COURSE STRUCTURE & SYLLABUS OF BACHELOR OF TECHNOLOGY (B.TECH)

In

Electronics & Telecommunication

Course Structure

Fourth Year

Seventh Semester

Syllabus

Elective – I

Paper Code	Name of the Subject
BEET5-I	Opto Electronics & Photonics – I
BEET5-II	Digital Voice picture Communication
BEET5-III	Radar System
BEET5-IV	Optical Fiber Communication

BEET 5-I- OPTO ELECTRONICS & PHOTONICS – I

1. ELEMENTAL AND COMPOUND SEMICONDUCTORS

Introduction, Bounding in Solids, Crystalline Nature of Solids, Alloy Semiconductors, Lattice-Mismatched and Pseudomorphic Materials, Transmission Media and Choice of Materials, Crystal Growth, Device Processing

2. ELECTRONIC PROPERTIES OF SEMICONDUCTORS

Introduction, Carrier Effective Masses and Bandstructure, Effect of Temperature and Pressure on Bandgap, Carrier Scattering Phenomena, Semiconductor Statistics, Conduction Processes in Semiconductors, Bulk and Surface Recombination Phenomena

3. OPTICAL PROCESSES IN SEMICONDUCTORS

Electron-Hole Pair Formation and Recombination, Absorption in Semiconductors, Effect of Electric Field on Absorption: Franz-Keldysh and Stark Effects, Absorption in Quantum Wells and the Quantum-Confined Stark Effect, The Kramers-Kornig Relations, Radiation in Semiconductors, Deep Level Transitions, Auger Recombination, Luminescence from Quantum Wells, measurement of Absorption and Luminescence Spectra, Time-Resolved Photoluminescence

4. JUNCTION THEORY

Introduction, P-N Junctions, Schottky Barriers and Ohmic Contracts, Semiconductor Heterojunctions Chapter Highlights

5. LIGHT EMITTING DIODES

Introduction, The Electroluminescent Process, Choice of LED Materials, Device Configuration and

Efficiency, Light Output from LED, LED Structures, Device Performance characteristics, Frequency Response and Modulation Bandwidth, Manufacturing Process and Applications

BEET 5-II- DIGITAL VOICE PICTURE COMMUNICATION

1. RADIO RECEIVERS

Trf and Superheat receivers, AM broadcast receivers, Communication Receivers, Tuning Indicator, Diversity reception, FM receivers.

2. NOISE

Introduction, External noise, Internal noise, Noise in Communication system, Noise in AM,FM, and PM system, Noise in pulse modulated systems.

3. PROPAGATION OF WAVES

Reflection/ refraction of radio waves, Atmospheric absorption – Tropospheric Scatter, Ionospheric Layers, Sky Waves, Virtual Height, Regular & irregular ionospheric variations, Skip distance, Primary & Secondary Service Area.

4. BROAD BANK COMMUNICATIONS

Time division multiplexing, Frequency Division multiplexing, Computer Communication System, Microwave Links, Line of Sight (LOS)links, Tropospheric Links, Satellite Communications – Choice of Orbit FDMA, TDMA, SPADE, Optical Communications – Modulation and Detection, Integrated service digital network (ISDN).

5. PICTURE-SIGNAL TRANSMISSION AND RECEPTION

Facsimile-transmission and reception, Television-scanning process, CCIR-B standards, TV camera systems – image orthicon and vidicon –transmission and reception principle for black and white TV signals, Principle of color TV – primary colours, colour TV systems – NTSC, SECAM, PAL, Transmission and reception using PAL system, PIL Picture tube.

6. RECORDING AND DIGITAL PROCESSING OF VIDEO SIGNALS

Basic Video recording principles, Recording of luminance signals, Recording of Chrominance signal, Frequency range of the VHS signal, Tape loading, Tape format in VHS systems, Operating modes of a video cassette recorder, E-E mode, Playback mode, Digital processing of Video Signals, How much digital is the Digital TV? Video processor, Audio Processing, Control Computer, CD Players

BEET 5-III- RADAR ENGINEERING – I

1. AN INTRODUCTION TO RADAR

Basic Radar , The Simple Form of the Radar Equation, Radar Block Diagram, Radar Frequencies, Application of Radar, The Origins of Radar

2. THE RADAR EQUATION

Introduction, Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probability Density Functions, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, Other Radar Equation Considerations

3. MTI AND PULSE DOPPLER RADAR

Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance, MTI from a Moving Platform (AMTI), Pulse Doppler Radar, Other Doppler Radar Topics

4. TRACKING RADAR

Tracking with Radar, Monopulse Tracking, Conicla Scan and sequential Lobing, Limitations to Tracking Accuracy, Low-Anle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars (ADT)

5. DETECTION OF SIGNALS IN NOISE

Introduction, Matched-Filter Receiver, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers, The Radar Operator, Signal Management

6. INFORMATION FROM RADAR SIGNALS

Introduction, Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition

BEET 5-IV- OPTICAL FIBER COMMUNICATION

1 ...ELEMENTARY DISCUSSION OF PROPAGATION IN DIELECTRIC WAVEGUIDES

Introduction, Step-index fibers: numerical aperture and multi path dispersion, Propagation and multipath dispersion in graded-index fibers, Modes and rays, The slab waveguide

2 MATERIAL DISPERSION

Refractive index: theory, The refractive indices of bulk media: experimental values, Time dispersion in bulk media, The wavelength of minimum dispersion

3 ATTENUATION MECHANISMS IN OPTICAL FIBERS

Introduction, Absorption, Scattering, Other very low-loss materials, All-plastic and polymer-clad-silica (PCS) fibers, Damage by ionizing radiation

4 SYSTEM CONSIDERATIONS

The optimum wavelength for silica fibers, The ultimate bandwidth limitation, A comparison between optical fibers and conventional electrical transmission lines

5 SINGLE-MODE FIBERS

Types of single-mode fiber, Mode spot size, HE 11 mode propagation characteristics

6 THE FABRICATION OF FIBERS, CABLES AND PASSIVE COMPONENTS

Fiber production methods, Fiber strength, Cables, Splices and connectors

7 FIBER PARAMETERS: SPECIFICATION AND MEASUREMENT

Introduction, The refractive-index profile, Near- and far-field intensity distributions, Attenuation measurements, Bandwidth measurements, Cutoff wavelength

8 THE DESIGN OF LEDS FOR OPTICAL COMMUNICATION

The external quantum efficiency, The Burrus-type double heterostructure surface- emitting LED (DH-

SLED), The stripe-geometry, edge-emitting LED (ELED), LED-to-fiber launch efficiency, Lensed LED-to-fiber launch systems, LED designs

9 SEMICONDUCTOR LASERS

The theory of laser action in semiconductors, Some simplified calculations, Modulation frequency response, Noise in semiconductor lasers

10 SEMICONDUCTOR LASERS FOR OPTICAL FIBER COMMUNICATION SYSTEMS

Introduction, Methods for obtaining the stripe geometry, Optical and electrical characteristics of Fabry-Perot lasers, Spectral characteristics, Power and voltage characteristics, Quantum-well lasers and laser arrays, Single frequency semiconductor lasers, The reliability of DH semiconductor LEDs and lasers, The transmitter module

11 THE RECEIVER AMPLIFIER

Introduction, Sources of receiver noise, Circuits, devices and definitions, Signal-to-noise ratio in the voltage amplifier circuit, Signal-to-noise ratio in the transimpedance feedback amplifier, The ideal quantum-limited receiver, Amplifier design examples

12 THE REGENERATION OF DIGITAL SIGNALS

Causes of regeneration error, The quantum limit to detection, The effect of amplifier noise and thermal noise on the error probability, Noise penalties in practical system

13 OPTICAL FIBER COMMUNICATION SYSTEMS

Introduction, The economic merits of optical fiber systems, Digital optical fiber telecommunication systems, Data communication networks, Analog systems, The optical ether

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