ECE - 3rd Year

B. N. Mandal University, Laboonagar, Madhepura

Details of theory & Sessional Papers code of 3rd Year B. Tech. Course

Branch: Electronics & Communication Engineering

Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
Microprocessor & Its Applications	µP	EC-301	2	1	3	70	30	Microprocessor & Its Applications-100
Analog Electronics	AE	EC-302	2	1	3	70	30	Analog Electronics-100
Network Theory	NT	EC-303	2	1	3	70	30	Network Theory-50
Electromagnetic Field Theory	EMFT	EC-304	3	1	0	70	30	---
Signals & Systems	SS	EC-305	3	1	0	70	30	---
Electrical Instruments & Measurements	EIM	EC-306	2	1	3	70	30	Electrical Instruments & Measurements-50
Elective-I (Introduction to Communication Systems)	Elective-I (CS)	EC-307	3	1	0	70	30	---
Elective-II (Fiber Optic Communication)	Elective-II (FOC)	EC-308	2	1	3	70	30	Elective-II- 50 (Fiber Optic Communication)
Industrial Training	IT	EC-309	0	0	3	---	---	Industrial Training-50

Elective I

- Introduction to Communication Systems.
- Microelectronics IC Design & Fabrication.
- TV Engineering.
- Microcontrollers.

Elective II

- Fiber Optic Communication.
- Digital System Design.
- Embedded System Design.
- Digital Image Processing.

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Expert-II (Internal)
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Member Secretary
Syllabus Committee
BNMU, Madhepura

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t: Microprocessor & its Applications Branch Code: EC-301 (ECE/CSE/EE)

2-13

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Intel 8085

1. **Introduction:** CPU, register, memory, buses, memory addressing capacity of a CPU. **Lecture:3**
2. **CPU Architecture:** Pin configuration, instructions, addressing modes, instruction word size, languages. **Lecture:4**
3. **Timing diagram:** Read cycle, write cycle, fetch cycle, memory read, memory write, I/O cycle. **Lecture:4**
4. **Programming:** Simple programming: 8-bit addition & subtraction, 16-bit addition, delay subroutine using register, finding lowest and highest no. in data array. **Lecture:5**
5. Data transfer schemes, I/O port. **Lecture:6**

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6. 8255, 8251, 8253, 8257 chips, pin diagram, function of different modes. **Lecture:7**
7. **Interfacing** of ADC, analog multiplexer, simple and hold. **Lecture:4**

Intel 8086

8. **Architecture:** BIU and execution unit, pin diagram, function of different modes **Lecture:4**
9. **Addressing modes:** Instruction. **Lecture:4**
10. **Programming.** **Lecture:3**

books:

1. Fundamental of Microprocessor & microcontroller by B Ram, Dhanpat Rai.
2. Advance Microprocessor by B Ram.

rence books:

1. Microprocessor and interfacing by D V Hall, TMH.
2. Microprocessor Architecture by R S Gaonkar.
3. Microprocessor with application in process control by S I Ahson, TMH.
4. Programming Microprocessor interfaces by Michael Andrews, PHI.
5. The intel Microprocessor Architecture, programming and interfacing by B Brey, PHI.

roprocessor Lab:

1. Different programs related to 8085 & 8086.
2. Application of different interfaces.

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ect: Analog Electronics Branch Code: EC-302 (ECE/EE)

P: 4-1-3

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1. **Four ideal amplifiers:** Ideal voltage amplifier, ideal current amplifier, ideal transconductance amplifier, and ideal transresistance amplifier, distortions (amplitude or harmonic distortions, frequency distortion and phase distortion). **Lecture: 4**
2. **Mid frequency amplifiers:**
   Analysis of CB, CE & CC amplifiers using hybrid model.
   Low and High frequency analysis of CB, CE & CC.
   Rise time method for determination of fb using the formula for tr fh – 0.35 and 10% sag method for the determination of flower using sag method. **Lecture: 16**
3. **Bootstrapping in emitter follower:** Darlington pair, cascade amplifier, CC-CB Cascade. **Lecture: 5**

ond Term

4. **Multistage amplifiers** and band width shrinkage in multistage amplifiers. **Lecture: 3**
5. **Incremental model** of FET and incremental analysis of common source at low and high frequencies. **Lecture: 3**
6. **Noise and noise figure in amplifiers:** Thermal noise, shot noise, flicker noise, friss formula. **Lecture: 4**
7. **Class A, Class B, and Class AB** power amplifiers with reference to complementary symmetry amplifiers, Push Pull amplifier. **Lecture: 5**
8. **Barkhausen criteria and oscillator:** Wein bridge, RC phase shift, quadrature, Hartley, colpitts oscillators. **Lecture: 6**
9. **Tuned amplifiers:** Single tuned amplifiers. **Lecture: 4**

xt books:

1. Micro electronics by Millman and Grabel, McGraw Hill.
   Integrated Electronics by Millman & Halkias, McGraw Hill.

ference:

1. Microelectronics circuits by Sedra and Smith, Oxford university.
2. Microelectronics circuit analysis and design by Rashid, PWS publication.
3. Semiconductor circuit application- an introduction to transistors and IC's by Malvino, TMH.
4. Electronic devices and integrated circuit- B P Singh and Rekha Singh, Pearson.
5. Electronic principles, 7th edition by Albert Malvino & Davis J Bates, TMH.
6. A Hand book of Electronics by Gupta & Kumar, Meerut Pub.

nalog Electronics Lab:

1. Two stage RC-coupled amplifier.
2. Class C tuned voltage amplifier.
3. Wein bridge oscillator.
4. Colpitts oscillator.
5. Hartley oscillator.
6. Multistage amplifier.
7. Operational amplifier.

etwork Theory Branch Code: EC-303 (ECE/EE)

ransient response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, mpulse and sinusoidal excitations using Laplace transform. **Lecture: 6**

erminal pairs or ports: Network functions of one port and two port networks, poles and zeros of network functions, restrictions on pole and zero locations for driving point functions and ransfer functions, time domain behavior from the pole zero plot. **Lecture: 10**

Relationship of two port variables: Short circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationships between parameter sets, inter connection of two port networks. **Lecture: 8**

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Principles of network topology: Graph matrices, network analysis using graph theory. **Lecture: 8**

Filter fundamentals: High pass, low pass, band pass, and band reject filters **Lecture: 8**

Positive real functions: Synthesis of one port and two port networks, elementary ideas of active networks. **Lecture: 8**

s:

Networks and systems by D Roy Choudhary New age international.
Network analysis by Van Valkenburg, PHI.
Introduction to modern network synthesis by Van Valkenburg, John Wiley.

ce books:

Basic circuit theory by Dasoer Kuh, McGraw Hill.
A course in electrical circuit analysis by Soni and Gupta, Dhanpat rai & sons.
Circuit analysis by G K Mittal, Khanna pub.

k Theory Lab:

Practical based on Syllabus.

t: Electromagnetic Field Theory Branch Code: EC-304 (EC E/EE)

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1. Introduction to field co-ordinate systems. **Lecture: 3**
2. Electrostatics: Coulomb's law, Gauss's law and its applications, the potential functions, Equipotential surface, Poisson's and Laplace's equation, applications (solution for some simple cases), capacitances, electrostatics energy, conductor properties and boundary conditions b/w dielectric and dielectric-conductor, uniqueness theorems. **Lecture: 9**
3. **Magneto statics:** Biot-savart law, Ampere's circuital law, Curl, Divergence, Stoke's theorem, Magnetic flux, and magnetic flux density, energy stored in magnetic field, Ampere's force law, Magnetic vector potential, analogy b w electric and magnetic field. **Lecture: 7**
4. **Maxwell's equations:** Equation of continuity for time varying field, inconsistency of ampere circuital law, Maxwell's equations in differential and integral form. **Lecture: 4**

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5. **Electromagnetic wave:** Solution of wave equation in free space, uniform plane wave propagation, uniform plane waves, the wave equation for conducting medium, wave propagation in lossless medium and inconductive medium, conductors and dielectrics, polarization. **Lecture: 4**
6. **Reflection and refractions:** Reflection by a perfect conductor with normal as well as oblique incidence. Reflection refraction by perfect dielectrics with normal and oblique incidence. Surface impedance. **Lecture: 7**
7. **Poynting vector:** Poynting theorem, instantaneous, average and complex pointing vector, power loss in a plane conductor. **Lecture: 3**
8. **Transmission lines:** Transmission line theory, low loss radio-frequency and UHF transmission line. UHF line as a transformer, voltage step up of the quarter wave transformer. Transmission line chart (Smith chart). **Lecture: 10**

ooks:

1. Electromagnetic waves and radiating system by E C Jordan, K G Balmain, Pearson.
2. Engineering Electromagnetics by W H Hayt, TMH.

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stem and Signal: Definition, classification of systems, standard test signal, properties of stem, properties of linear system. **Lecture: 5**

nalogous System: Force, voltage analogy, force current analogy, mechanical coupling devices, lectromechanical system. **Lecture: 7**

aplace transformation: Laplace transform of some important functions, shift theorem and its pplications, laplace transform of periodic functions, analysis of response, initial and final values heorem, response to periodic sinusoidal excitation. **Lecture: 12**

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xan...ly ... methods: Fourier series expansion of periodic functional symmetry condition, exponential form of fourier series, fourier integral and fourier transform, analysis by fourier methods, fast fourier transform. **Lecture: 15**

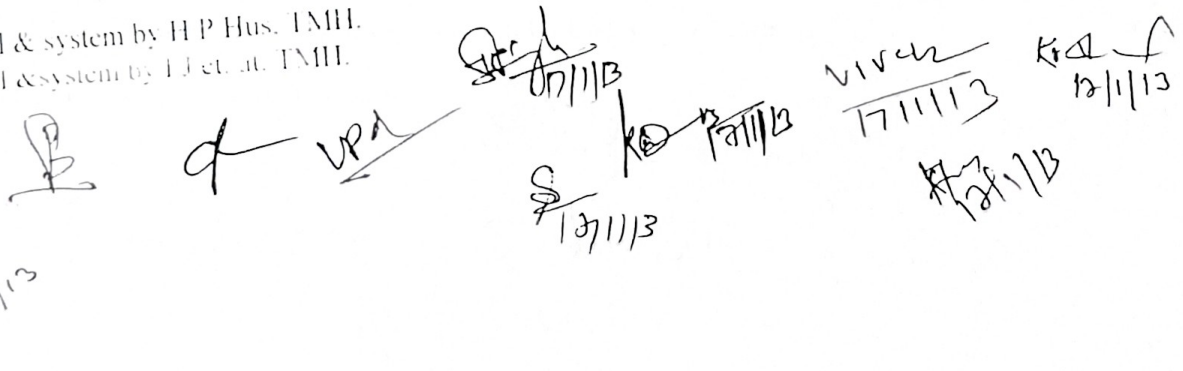
Z transformation: Z transform, discrete time, LTI system, solution of difference equation, applications of Z transform to open loop system. **Lecture: 9**

s:

Analysis of linear system by D K Cheng, Narosa pub.
Modeling and analysis of linear system by J P Tiwari, Dhanpat Rai & Sons.

e books:

Signal & system by H P Hus, TMH.
Signal &system by J J et. al, TMH.



t: Electrical Instruments & Measurements Branch Code: EC-306
(EC/EE)

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1. Measurements of voltage, current, power and power factor, energy and frequency. **Lecture: 10**
2. Range extension including current and potential transformer. **Lecture: 8**
3. Galvanometer: Dynamics of D'Arsonval Galvanometer, vibration galvanometer, ballistic galvanometer. **Lecture: 6**

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4. Measurement of inductance and capacitance: AC bridges, Maxwell, Wein, Anderson and shearing bridges, general equations and vector diagram under balanced conditions, error and precaution in bridge measurements, wagner's earth connection and shielding of bridge measurement and elements. **Lecture: 10**
5. Standard AC and DC potentiometers, principle, standardization and application. **Lecture: 5**
6. Measurement of resistances: Measurements of low resistance by Kelvin double bridge and potentiometer method, measurement of high resistance by loss of change method. **Lecture: 4**
7. Digital measurements. **Lecture: 5**

ooks:

1. Electrical measurement and measuring instruments by E W Golding.
2. Basic electrical measurement by M B Stout, PHI.

nce books:

1. Measurement systems: Application and Design by Doebein, 5th edition, TMH.

ical Instruments & Measurements Lab:

Practical based on Syllabus.

lective I (Introduction to Communication Systems) BranchCode:EC-307
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Periodic signals (Sinusoidal, rectangular, saw tooth and triangular waves) and its Fourier series expansion with single side representation in real frequency domain and with double side representation in rotating phasor domain. **Lecture: 4**

Aperiodic signal: A signal pulse event and its fourier transform, impulse response of a linear time invariant system, convolution and response to arbitrary input. **Lecture: 4**

Block diagram of communication system and comparative study of analog and digital communication. **Lecture: 3**

Modulation (upward frequency translation) & demodulation (downward frequency translation) and the need for modulation, broad classification of modulation [linear (amplitude-AM) and exponential (frequency-FM and phase-PM)]. MODEM. **Lecture: 6**

Generation of double side band (DSB) with carrier, double side band with suppressed carrier (DSBSC) and single side band with suppressed carrier (SSBSC), demodulation of double side band with carrier- incoherent or envelope detector, peak diode detector, coherent or synchronous detection of DSBSC and SSBSC. **Lecture: 8**

Term

Analog pulse modulation: PAM, PWM, PPM and demodulation, comparative study of various analog pulse modulation, comparison of incoherent and coherent detection. **Lecture: 5**

Superheterodyne Receivers: Intermediate frequency and its advantages, alignment and tracking, image rejection and IC version of the receiver. **Lecture: 3**

Frequency Multiplexing in carrier telephony. **Lecture: 1**

Generation of FM signals (direct and indirect methods) and demodulation. **Lecture: 3**

Comparative study of SNR in AM, FM, & PM system and use of emphasis circuit in FM for SNR optimization. **Lecture: 2**

Television: Block diagram of the transmitter and receiver, description and working of video camera, description working of B/W, colour TV receiver, description of the composite signal in B/W, colour TV. **Lecture: 6**

RADAR: Block diagram, operation and types, Radar range equation, Radar Transmitter & Receiver. **Lecture: 4**

LCD Flat panel displays. **Lecture: 2**

ks:

Radio systems for technicians by D C Green, Longman.

Learning electronic communication through experimentation using electronic work bench by Pearson, Pearson.

ce books

Communication system by Bruce carison, TMH.

Electronic communication system by Kennedy IV edition, TMH.

Electronic communication system by Roody and Coolen, Pearson.

Telecommunication system engg. Vy Freeman, John Wiley.

Communication system by Haykin, Wiley.

Elective-I (Microelectronics: IC Design & Fabrication) BranchCode:EC-307
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Introduction to MOS technology: Introduction to IC technology, MOS & related VLSI technology, basic MOS transistors (Enhancement mode and depletion mode), NMOS process, CMOS process (P-well, N-well, Twin-tub processes), Bi CMOS process flow, aspects of CMOS & Bi CMOS devices. **Lecture: 6**

Basic electrical properties of MOS circuits: MOSFET Threshold voltage, I-V relationship for MOSFET, MOSFET transconductance, the pass transistor, NMOS inverter, pull- up to pull-down ratio for NMOS inverter driven by NMOS inverter and pass transistor, different forms of pull-up (load resistor, depletion mode NMOS, Enhancement mode pull-up, CMOS pull-up), CMOS inverter, MOS transistor circuit model, latch up in CMOS circuits, Bi CMOS inverter, comparative aspects of CMOS and bipolar transistors. **Lecture: 7**

MOS circuit design processes: MOS Layers, stick diagrams (NMOS design style, CMOS design style), Euler path and design optimization, design rules and layout (Lambda based design rules, contact cuts, double metal MOS process rules, CMOS lambda based design rules), two micron double metal double poly CMOS rules. **Lecture: 5**

Basic circuit concepts: Sheet resistance, area capacitance of layers, inverter delays, driving large capacitive loads, propagation delay (cascaded pass transistors, design of long poly silicon wires), wiring capacitances (fringing fields, interlayer capacitance, peripheral capacitance). **Lecture: 6**

Scaling of MOS circuits: Scaling models and scaling factors (gate area, gate capacitance, channel current density, channel resistance, gate delay, maximum operating frequency, saturation current, current density, power dissipation), limitation of scaling. **Lecture: 4**

Subsystem design and layout: Switch logic (pass transistors and transmission gates), gate logic (inverter, two input CMOS NAND & NOR gates), structure design of a parity generator. **Lecture: 4**

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7. **Memory and aspects of system timing:** System timing considerations, one transistor dynamic memory cell, three transistor dynamic RAM cell (area, dissipation, volatility), RAM arrays. **Lecture: 4**

8. **Practical aspects:** Optimization of NMOS & CMOS inverters, input output pads, aspects of design tools (graphical and tree layout, design verification, design rule checkers, circuit extractors simulators). **Lecture: 4**

9. **Crystal growth and doping:** Starting materials, Czochralski method, gradient freeze method, considerations for proper crystal growth (role of point defects, thermal gradients, turbulences, pull and spin rate, crystal orientation, crystal hardening techniques), doping (rapid stirring conditions, partial stirring conditions, radial doping variations), zone processes (zone refining, zone leveling, neutron transmutation doping). **Lecture: 4**

10. **Diffusion:** Diffusion in a concentration gradient, diffusion equation, impurity behavior in silicon, diffusion systems for silicon, redistribution during oxide growth, diffusion during oxide growth, cooperative diffusion, evaluation techniques for diffused layers in silicon. **Lecture: 2**

11. **Epitaxy:** Nucleation and growth, doping, dislocation, thermally induced strain, molecular beam epitaxy, vapour phase epitaxy for Si, liquid phase epitaxy. **Lecture: 2**

12. **Ion implantation:** Penetration range (nuclear and electronic stopping, transverse effects), implantation damage, annealing, ion implantation systems, process consideration, high energy and high current implants. **Lecture: 2**

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Different types of microcontrollers: Embedded microcontrollers, external memory microcontrollers, processor architecture, Harvard & Princeton. **Lecture: 4**

Microcontrollers: Overview of 8051 microcontroller, application areas, compares and contrasts. Microprocessor and microcontroller. **Lecture: 2**

8051 Microcontrollers architecture: 8051 pin description, conception about program counter, data pointer register bank, flags, program status word (PSW), internal memory, RAM, ROM, memory map, stack and stack pointer, input and output ports, external memory, counters and timers, serial data, input/output interrupts. **Lecture: 8**

8051 addressing modes: Immediate and register addressing modes. Accessing memory using various addressing modes. Bit address for I/O and RAM. **Lecture: 3**

Assembly language programming concepts: Assembling and running an 8051 program, 8051assembly language programming concepts using arithmetic, logical, data mover, call, jump, loop, time delay instructions and subroutines. **Lecture: 8**

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. **I/O port programming:** 8051 I/O port assembly language programming concepts. **Lecture: 3**

. **Assembly language programs** based on rotate, compare and data serialization concepts. **Lecture: 3**

8. **8051 timers programming in assembly:** 8051 timers programming concept, counter programming. **Lecture: 5**

. **Interrupts programming in assembly:** Programming timer interrupts. **Lecture: 3**

10. **Real world interfacing on 8051:** Intelligent LCD display, interfacing keyboard to 8051. **Lecture: 5**

11 **PIC microcontrollers:** Introduction to PIC microcontrollers, architecture and pipelining, program memory considerations. Addressing modes, CPU registers, instruction set, simple operation **Lecture: 6**

ooks:

1 The 8051 microcontroller and embedded system by M A Mazidi, Pearson/PHI.
2. Design with PIC microcontrollers by John B Peatman, Pearson.

ner books:

1 The 8051 Microcontroller by Kenneth Ayala, Thomson learning.
2. Embedded microcontroller systems by J W Valvano Brooks, Thomson learning.
3. Microcontrollers and microcomputers by Fredrick M Cady, Oxford.

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ject: Elective-II (Digital Image Processing) BranchCode:EC-308 (ECE)

P: 3-1-0

Term

1. Introduction: Background, digital image representation, fundamentals step in image processing, elements of a digital image processing system. **Lecture:4**
2. Digital image **fundamentals:** Elements of visual perception, a simple image model, sampling and quantization, some basic relationship between pixels, imaging geometry. **Lecture:6**
3. Image transforms: introduction to the fourier transform, the discrete fourier transform, some properties of the two-dimensional fourier transform, other separable image transforms. **Lecture:6**
4. Image **enhancement:** Spatial domain methods, frequency domain methods, some simple intensity transformations, histogram processing, image subtraction, image averaging, background, smoothing filters, sharpening filters, low pass filtering, high pass filtering, generation of spatial masks from frequency domain specification. **Lecture:9**

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5. Image **restoring:** Degradations model- definitions, degradation model for continuous functions, diagonalization of the circulant and the block circulant matrices, circulant matrices, block circulant matrices, effects of diagonalization on the degradation model, algebraic approach to restoration, unconstrained restoration, constrained restoration, inverse filtering- formulation, removal of blur caused by uniform linear motion, restoration in the spatial domain, geometric transformation. **Lecture:12**
6. Image **compression:** Fundamentals- coding redundancy, interpixel redundancy, psycovisual redundancy, fidelity criteria, image compression models- the source encoder and decoder, the channel encoder and decoder. Elements of information theory- measuring information, the information channel, fundamental coding theorems, using information theory. Error- free compression- variable- langth coding, bit- plane coding, lossless predictive coding. Lossy compression- lossy predictive coding, transform coding. **Lecture:14**

xt books:

1. Digital image processing, 2nd edition by Rafael C Gonzalez and Richard E Woods, Pearson.

ference books:

1. Digital image processing by W K Pratt, John Wiley.
2. Fundamentals of digital image processing by A K Jain, PHI.
3. Image processing, analysis and machine visions by M Sonka et. al., Thomson Learning, Indian edition.

Elective-II (Fiber Optic Communication) Branch Code: EC-308 (ECE)

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Historical note of comparative study with respect to RF and microwave communication. **Lecture: 2**

Block diagram of an optical fiber communication system. **Lecture: 2**

Optical fiber: Basic optical laws and definitions, principles of light propagation in fibres, ray theory, optical fiber materials, fiber fabrication, optical fiber cables. **Lecture: 8**

Signal degradation in optical fibers: Attenuation, chromatic dispersion and inter modal dispersion, dispersion shifted and flattened fibers. **Lecture: 3**

Optical modulator: LED & LASER diodes- basic concepts, operation, modulation methods, **Lecture: 6**

Optical detector: PIN & APD-operation, detector noise, response time, photodiode materials. **Lecture: 3**

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7. Splices, connectors, couplers and grating **Lecture: 8**
8. Optical Transmitters. **Lecture: 5**
9. Optical Receivers. **Lecture: 5**
10. Optical link design. **Lecture: 6**

ooks:

1. Fiber optic system by John Powers, Irwin.

nce books:

1. Optical fiber communication by Keiser, TMH.
2. Optical fiber communication by Senior, PHI.
3. Optical communication systems by Gowar, PHI.
4. Opto Electronics- an introduction by Wilson & Hawkes, PHI.
5. Optical Communication by Palais, Pearson.

Optic Communication Lab:

1. Modulation and demodulation using fiber optic cable.
2. Wavelength measurement using LASER.
3. Measurement of attenuation losses in FOC.
4. To determine the wavelength of laser light with a transmission grating.

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Elective-II (Digital System Design) BranchCode:EC-308 (ECE)

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Introduction to Computer aided design tolls for digital systems. Hardware description languages, introduction to VHDL, data objects, classes and data types, operators, overloading, logical operators. Types of delay entity and architecture declaration. Introduction to behavioural. Data flow and structure models. **Lecture: 12**

Assignment statements: Sequential statements and process, conditional statements, case statement. Array and loops, resolution functions, packages and libraries, concurrent statements. Subprograms: application of functions and procedures, structural modeling. Declaration structural layout and generics. **Lecture: 12**

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VHDL Models and simulation of combinational circuits such as multiplexers, demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc. VHDL models and simulations of sequential circuits shift registers, Counters etc. **Lecture: 8**

Basic components of a computer: Specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL. **Lecture: 8**

Programmable logic devices: ROM, PLAs, PALs, GAL, CPLDs, and FPGA, design implementation using CPLDs and FPGAs. **Lecture: 8**

ce books:

1. IEEE standard VHDL language reference manual (1993).
2. Digital design and modeling with VHDL and synthesis by K C Chang, IEEE computer society press.
3. A VHDL primer by Bhaskar, Prentice Hall(1995).
4. Digital system design using VHDL by Charles H Roth, PWS (1998).
5. VHDL analysis and modeling of digital systems by Nawabi Z, McGraw Hill.
6. VHDL 4th edition by Perry, TMH.
7. Introduction of digital systems by Ereegovac, Lang & Moreno, John Wiley.
8. Fundamentals of digital logic with VHDL design by Brown & Vranesic, TMH.
9. Modern Digital Electronics 3rd edition by R P Jain.

ective-II (Embedded System Design) BranchCode:EC-308 (ECE)

ntroduction: Embedded systems overview, processor technology- General purpose processor software), single purpose processors (hardware), Application- specific processors, IC echnology- full-custom/VLSI, Semicustom ASCI (gate array and standard cell), PLD, etc.
Lecture: 5

Basic concepts of computer architecture: Concepts, memory, I/O, DMA, parallel and distributed computers, embedded computers architecture, etc. **Lecture: 7**

Embedded processors and systems: The PIC Micro-controllers- A table of two processors and support components, Bus interfacing, AT 90S8515 Memory cycle and Bus signals, memory maps and address decoding, programmable logic (PALs, LCAs or PLDs), timing analysis and memory management. **Lecture: 10**

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MC 68000 **Series computer:** A simple 68000 architecture, a simple 68000 based computer reset circuit, address decoder I/O (Multifunction peripheral), memory interfacing to SRAM and EPROMs, wait state generator, etc. **Lecture: 4**

DSP based controller: DSP 56800 programmer's model, a DSP 56805 based computer DSP 56805 block diagram, crystal oscillator circuit and module, reset and interrupts, external memory, interfacing to program, SRAM and data SRAM, shared program and data memory, address decoder for two 32k SRAMs and eight peripherals, JTAG. **Lecture: 5**

Peripherals and interfacing: Adding peripherals and interfacing- serial peripherals and interfacing- serial peripheral interface (SPI), Inter Integrated circuit (I^2C), adding a real time clock with I^2C, adding a small display with I^2C, Serial ports- UARTs, Error detection, RS-232c, & RS-422, Infrared communication, USB networks- RS-485, Controller area network (CAN), Ethernet, Analog sensors- Interfacing external ADC, Temperature sensor, light sensor, accelerometer, pressure sensor, magnetic field sensor, DAC, PWM, embedded system applications- motor control and switching big loads. **Lecture: 14**

ooks/Reference books:

1. Designing embedded hardware by Catsoulis, Hohn, Shroff Pub. and distributors pvt. Ltd. New Delhi.
2. Embedded system design- A unified hardware/software introduction by Vahid, Frank and Givargis, Tony, John Wiley and sons, Peplika press Delhi.