.S.Beasley & G.M.Miler, Modern Electronic Communication(8/e), Pearson

J.Smith, Modern Communication Circuits (2/e), McGraw Hill

EC307

Course Objective

To impart knowledge on basics of antenna theory and to analyze and design a start of art antenna for wireless communications.

Antennas (3 – 0 - 0) 3

Radiation fundamentals. Potential theory. Helmholtz integrals. Radiation from a current element. Basic antenna parameters. Radiation field of an arbitrary current distribution. Small loop antennas.

Receiving antenna. Reciprocity relations. Receiving cross section, and its relation to gain. Reception of completely polarized waves. Linear antennas. Current distribution. Radiation field of a thin dipole. Folded dipole. Feeding methods. Baluns.

Antenna arrays. Array factorization. Array parameters. Broad side and end fire arrays. Yagi-Uda arrays Log-periodic arrays.

Aperture antennas. Fields as sources of radiation. Horn antennas. Babinet's principle. Parabolic reflector antenna.Microstrip antennas.

Wave Propogation: Propogation in free space. Propogation around the earth, surface wave propogation, structure of the ionosphere, propogation of plane waves in ionized medium, Determination of critical frequency, MUF. Fading, tropospheric propogation, Super refraction.

Course Outcome

At the end of learning the course, one should be able to apply his mind in developing an antenna for any given frequency and apply practically.

Students are expected to be familiar with integration of recent antennas for optical communication systems also.

References:

R.E.Collin, Antennas and Radio Wave Propagation, McGraw – Hill,1985.

K.F.Lee, Principles of Antenna Theory, Wiley,1984.

J.R. James etal, Microstrip Antenna Theory and Design, IEE, 1981.

Frederick Emmons Terman, Electronic Radio Engineering (4/e), McGraw Hill

EC309

Course Objective

This subject introduces the theoretical & circuit aspects of Op-amp, which is the backbone for the basics of Linear integrated circuits.

Analog Integrated Circuits (3 -0 - 0) 3

Operational Amplifiers, DC and AC characteristics. Applications of Op-amp. Precision rectifiers. Log and antilog amplifiers. Four quadrant multipliers. Instrumentation amplifier.

Active filters. Filter classification. Standard approximations. Butterworth, Chebyshev and Bessel filters. Switched capacitor filter.

Multivibrators using opamps. 555 timer. Triggering circuits for bistable and monostable multivibrators. Programmable timer.

Data converters. Analog multiplexer .A/D and D/A converters. PLL-Applications of PLL. Frequency synthesizers. Coherent synthesizers using PLL. Direct digital synthesis. Phase noise in oscillators.

Voltage regulators. Regulators using opamps. IC regulators. Protection circuits. Foldback current limiting. Current boosting of IC regulators. Switching regulators.

Course Outcome

To analyse, design, and implement any application using op-amp.

To understand the rapid advances in technologies like Analog VLSI system.

References:

S.Franco, Design with Operational Amplifiers and Analog Integrated Circuits (3/e) TMH, 2003

R.Gayakwad, Op-amps and Linear Integrated Circuits (4/e), PHI

D.A.Bell, Solidstate Pulse Circuits (4/e), PHI

EC311

Course Objective

To make the students to learn the advanced techniques in designing the advanced Microprocessors and give exposure to the cache organization, memory management, multitasking and bus interfacing.

Advanced Microprocessors (3 – 0 - 0) 3

Software model for Pentium. Real and protected mode of operation. Instruction set and addressing modes. Interrupts.

Hardware details of Pentium, Pipelining. Branch prediction. Cache memories. Floating point unit.

Segmentation. Memory management. Paging. Protection. Multitasking. Exceptions and interrupts. Virtual 8086 mode. Protected mode applications.

Special processors. Power PC architecture and organization. Programming model. Instruction sets.

Bus interface. ISA bus. Extended ISA and VESA local bus. PCI bus. USB bus. Serial bus standards. Parallel printer interface standards.

Course Outcome

Students will be able to design a high speed & high performance Microprocessors.

Ability to understand and implement the new serial and parallel bus standards.

References:

B.Brey, The Intel Microprocessors Etc, (4/e) PHI, 1998

J.L.Antonakos, An Introduction to Intel Family of Microprocessors, Pearson, 1999.

D.Tabak, Advanced Microprocessors, McGraw- Hill, 1995

EC313

Analog Integrated Circuits Laboratory 0 - 0 - 3 – 1

EC315

Digital Signal Processing Laboratory 0 - 0 - 3 – 1