

SEMESTER - VII

EC 1701 - OPTICAL COMMUNICATION

(2-1-0)

Optical Transmission Medium

Fiber-step index; graded index; single mode, multimode; Dispersion and attenuation in fibre; Splicing - techniques, Atmosphere & Free space as medium.

Optical Sources and Amplifiers

Light Emitting Diode, Semiconductor lasers, fiber lasers, semiconductor optical amplifiers.

Optical Detectors

Si, Ge, GaAs. Detection Characteristics: Avalanche Photodiode, PIN photodiode.

Modulation and Demodulation

Internal and external modulation. Electro-optic effect, acousto-optic effect, PCM, PCM/PL, Digital PPM, PRM, PFM; Direct detection, integrated and trans-impedance amplifier; Coherent receivers - Homodyne and Heterodyne. Phase Locked Loops.

Noise Sources

Phase noise, Polarisation fluctuation noise, AM noise, Shot noise in photodiode, Thermal noise, ASE noise in optical amplifiers.

Applications

Optical WDM, CDM and TDM networks and switching, SDH/SONET, Optical ATM.

Suggested Text books & References

- Keiser, G., "Optical Fiber Communications", 2nd Ed., McGraw Hill, 1991.
- Agrawal, G.P., "Optical Communication Systems", John Wiley, 1992.
- Yariv, A., "Optical Electronics", Saunders College Publishing, 1991.
- Gowar, J., "Optical Communication Systems", Prentice Hall of India, 1998.

EC 1702 - DIGITAL SIGNAL PROCESSING

(2-1-0)

Introduction: Limitations of analog signal processing, Advantages of digital signal processing.

Discrete Time Characterization of Signals & Systems

Some elementary discrete time sequences and systems; Concepts of stability, causality; linearity, time invariance and memory; Linear time invariant systems and their properties; Linear constant coefficient difference equations.

Frequency Domain Representation of Discrete Time Signal and Systems

Complex exponentials as eigen functions of LTI systems; Fourier Transform of sequences. Fourier transform theorems and symmetry properties of Fourier Transform

Sampling of Continuous Time Signals

Frequency Domain Representation of Uniform sampling Reconstruction of a continuous time signal from its sample; Discrete Time Processing of Continuous time signals and vice-versa: Decimation & Interpolation; Changing the sampling rate by integer and non integer factors using discrete time processing.

The Z transform

Limitations of the Fourier Transform; Z-Transform, Region of convergence; Properties of the Z-transform; Inverse transform using contour integration; Complex convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non zero initial conditions.

Discrete Fourier Transform

DFT and its properties; Linear, Periodic and Circular convolution; Linear Filtering Methods based on DFT; Filtering of long data sequences; Fast Fourier Transform algorithm using decimation in time and decimation in frequency techniques; Linear filtering approaches to computation of DFT.

Transform Analysis of LTI systems

Frequency response of LTI systems, System functions for systems characterized by linear constant coefficient difference equations, Relationship between magnitude and phase; All pass systems. Minimum phase systems.

Structure for Discrete Time Systems

Signal flow graph representation, Transposed forms, Lattice structure

Design of Digital Filters

Linear Phase FIR filters; FIR differentiators and Hilbert Transformers; HR filter design by Impulse Invariance, Bilinear Transformation; Matched Z-Transformation, Frequency transformations in the Analog and Digital Domain.

Finite Precision Effects

Fixed point and Floating point representations, Effects of coefficient quantization. Effects of Roundoff noise in digital filters, Limit cycles.

Digital Signal Processors

Architecture and various features of TMS/ADSP series of digital signal processors; Instruction set and few applications of TMS 320 CXX.

Suggested Text books & References

- Oppenheim, A.v. & Schaffer, R.W., "Discrete Time Signal Processing". Prentice Hall, 1989.
- Proakis, J.G. & Manolakis, D.G., "Digital Signal Processing". Prentice Hall, 1992.

Basic Device Technology

Single crystal growth and purification, epitaxy, oxidation, diffusion, ion implantation and pn junction formation; semiconductor measurements.

Integrated Circuit Fabrication Process

Monolithic, hybrid, thin film and thick film technology; pattern generation and photo mask fabrication, photolithography, isolation technique, metallization, interconnection; encapsulation and testing.

Monolithic Circuit Components

Epitaxial diffused system, diffused collector process, triple diffused process, bipolar transistor formation; diode formation, basic diode connections of IC transistors, diode as capacitor, thin film capacitor; sheet resistance; diffused resistor, thin film resistor, parasitics in integrated circuits; layout considerations.

MOS Technology

MOSFET as basic IC component, comparison of MOSFET with BJT as IC component. MOS isolation techniques, poly-silicon gate technology, self aligned gate technology; NMOS process sequence, NMOS inverter, pass transistor and gates; N-tub, P-tub and twin-tub CMOS structures; CMOS-process sequence.

VLSI Technology

Scaling theory and device miniaturization, E beam masks, plasma etching, choice of photo resists; stick, stick diagram, VLSI design rules and layout diagrams, computer aids. VLSI

Circuit Concepts

Inverter delays, driving large capacitive loads, propagation delays and effect of wiring capacitances; pull up and pull down ratios of NMOS and CMOS inverter, alternative forms of pull up, NMOS and CMOS inverter transfer characteristics, CMOS gates.

Suggested Text books & References

- Warner, Jr. M., (Ed.), "Integrated Circuits-Design Principles And Fabrication", McGraw Hill Book Company, New York, 1965.
- Veronis, A., "Integrated Circuits Fabrication Technology", Reston Publishing Company Inc., Virginia, 1979.
- Allison, "Electronic Integrated Circuits-Their Technology and Design", McGraw Hill Book Company, 1975.
- Sze (Ed.), "VLSI Technology", McGraw Hill Book Company, USA, 1983.
- Mead and Conway, L.A., "Introduction to VLSI Systems", Addison Wesley, USA, 1980.

OPEN ELECTIVE – I (3-1-0)

PROFESSIONAL ELECTIVE – I (3-1-0)

PRACTICAL / DRAWING / DESIGN

EC 1704 -P - Optical Communication Lab. (0-0-3)

List of experiments:

- Splicing technique of optical fiber.
- Study of PIN photodiode and its application.
- Study of Fiber LASER, Semiconductor LASER.
- Study of Hetrodyne and Homodyne receiver.
- Study of Optical ATM.

EC 1705 -P - Digital Signal Processing Lab. (0-0-3)

List of experiments:

- To plot the frequency response of low pass filter using Kaiser Window.
- To generate a triangular wave using fourier series.
- To design a Butterworth Low Pass Filter for given specifications.
- Generation of Unit Step, Exponential and Sinusoidal sequence on MATLAB.
- To compute the DFT of a sequence and plot magnitude and phase response.

CS 1712-P - Computer Networking Lab. (0-0-3)

- Simulation Experiments for protocol performance.
- Configuring, testing and measuring Network devices and parameters/policies;
- Network management experiments;
- Exercises in Network programming.

EC 1706 -P – Project-I. (0-0-3)

HS 1707 – P GENERAL PROFICIENCY – VII (0-0-0)