Programme Educational Objectives

Bachelor of Electronics and Instrumentation Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. have successful technical and professional careers in their chosen fields such as Process Control, Electronics & Information Technology.
2. engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics & Instrumentation

Programme Outcomes

The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Instrumentation Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems/processes and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Instrumentation Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainable Development.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

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## ELECTIVES FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING

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OBJECTIVES

- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I  MATRICES


UNIT II  FUNCTIONS OF SEVERAL VARIABLES


UNIT III  ANALYTIC FUNCTION

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION

Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V  LAPLACE TRANSFORMS


TOTAL: 45 PERIODS

OUTCOMES

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

BOOKS FOR STUDY

REFERENCES

PTPH8152 PHYSICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to EEE, E &I and ECE Branches) 3 0 0 3

OBJECTIVES:
- To Illustrate, with suitable examples, the concepts of conductors, semiconductors, dielectric, magnetic and superconducting materials.
- To make the students familiarize with the optical properties of materials.
- To introduce the essential principles of physics for electronics and communication engineering applications.

UNIT I ELECTRICAL PROPERTIES OF METALS

UNIT II SEMICONDUCTORS

UNIT III DIELECTRIC MATERIALS AND INSULATION
Matter polarization and relative permittivity: definition - dipole moment and polarization vector P-polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization - frequency dependence - local field and Clausius-Mossetti equation - dielectric constant and dielectric loss - Gauss's law and boundary conditions - dielectric strength and insulation break-down in gases, liquids and solids - capacitor materials - typical capacitor constructions - piezoelectricity, ferroelectricity and pyroelectricity - quartz oscillators and filters - piezo and pyroelectric crystals.

UNIT IV MAGNETIC PROPERTIES AND SUPERCONDUCTIVITY
UNIT V  OPTICAL PROPERTIES OF MATERIALS


TOTAL : 45 PERIODS

OUTCOMES:
The student will be able to
• apply the electrical properties of matter while understanding the relevant electrical phenomenon.
• apply the concepts of semi conductors and understand the working principle of all types of semiconductor devices
• apply the concepts of dielectric materials and magnetic properties and understand the electrostatic, electromagnetic, electromechanical behavior of equipments.
• apply the optical properties of materials and understand the electro optic effects.

TEXT BOOKS:

REFERENCES:

UNIT I  ELECTROCHEMISTRY

UNIT II  ENERGY SOURCES

UNIT III  CONDUCTIVITY IN SOLIDS AND SPECIALTY POLYMERS
Electrical properties of solids- band theory of solids- types of energy bands- application of band theory to solids- semiconductors- types- n and p types- superconductors. Classification of insulating materials based on function and physical state- thermal insulators- optical fibers- organic electronic materials- fullerenes. Introduction to thermoplastics and thermosetting plastics- phenolic and epoxy resins, silicone polymers, rubbers; polyelectrolytes, electrically conducting polymers, polymers with piezoelectric, pyroelectric and ferroelectric properties, photonic polymers, photo resists, basics of LCD and LED.

UNIT IV  WATER CHEMISTRY
Boiler feed water- requirements- formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation- external treatment (ion exchange method) - internal treatment- (phosphate, calgon, carbonate, colloidal)- boiler compounds- caustic embrittlement- boiler corrosion- priming and foaming- desalination of brackish water – reverse osmosis.

UNIT V  ANALYSIS OF MATERIALS

TOTAL 45 PERIODS

OUTCOMES:
- The knowledge gained on analysis materials, polymers, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVES:
The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV FUNCTIONS AND POINTERS

UNIT V STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS
REFERENCES


PTEI8101 ELECTRONIC DEVICES, CIRCUITS AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- understand principle of current flow through the p-n junction and relating this phenomena they will be taught to characterise and operate diodes, bipolar and field-effect transistors.
- learn the function and application of the diodes, bipolar junction and field effect transistors in electronic circuits.
- gain knowledge about the operation of multistage and differential amplifiers.
- design and analyse feedback amplifiers and oscillators.

UNIT I PN JUNCTION DEVICES 9
Semiconductor conductivity - drift current and diffusion current - PN junction - barrier voltage - diode equation - diffusion and transition capacitance - Application of diode as rectifier, clipper and clamper. Special devices and applications, Zener diode as voltage regulator, Schottky diodes for high speed switching, UJT relaxation oscillator, Thyristors - SCR, Diac and Triac.

UNIT II BIPOLAR JUNCTION TRANSISTORS AND APPLICATIONS 9

UNIT II JFET, MOSFET AND THEIR APPLICATIONS 9
JFET and MOSFET device structure and current equation - Equivalent circuit - Biasing - CS, CG and CD amplifiers. Frequency response of CS amplifier - NMOS and CMOS inverter.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9
BJT cascaded amplifiers - Single and double tuned amplifiers - gain and frequency response - BJT and FET Differential amplifiers - common mode and difference mode analysis.

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9
Advantages of negative feedback - Feedback amplifiers with voltage / current sampling and series / shunt mixing - Positive feedback - Condition for oscillations - Phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.
OUTCOMES:
At the end of the course, the student should be able to:
- apply basic concepts of common semiconductor devices and electronic circuits for an application. The students will be capable to learn how to analyse simple but important applications of these devices in electronic circuits.

TEXT BOOKS
1. David A. Bell, Electronic Devices and Circuits, Oxford University Press, 2010.

REFERENCES

PTEI8201 DIGITAL LOGIC THEORY

OBJECTIVES:
The student should be made to:
- gain knowledge on implementation of logic circuits using gates.
- understand the basic concepts of Boolean algebra and combinational circuits.
- learn about the operation of flip flops and will be able to design a synchronous and asynchronous sequential circuits.
- study the basic concepts of state machine diagrams and its applications.
- Get exposure on programmable logic devices and VHDL programming.

UNIT I BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS

UNIT II ASYNCHRONOUS SEQUENTIAL CIRCUITS

UNIT III ASYNCHRONOUS SEQUENTIAL CIRCUITS
Analysis of asynchronous sequential machines - state assignment - asynchronous design problem.

UNIT IV ALGORITHMIC STATE MACHINE
ASM Chart - Data path Subsystem - Control subsystem - Design examples- Binary multiplier, Weighing machine and Waveform generator.

UNIT V PROGRAMMABLE LOGIC DEVICES AND VHDL
OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge on the fundamental concepts and design of digital systems.
- Learn the function of flip flops and able to design a synchronous and asynchronous sequential circuits.
- understand programmable logic devices and VHDL programming.

TEXT BOOKS:

REFERENCES:
UNIT V  DISPLAY AND RECORDING DEVICES

Cathode ray oscilloscope – Classification - Sampling and storage scopes – Seven segment and dot matrix displays – X-Y recorders – Magnetic tape recorders – Data loggers.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the working principle of all types of common electrical and electronic instruments.
• Gain knowledge on analog and digital instruments.
• understand the different types of display and recording devices.

TEXT BOOKS:
3. J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, 2011
4. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, New Delhi, 2010

REFERENCES:

PTEI8203 ELECTRICAL MACHINES LT P C
3 0 0 3

OBJECTIVES:
The student should be made to:
• study about the construction and working principle of DC machines, AC Machines, transformers, synchronous machines and induction machines.
• learn the procedure for selecting machines for different applications.

UNIT I  D.C. MACHINES

UNIT II  TRANSFORMERS
UNIT III     SYNCHRONOUS MACHINES  9
Principle of alternators:- Construction details, Equation of induced EMF and Vector
Diagram-Voltage regulation - Synchronous motor:- Starting methods, Torque, V -curves,
Speed control and Hunting.

UNIT IV     INDUCTION MACHINES  9
Induction motor:- Construction and principle of operation, Classification of induction Motor-
Torque equation-Condition for maximum torque-Equivalent Circuit- Power losses –
Efficiency - Starting methods and Speed control.

UNIT V     SPECIAL MACHINES  9
Types of single phase motor –Double revolving field theory – Cross field theory –
Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor –
Universal motor – Hysterisis motor - Permanent magnet synchronous motor –Switched
reluctance motor – Brushless D.C motor.

OUTCOMES:
At the end of the course, the student should be able to:
• gain knowledge about the construction, working principle and applications of DC
machines, AC machines and special machines.

TEXT BOOKS:

REFERENCE BOOKS:
   Delhi, 2007.
2. Del Toro, V., “Electrical Engineering Fundamentals”, Prentice Hall of India, New Delhi,
   1995.
   1999.

PTEI8204    TRANSODUCER ENGINEERING     L T P C
                             3 0 0 3

OBJECTIVES : The student should be made to:
• study about the concepts of measurement, error and uncertainty.
• gain knowledge on the static and dynamic characteristics of measuring instruments.
• Learn about the principle, operation and characteristics of different variable resistance
transducers.
• understand the principle of operation and characteristics of different variable inductance
transducers
• develop knowledge on operation and applications of piezo electric and Hall effect transducers.
UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS

UNIT II CHARACTERISTICS OF TRANSDUCERS
Static characteristics – Accuracy, precision, resolution, sensitivity, linearity, span and range -Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers - Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS
Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS
Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the concepts of measurement, error and uncertainty .
• know the principle of operation and characteristics of different types of transducers.

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVES:
The student should be made to:
- know the procedure to obtain the static and dynamic characteristics of various types of transducers.
- study the procedure to measure unknown resistance, inductance and capacitance using bridge circuits.
- gain knowledge to calibrate electrical instruments.
- learn about the flapper nozzle system.

1. Characterisation of loading effect on Potentiometer.
2. Dynamic characteristics of various types of Thermocouple with and without thermo wells.
3. Design of cold junction compensation for Thermocouples.
4. Static and Dynamic characteristics of RTD and lead wire compensations.
5. Static characteristic of Thermistor and its linearization.
7. Calibration of Strain Gauge type force and torque transducers.
8. Calibration of magnetic and photoelectric type velocity transducers.
9. Static characteristic of flapper-nozzle system.
11. Study of Capacitive transducer.
14. Wheatstone and Kelvin’s bridge for measurement of resistance.
15. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- obtain the static and dynamic characteristics of various types of transducers.
- measure unknown resistance, inductance and capacitance using bridge circuits.
- calibrate electrical instruments.

OBJECTIVES:
The student should be made to:
- gain knowledge about the different methods of representation of systems, their transfer function models and state space models.
- develop state space models of selective systems.
- learn about the time response of systems subjected to different test inputs and the associated steady state/dynamic errors.
- understand the open loop and closed loop frequency responses of systems, and analyze the stability and performance.
• Know about the concept of stability of control systems and methods of stability analysis using root locus approach and Routh-Hurwitz criterion.
• Know and practically implement the procedure to design lag, lead and lag-lead compensators for a control system.

UNIT I INTRODUCTION
Control System-Open and Closed Loop-Effect of Feedback-System representations-Transfer functions, Block diagrams, signal flow graphs, gain formula of Mechanical and Electrical Systems.

UNIT II STATE VARIABLE MODEL AND ANALYSIS

UNIT III TRANSFER FUNCTION MODEL AND ANALYSIS

UNIT IV FREQUENCY DOMAIN ANALYSIS OF TRANSFER FUNCTION MODELS
Frequency response – resonance peak – Bandwith – effect of adding poles and zeros – Magnitude and phase plots of typical systems– Gain margin – Phase margin-Bode plot–Nyquist’s stability criterion

UNIT V DESIGN OF CONTROL SYSTEMS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• apply concepts of Linear control theory and design for a system.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- understand the construction and working of instruments used for measurement of force, torque, velocity, acceleration, vibration and density.
- study about the different types of pressure measurement techniques.
- learn the concept of calibration of instruments used for temperature and pressure measurement.
- gain knowledge on the design signal conditioning circuits and compensation schemes for temperature measuring instruments.
- learn how to select the instruments according to a specific application.

UNIT I  MEASUREMENT OF FORCE, TORQUE AND SPEED  9
Electric balance - Different types of load cells - Hydraulic, Pneumatic, strain gauge-Magnetoelectric and Piezoelectric load cells - Different methods of torque measurement - Strain gauge-Relative angular twist-Speed measurement-Capacitive tacho-Drag cup type tacho-D.C and A.C tacho generators - Stroboscope.

UNIT II  MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY  9
Accelerometers - LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments - Seismic instruments as accelerometer - Vibration sensor - Calibration of vibration pickups - Units of density and specific gravity - Baum scale and API scale - Pressure type densitometers - Float type densitometers - Ultrasonic densitometer - gas densitometer.

UNIT III  PRESSURE MEASUREMENT  9
Units of pressure - Manometers, different types, Elastic type pressure gauges, Bourdon tube, bellows and diaphragms - Electrical methods: Elastic elements with LVDT and strain gauges -Capacitive type pressure gauge - Piezo resistive pressure sensor - Resonator pressure sensor - Measurement of vacuum-McLeod gauge-Thermal conductivity gauge-Ionization gauges - Cold cathode type and hot cathode type - calibration of pressure gauges - Dead weight tester.

UNIT IV  TEMPERATURE MEASUREMENT - I  9
Definitions and standards - Primary and secondary fixed points - Calibration of thermometers - Different types of filled in system thermometers - Sources of errors in filled systems and their compensation - Bimetallic thermometers - RTD - characteristics and signal conditioning - 3 lead and 4 lead RTDs - Thermistors.

UNIT V  TEMPERATURE MEASUREMENT - II  9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the construction and working of instruments used for measurement of force, torque, velocity, acceleration, vibration and density, temperature and pressure.
select instruments according to the application.

TEXT BOOKS

REFERENCE BOOKS

PTEI8303 MICROPROCESSOR, MICROCONTROLLER AND APPLICATIONS

OBJECTIVES:
The student should be made to:
- know architecture of 8085,8086 Microprocessors and 8051 microcontroller.
- learn assembly language programming in 8085,8086 Microprocessors and 8051 microcontroller.
- understand the concept about peripherals and their interfacing with Microprocessors and microcontrollers.
- Gain knowledge on Microcontroller based systems for industrial applications.

UNIT I 8085 PROCESSOR

UNIT II 8086 PROCESSOR
Introduction to 8086 - Architecture –Maximum mode - Minimum mode - Addressing Modes - Instruction format - Instruction set – Assembly Language Programming – Interrupt system - Memory and I/O interfacing - Strings - procedures and Macros.

UNIT III PERIPHERAL INTERFACING & APPLICATION
Programmable Peripheral Interface (8255) - keyboard display controller (8279) – ADC - DAC Interface - Programmable Timer Controller (8254) - Programmable interrupt controller (8259) - Serial Communication Interface (8251)- DMA Controller(8257).

UNIT IV MICROCONTROLLER

UNIT V MICRO CONTROLLER BASED SYSTEM DESIGN

TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:

- know architecture and development of assembly language programming of 8085, 8086 Microprocessors and 8051 micro controller.
- Apply knowledge on Microcontroller based systems for industrial applications.

TEXTBOOKS

REFERENCES

PTEI8304 OPERATIONAL AMPLIFIERS AND LINEAR INTEGRATED CIRCUITS L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:

- study the fundamentals of integrated circuit's fabrication and operation.
- learn the functions of linear and non-linear integrated circuits for specific applications.
- understand the operation of special function integrated circuits for Instrumentation and process control applications.
- get knowledge about the different types of A/D and D/A converters.
- gain knowledge on design and analysis of linear and non linear circuits using operational amplifiers.

UNIT I FABRICATION OF IC AND OP-AMP SPECIFICATIONS
IC classification - fundamentals of monolithic IC technology - epitaxial growth, masking and etching, diffusion of impurities- Realization of monolithic ICs and packaging- Fabrication of diodes, capacitance, resistance - Operational amplifiers, specifications, frequency compensation - slew rate and methods of improving slew rate.
UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS

UNIT III ANALOG MULTIPLIER AND PLL
Analysis of four quadrant and variable transconductance multipliers - Voltage controlled Oscillator - Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS
Analog switches - High speed sample and hold circuits and sample and hold IC’s - Types of D/A converter - Current driven DAC - Switches for DAC - A/D converter, Flash, Single slope, Dual slope, Successive approximation - DM and ADM converters.

UNIT V SPECIAL FUNCTION IC’S
Timers - Voltage regulators - linear and switched mode types - Switched capacitor filter - Frequency to Voltage converters - Tuned amplifiers - Power amplifiers - Isolation Amplifiers - Opto couplers.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the fundamentals of integrated circuit's fabrication and operation.
• apply the concepts of special function integrated circuits for Instrumentation and process control applications and concepts of different types of A/D and D/A converters.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn assembly level programs in 8085 and 8086 Microprocessors and 8051 microcontroller.
- know the procedure for Interfacing of peripheral devices such as PPI, Timer, ADC/DAC with microprocessor and microcontroller.
- understand 8085/8255/8051 simulation software.
- gain knowledge on implementation of microprocessor based applications such as of Stepper Motor Controller, Traffic Light Controller, PID controller and Data Acquisition System

8085 BASED EXPERIMENTS:
2. Interfacing experiments (with 8279, 8255, 8251, ADC, DAC, Traffic Light and Stepper motor)

8051 BASED EXPERIMENTS:
1. Programming using Arithmetic, logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and verifying Timer, Interrupts and UART operations in microcontroller.
3. Interfacing ADC and DAC.
4. Interfacing (16X2) LCD Display.
5. Temperature measurement.
6. DC motor speed control.

8086 BASED EXPERIMENTS:
1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations.
2. Macro assembler Programming for 8086. (Simulator)

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- write and debug assembly level programs in 8085 and 8086 Microprocessors and 8051 microcontroller.
- use 8085/8255/8051 simulation software.
- design and implement the microprocessor based applications such as of Stepper Motor Controller, Traffic Light Controller, PID controller and Data Acquisition System
OBJECTIVES:
The student should be made to:
- learn the construction, installation and working of different variable head type flow meters.
- know about the construction, working and calibration of different quantity flow meters, variable area flow meters and mass flow meters.
- gain knowledge about the construction, installation and working of electrical type, open channel and solid flow meters.
- understand the principle, operation and application of different level measuring instruments.
- learn the principle and operation of viscosity, humidity and moisture measurement.

UNIT I VARIABLE HEAD TYPE FLOWMETERS
Expression for flow rate through restriction (compressible and incompressible flow) - Orifice plate – different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle – Dall tube – Elbow taps- Pitot tube – combined pitot tube - averaging pitot tube – installation and applications of head flow meters

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS

UNIT III ELECTRICAL TYPE FLOW METERS

UNIT IV LEVEL MEASUREMENT
Level measurement – Float gauges - Displacer type –D/P methods-Bubbler system- Load cell – Electrical types:– Conductivity sensors – Capacitive sensors – Nucleonic gauge - Ultrasonic gauge – Boiler drum level measurement:– Differential pressure and Hydrastep methods - Solid level measurement.

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the construction, installation and working of different variable head type flow meters.
- analyze the different level measuring instruments and gain knowledge about the principles of viscosity, humidity and moisture measurement.
TEXT BOOKS

REFERENCE BOOKS

PTEI8402 PRINCIPLES OF COMMUNICATION ENGINEERING LT P C
3 0 0 3

OBJECTIVES:
The student should be made to:
• learn the basic concept of Amplitude and Angle Modulation.
• Gain knowledge about different pulse modulation and Demodulation techniques.
• Study about the digital modulation techniques and evaluate the error probability.
• gain knowledge on various modes of communication systems.

UNIT I AMPLITUDE MODULATION

UNIT II ANGLE MODULATION
Angle modulation: - FM and PM waveforms, Frequency deviation, Phase Deviation and Modulation index, Frequency spectrum of Angle modulated wave - Phase and Frequency modulator and demodulator, Direct FM Transmitter, Indirect transmitters, Angle modulation versus Amplitude Modulation, FM receivers and Frequency versus Phase Modulation.

UNIT III PULSE COMMUNICATION

UNIT IV DATA TRANSMISSION
Base band signal receiver: - Error probability, Optimum and matched filter techniques and Coherent reception - Digital modulation systems: - Amplitude Shift Keying, Frequency Shift Keying and Phase Shift Keying, Comparison of data transmission systems.
UNIT V COMMUNICATION SYSTEMS


OUTCOMES:
At the end of the course, the student should be able to:
- understand the basic concept of Amplitude and Angle Modulation.
- gain knowledge on various modes of communication systems.

TEXT BOOKS

REFERENCE BOOKS

PTEI8403 PRINCIPLES OF DIGITAL SIGNAL PROCESSING L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- gain knowledge on continuous/Discrete time signals and systems.
- Understand different sampling techniques and effects of quantization.
- gain knowledge on discrete and fast Fourier transform algorithms and their applications.
- learn the concepts of IIR and FIR filters.

UNIT I INTRODUCTION TO SIGNALS AND SYSTEMS 9
Classification of systems - continuous, linear, time invariant, causal, stable systems - Classification of signals - continuous, energy and power signals; mathematical representation of signals; spectra of standard signals.

UNIT II SAMPLING AND QUANTIZATION 9
Sampling techniques - quantization - quantization error - Nyquist rate - Aliasing effect - Digital signal representation - Truncation - Overflow errors in numerical computation - Interpolation.

UNIT III DISCRETE TIME SIGNALS AND SYSTEMS 9
UNIT IV DISCRETE FOURIER TRANSFORM & FFT
DFT properties, magnitude and phase representation - Direct computation of DFT, FFT
DIT & DIF algorithms - Radix 2 - Convolution - Application using FFT – Power spectrum.

UNIT V DESIGN OF DIGITAL FILTERS
Butterworth approximation - Butterworth IIR lowpass digital filter using impulse invariant
and bilinear transformation - FIR filters - linear phase filters - window design technique –
Rectangular, Hamming and Hanning Kaiser windows – realization structures.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- analyze continuous/Discrete time signals and systems.
- Apply discrete and fast Fourier transform algorithms and understand the concepts
  of IIR and FIR filters.

TEXT BOOKS
1. Johnny R. Johnson, Introduction to Digital Signal Processing, Prentice Hall of India,
   2009.

REFERENCES
   and Applications, Pearson Education, New Delhi, 2003 / PHI.
3. John P. Uyemura, A first course in Digital System Design An integrated approach,
   Hill, 2010.
5. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, Discrete-Time Signal

PTEI8404 PROCESS CONTROL

OBJECTIVES:
The student should be made to:
- develop the skills for obtaining the mathematical model of processes.
- analyze the dynamic model of different processes and to understand the difference
  between lumped and distributed parameter models.
- Know about the different control action and their relative merits, demerits and
  applications.
- gain knowledge on the construction, operation, characteristics and selection of
  control valves.
- learn the different tuning methods for PID controllers.
- Develop knowledge about the different multi loop control schemes and their
  applications.
UNIT I   PROCESS DYNAMICS

UNIT II   CONTROL ACTIONS

UNIT III   FINAL CONTROL ELEMENTS
I/P converter - Pneumatic and electric actuators – Valve Positioner – Control Valves – Characteristic of Control Valves:- Inherent and Installed characteristics – Modeling of pneumatic control valve – Valve body:-Commercial valve bodies – Control valve sizing – Cavitation and flashing – Selection criteria.

UNIT IV   CONTROLLER TUNING
Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio - Tuning:- Process reaction curve method, Continuous cycling method and Damped oscillation method – Determination of optimum settings for mathematically described processes using time response and frequency response approaches –Auto tuning.

UNIT V   MULTILOOP CONTROL

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- know about process dynamics, PID controllers and its tuning
- Gain knowledge about the construction, operation, characteristics and selection of control valves.
- Get familiarized with different multi loop control schemes and their applications.

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVES:
The student should be made to:
• gain knowledge on the measuring instruments for accurate measure of process variables (flow, level, temperature, viscosity and pressure)
• get understanding about the usage of various types of analytical instruments such as pH, Conductivity, UV absorbance and transmittance.
• Learn about the calibration of Bio-medical measuring instruments.

1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Torque measurement
4. Viscosity measurement
5. Vacuum pressure measurement
6. Level measurement using d/p transmitter
7. UV – Visible spectrophotometer
8. IR spectrophotometer
9. pH meter standardization and measurement of pH values of solutions
11. ECG measurement
12. Pulse rate measurement
13. One or two experiments beyond syllabus

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• effectively use the measuring instruments for accurate measure of process variables (flow, level, temperature, viscosity and pressure) and Bio-medical measuring instruments using calibrators
• Get familiarized with the usage of various types of analytical instruments such as pH, conductivity, UV absorbance and transmittance.

OBJECTIVES:
The student should be made to:
• gain knowledge on various Spectro Photometers.
• learn about the ion conductivity and dissolved component analyzer.
• Understand the principle and operation of important instrumental methods for chemical analysis of gas samples.
• understand the principle, types of applications of chromatography.
• Study about the construction and working principle of X-ray, Nuclear Magnetic Resonance and Mass spectroscopy
UNIT I  COLORIMETRY AND SPECTROPHOTOMETRY  

UNIT II  CHROMATOGRAPHY  

UNIT III  INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS  
Types of gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV  PH METERS AND DISSOLVED COMPONENT ANALYZERS  
Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, cyclic voltametry, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT V  NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES  

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• acquire knowledge on number of analytical tools which are useful for industrial analysis, drugs and pharmaceutical labs.
• Get exposed to different chromatographic techniques, NMR and dissolved component analyzers.

TEXT BOOKS

REFERENCES
OBJECTIVES:
The student should be made to:
- study about the state space analysis for discrete data systems
- gain knowledge on parametric and non parametric methods of system identification.
- learn the procedure for designing various digital controllers
- Know about the steps for carrying out analysis and design of multiloop controllers for MIMO processes.
- Learn about the different multivariable controllers and their implementation issues.

UNIT I DISCRETE STATE-VARIABLE TECHNIQUE 9
State equation of discrete data system with sample and hold – State transition equation – Methods of computing the state transition matrix – Decomposition of discrete data transfer functions – State diagrams of discrete data systems – System with zero-order hold – Controllability and observability of linear time invariant discrete data system – Stability tests of discrete-data system – State observer

UNIT II SYSTEM IDENTIFICATION 9

UNIT III DIGITAL CONTROLLER DESIGN 9

UNIT IV MULTI-LOOP REGULATORY CONTROL 9

UNIT V MULTIVARIABLE REGULATORY CONTROL 9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- carry out state space analysis for discrete data systems and able to design various digital controllers.
- Apply their knowledge on parametric and non parametric methods of system identification.
- Apply their knowledge on carrying out analysis and design of multiloop and multivariable controllers for MIMO processes.

TEXT BOOKS:
OBJECTIVES:
The student should be made to:

- study about the PIC Microcontroller, its architecture and programming.
- gain knowledge about the interrupts and timer of PIC microcontroller.
- study and understand the peripherals and interfacing devices with microcontrollers.
- Get introduced to the concept of ARM processor, its architecture and programming.
- Learn the ARM processor organization, execution, implementation and applications.

UNIT I PIC INTRODUCTION

UNIT II INTERRUPTS AND TIMER

UNIT III PERIPHERALS AND INTERFACING

UNIT IV ARM INTRODUCTION

UNIT V ARM ORGANIZATION
3-Stage Pipeline ARM Organization – 5-Stage Pipeline ARM Organization – ARM Instruction Execution - ARM Implementation – ARM Instruction Set – ARM coprocessor
interface – Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:

- Get familiarized with PIC Microcontroller, its architecture and programming.
- Gain knowledge about the interrupts, timer and strings of PIC microcontroller.
- Gain knowledge about ARM processor, its architecture, programming and applications.

TEXT BOOKS:

REFERENCE:

PTEI8511 PROCESS CONTROL LABORATORY L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:

- Learn the procedure for obtaining the servo and regulatory responses of process control loops such as level, pressure, flow and temperature.
- Understand the procedure for obtaining the optimum controller settings using various tuning methods by experimental and mathematically described processes.
- Learn and analyze the control schemes for multiloop processes such as three tank and four tank systems.

LIST OF EXPERIMENTS
1. Study of Process Control Training Plant and Compact Flow Control Unit.
2. Characteristics of Pneumatically Actuated Control Valve (with and without Positioner).
3. Level Control and Pressure Control in Process Control Training Plant.
5. PID Implementation Issues.
6. Tuning of PID Controller for mathematically described processes
7. PID Enhancements (Cascade and Feed-forward Control Schemes)
8. Design and Implementation of Multi-loop PI Controller on the Three-tank system.
9. Analysis of Multi-input Multi-output system (Four-tank System).
10. Study of AC and DC drives.
11. Study of pH Control Test Rig.
12. Auto-tuning of PID Controller

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- conduct the experiments and obtain the servo and regulatory responses of process control loops such as level, pressure, flow and temperature.
- arrive the optimum controller settings using various tuning methods by experimental and mathematically described processes.
- analyze and design control schemes for multiloop processes such as three tank and four tank systems.

PTEI8601 BIOMEDICAL INSTRUMENTATION

OBJECTIVES:
The student should be made to:
- understand the various physiological signal measurements and various assisting devices.
- Gain knowledge about the recording of ECG, EEG, EMG and ERG signals and their analysis.
- learn about the techniques used for measurement of Blood, heart, lung and liver related parameters.
- Study different medical imaging systems and its applications.
- understand the concept of assisting and therapeutic devices.

UNIT I BASIC CONCEPTS OF MEDICAL INSTRUMENTATION

UNIT II ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

UNIT III NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

UNIT IV MEDICAL IMAGING SYSTEMS

UNII V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge about the recording of ECG, EEG, EMG, and ERG signals and their analysis.
- Get familiarized about the techniques used for measurement of Blood, heart, lung and liver related parameters.
- Gain knowledge on different medical imaging systems and its applications.

TEXT BOOKS:

REFERENCES

PTEI8602 LOGIC AND DISTRIBUTED CONTROL SYSTEM L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- study the fundamentals of Data Networks.
- gain knowledge about hardware architecture and software for PLCs and SCADAs.
- design PLC program using ladder logic programming, functional block programming and sequential functional chart for selected Industrial processes.
- study the Distributed Control System, its architecture and interfacing.
- Learn about selective Industrial data communication protocols such as HART and field bus communication suitable for an industrial application.

UNIT I DATA NETWORK FUNDAMENTALS 9

UNIT II PLC AND SCADA
9
Evolutions of PLCs – Sequential and Programmable Controllers – Architecture – Comparative study of Industrial PLCS. – SCADA:- Hardware and software, Remote terminal units, Master station, Communication architectures and open SCADA protocols.

UNIT III PLC PROGRAMMING
9
PLC Programming:- Ladder logic , Functional block programming, sequential function chat, Instruction list.

UNIT IV DISTRIBUTED CONTROL SYSTEM
9
DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Displace study of any one DCS available in market - case studies in DCS

UNIT V HART AND FIELD BUS
9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Get familiarised to fundamentals of Data Networks and select Industrial data communication protocols such as HART and field bus communication suitable for an industrial application.
- Acquire knowledge about hardware architecture, software and programming of PLCs.
- Get exposed to Distributed Control System, its architecture and interfacing.

TEXT BOOKS

REFERENCES
1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005
2. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India, New Delhi, 2010

35
OBJECTIVES:
The student should be made to:
- gain knowledge about different types of power plants.
- study about the methods used for measurement of process variables related to thermal power plant.
- learn the different control schemes for boiler and its auxiliary units.
- study the concept of burner management system.
- Understand the different configuration of turbine control system.

UNIT I  OVERVIEW OF POWER GENERATION

UNIT II  MEASUREMENTS IN POWER PLANTS

UNIT III  BOILER CONTROL – I

UNIT IV  BOILER CONTROL – II

UNIT V  CONTROL OF TURBINE
Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge about different types of power plants, measurements involved in thermal power plant.
- understand the different control schemes for boiler, turbine and their auxiliary units.

TEXT BOOKS

REFERENCES
OBJECTIVES:
The student should be made to:
• gain knowledge about the characteristics of CMOS, NMOS and their fabrication.
• learn and design rules and layout for NMOS and CMOS.
• understand FPGA, CPLD and their architectures.
• Study about the principle of HDL, its synthesis, validation and verification.
• Gain practical knowledge on VHDL programming of combinational and sequential logic circuits

UNIT I BASIC DEVICE CHARACTERISTICS
NMOS, PMOS, enhancement and depletion mode transistor, MOSFET threshold voltage, linear and saturated operation, standard NMOS and CMOS inverters- switching speed, transistor sizing and power dissipation, noise margin. Pass transistors and Transmission gates. CMOS device fabrication principles, CMOS latch-up. SPICE models and circuit simulation using PSPICE

UNIT II DESIGN RULES AND LAYOUT
Purpose of design rules, NMOS and CMOS design rules and layout, Design of NMOS and CMOS inverters, NAND and NOR gates. Interlayer contacts, butting and buried contacts, stick diagrams, layout of parity generator, multiplexer and adder element. Design and layout of 1 bit shift register cell.

UNIT III FPGA AND CPLDs
Introduction, FPGA Architectures: SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O Introduction to CPLDs. Comparison of FPGAs and CPLDs from Xilinx, Altera and Actel. Introduction to ASIC.

UNIT IV PRINCIPLES OF HDL

UNIT V VHDL PROGRAMMING
VHDL programs of encoder, decoder, multiplexer, adders, shift registers, counters and accumulator. Realizing PID controller in VHDL. Use of VHDL in process control applications.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Gain knowledge about the characteristics and design rules for CMOS, NMOS
• Get exposed to FPGA, CPLD, their architectures and capable of carrying out VHDL programming of combinational and sequential logic circuits
• understand the principle of HDL, its synthesis, validation and verification.
REFERENCES

PTEI8751 INDUSTRIAL DATA NETWORKS L T P C 3 0 0 3
(EEE, E&I)

OBJECTIVES:
The student should be made to:
- gain knowledge on the serial interface standards.
- understand the principle of network architecture and protocol stack.
- study about the characteristics and functions of the individual layers of the protocol stack.
- learn about the wired and wireless communication protocols used in industrial networks.

UNIT I RS – 232 AND RS – 485

UNIT II MODBUS DATA HIGHWAY (PLUS) AND HART PROTOCOLS

UNIT III AS – INTERFACE (AS-i) AND DEVICE NET
AS interfaces: Introduction, Physical layer, Data link layer and Operating characteristics.
Device net: Introduction, Physical layer, Data link layer and Application layer.

UNIT IV PROFIBUS PA/DP/FMS AND FF

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION
Industrial Ethernet: Introduction, 10Mbps Ethernet and 100Mbps Ethernet – Radio and wireless communication: Introduction, Components of radio link, the radio spectrum and frequency allocation and radio modems – Comparison of various industrial networks.

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Gain knowledge on the serial interface standards, network architecture and protocol stack
- Get familiarized with the wired and wireless communication protocols used in industrial networks.

TEXT BOOKS:
2. Buchanan, W., “Computer Buses”, CRC Press, 2000,

REFERENCES:

PTEI8001 ADVANCED CONTROL ENGINEERING LT P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- gain knowledge on the methods of plotting Nyquist chart for multivariable system.
- develop state space models.
- design state feedback control schemes and state observers.
- learn the different types of non-linearities and phase plane analysis.
- understand the different methods of determining the stability of non-linear systems.

UNIT I FREQUENCY DOMAIN DESCRIPTIONS 9
Properties of transfer functions - poles and zeros of transfer function matrices – singular value analysis – Multivariable Nyquist plots.

UNIT II STATE SPACE APPROACH 9

UNIT III STATE FEEDBACK CONTROL AND STATE ESTIMATOR 9
State Feedback – Output Feedback – Pole placement technique – Full order and Reduced Order Observers – Deadbeat Observers – Dead beat Control
UNIT IV  NON-LINEAR SYSTEMS

UNIT V  STABILITY OF NON-LINEAR SYSTEMS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• analyze MIMO systems methods of plotting Nyquist chart for multivariable system.
• analyze the state space models and capable to design state feedback control schemes and state observers.

TEXT BOOKS:

REFERENCE BOOKS:

PTEI8002  APPLIED DIGITAL SIGNAL PROCESSING  L T P C
3 0 0 3

OBJECTIVES :
The student should be made to:
• learn about different random signals and random processes.
• gain knowledge on different methods of spectrum estimation.
• understand the concepts of linear estimation and prediction.
• Know the procedure for design of different types of adaptive filters.
• Mathematically represent transfer function of signals using wavelet transforms and their applications.

UNIT I  DISCRETE TIME RANDOM SIGNALS

UNIT II  SPECTRUM ESTIMATION
UNIT III  LINEAR ESTIMATION AND PREDICTION  9
Forward and Backward linear prediction - Filtering - FIR Wiener filter - Filtering and linear prediction - non-causal and causal IIR Wiener filters - Discrete Kalman filter.

UNIT IV  ADAPTIVE FILTERS  9

UNIT V  WAVELET TRANSFORM  9
Short Time Fourier Transform - Continuous and discrete wavelet transform – Multi-resolution analysis, Application of wavelet transform - Cepstrum and Homomorphic filtering.

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:

1. understand the concept of multirate signal processing and random signal processing

TEXT BOOKS:

REFERENCES:

PTEI8003  APPLIED SOFT COMPUTING  L T P C  3 0 0 3

OBJECTIVES:
The student should be made to:

1. study the fundamentals of Neural networks and their architecture.
2. gain knowledge on the applications of Neural networks for modelling and control.
3. Get introduced to the concept of fuzzy set theory.
4. Understand Fuzzy logic theory for modelling and control.
5. Develop hybrid control Schemes and apply optimization algorithms.

UNIT I  ARTIFICIAL NEURAL NETWORK  9
UNIT II  NEURAL NETWORKS FOR MODELING AND CONTROL  
Modeling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox

UNIT III  FUZZY SET THEORY  
Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions

UNIT IV  FUZZY LOGIC FOR MODELING AND CONTROL  

UNIT V  HYBRID CONTROL SCHEMES  

TOTAL : 45 PERIODS

OUTCOMES:  
At the end of the course, the student should be able to:  
- understand the different ANN architecture and concept of Fuzzy Logic theory and their applications in modeling and control  
- Get familiarity with hybrid control Schemes and selected optimization algorithms.

TEXTBOOKS  

REFERENCE BOOKS  
OBJECTIVES:
The student should be made to:

- study about the transmission characteristics of light and principles of TRI in optical fibers.
- Understand about the types of optical fibres and its applications for the measurement of pressure, temperature, level and strain etc.
- Know about the fundamentals of laser system, its mode of operation and their classifications.
- learn the applications of laser for measurement of distance, velocity etc and material processing.
- understand the principles of Holography, its application in NDT and the use of laser in biomedical application.

UNIT I   OPTICAL FIBRES AND THEIR PROPERTIES
Principles of light propagation through a fibre - Different types of fibers and their properties, Fibre manufacture -- mechanical and transmission characteristics -- Connectors & splicers -- Fibre termination -- Optical sources -- Optical detectors.

UNIT II   INDUSTRIAL APPLICATION OF OPTICAL FIBRES
Fibre optic sensors -- Fibre optic instrumentation system for measurement of fibre characteristics -- Different types of modulators -- Interferometric method for measurement of length -- Moire fringes -- Measurement of pressure, temperature, current, voltage, liquid level and strain -- fiber optic gyroscope -- Polarization Maintaining fibers.

UNIT III  LASER FUNDAMENTALS
Fundamental characteristics of lasers -- Three level and four level lasers -- Properties of laser -- Laser modes -- Resonator configuration -- Q-switching and mode locking -- Cavity damping -- Types of lasers -- Gas lasers, solid lasers, liquid lasers, semiconductor lasers,Excimer lasers,VCSEL.

UNIT IV   INDUSTRIAL APPLICATION OF LASERS
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect -- Material processing -- Laser heating, welding, melting and trimming of material -- Material Removal and vaporization.

UNIT V   HOLOGRAM AND MEDICAL APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:

- understand the types of optical fibres and its application as fiber optic sensors
- Get familiarized on the applications of laser for measurement of distance, velocity, material processing, NDT and biomedical applications.
REFERENCE BOOKS:

PTEI8005  FUNDAMENTALS OF DIGITAL IMAGE PROCESSING    L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- learn and understand the fundamentals of digital image.
- gain knowledge on how images are enhanced to improve subjective perception.
- understand image restoration techniques.
- gain knowledge on image segmentation.
- study the principle of image compression.

UNIT I  DIGITAL IMAGE FUNDAMENTALS
Elements of digital image processing systems - Vidicon and Digital Camera working principles - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect - Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II  IMAGE ENHANCEMENT
Histogram equalization and specification techniques - Noise distributions - Spatial averaging - Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters - Homomorphic filtering - Color image enhancement.

UNIT III  IMAGE RESTORATION

UNIT IV  IMAGE SEGMENTATION
Edge detection - Edge linking via Hough transform - Thresholding - Region based segmentation - Region growing - Region splitting and Merging - Segmentation by morphological watersheds - basic concepts - Dam construction - Watershed segmentation algorithm.

UNIT V  IMAGE COMPRESSION
Need for data compression - Huffman, Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Transform coding - JPEG standard - MPEG.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Gain knowledge about how image are enhanced to improve subjective perception.
• understand the image restoration techniques.
• Gain knowledge on image segmentation and compression.

TEXT BOOKS:

REFERENCES:

PTEI8006 FUNDAMENTALS OF NANOSCIENCE AND MEMS

OBJECTIVES:
The student should be made to:
• learn about nano science technology and its engineering applications.
• gain knowledge on different micro fabrication methods
• learn the concept of patterning and lithography for nano scale devices
• know about environmental requirements for nano fabrication facilities
• understand different techniques for nano scale characterisation

UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.
UNIT V  CHARACTERISATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge on different micro fabrication methods and get exposed to patterning and lithography for nano scale devices
- understand different techniques for nano scale characterisation

TEXT BOOKS

REFERENCES

PTEI8007  INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- understand the different oil recovery methods, oil gas separation and its processing. learn about the most important unit operations in petrochemical industries like cracking, reforming etc.
- gain knowledge on the important derivatives obtained from petroleum and its uses.
- Know about the most important variables to be monitored and measured in petrochemical industry and steps followed for ensuring intrinsic safety.
- study about the different control schemes applied to processes like distillation column, PVC production unit, cracking and reforming.

UNIT I  OIL EXTRACTION AND PROCESSING
Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system - Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil - control loops in oil gas separator - scrubber - coalescer

UNIT II  PETROLEUM REFINING
Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum
UNIT III  CHEMICALS FROM PETROLEUM  9
Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC

UNIT IV  CONTROL LOOPS IN PETROCHEMICAL INDUSTRY  9
Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production

UNIT V  SAFETY IN INSTRUMENTATION SYSTEMS  9
Area and material classification as per National Electric Code (NEC) - Classification as per International Electrotechnical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the oil recovery methods, oil gas separation and the important derivatives obtained from petroleum and its uses.
• gain knowledge on the most important variables to be monitored, measured and controlled on selected unit operations in petrochemical industry

TEXT BOOKS:

REFERENCES:

PTEI8008  OPTIMIZATION TECHNIQUES  L T PC
3 0 0 3

OBJECTIVES :
The student should be made to:
• learn the procedure to numerically solve different classes of optimization algorithms using appropriate optimization techniques (Linear, Non linear and dynamic)
• understand procedure to select appropriate optimization algorithms for a given application
• gain knowledge about genetic Algorithms and its application in process control and instrumentation.

UNIT I  INTRODUCTION  9
Historical Development, Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems.– Case studies
UNIT II    LINEAR PROGRAMMING  9
Graphical method, Simplex method, Revised simplex method, Duality in linear
programming (LP), Transportation, assignment and other applications.

UNIT III    NON LINEAR PROGRAMMING  9
Unconstrained optimization techniques, Direct search methods, Descent methods,
Constrained optimization, Direct and indirect methods, Optimization with calculus, Khun-
Tucker conditions.

UNIT IV    DYNAMIC PROGRAMMING  9
Introduction, Sequential optimization, computational procedure, curse of dimensionality,
Applications in Control Engineering

UNIT V    ADVANCED TECHNIQUES OF OPTIMIZATION  9
Introduction- Genetic algorithms for optimization and search – Multi-objective evolutionary
optimization- The role Pareto-optimal problems in engineering design and their solution
strategies based upon Genetic Algorithms – Usage in process control- Particle Swarm
Optimization

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• solve numerically different classes of optimization algorithms using appropriate
  optimization techniques (Linear, Non linear and dynamic) and able to select
  appropriate optimization algorithms for a given application

TEXT BOOK :

REFERENCE BOOKS:

PTEI8009    POWER ELECTRONICS DEVICES AND CIRCUIT    L T P C
3 0 0 3

OBJECTIVES :
The student should be made to:
• understand the operation of controlled rectifiers, choppers, inverters and their applications.
• learn the principle of step up and step down choppers
• study about voltage source inverter, current source inverter and PWM.
• Gain knowledge about the applications of power semiconductor devices for the speed control of AC and DC motors.
UNIT I  POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS  

UNIT II  CONTROLLED RECTIFIERS  

UNIT III  CHOPPERS  
Step up and Step down Chopper – Chopper classification - quadrant of operation – Switching mode Regulators - Buck, Boost, Buck-Boost, and Cuk Regulators.

UNIT IV  INVERTERS  

UNIT V  APPLICATION  
Introduction to D.C and A.C drives – Electrical breaking - Open loop and Closed loop control of drives (Block diagram approach only) – Principle of vector control of AC drives - Stepper motor drives - Switched mode power supply - Introduction to HVDC and FACTS - Static VAR compensators.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the operation of controlled rectifiers, choppers, inverters and their applications and gain knowledge in selection of power semiconductor devices for the speed control of AC and DC motors.

TEXT BOOKS:

REFERENCE BOOKS:
OBJECTIVES:
The student should be made to:
- gain knowledge on the selection of processor and software for embedded applications
- learn about the serial and parallel communication protocols.
- understand interrupt service mechanism and device drivers
- know the procedure to design RTOS based embedded system
- acquire knowledge on selected embedded system applications.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS
Build process for embedded systems - Structural units in Embedded processor, selection of processor & memory devices - DMA – memory mapping - Timer and Counting devices, Watchdog Timer, Real Time Clock - Software Embedded in a system - IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging, Boundary Scan.

UNIT II EMBEDDED NETWORKING

UNIT III DEVICE DRIVERS AND INTERRUPTS SERVICE MECHANISM
PROGRAMMED - I/O busy-wait approach without interrupt service mechanism - ISR concept - interrupt service mechanism – multiple interrupts – context and periods for context switching, interrupt latency and deadline – Device Driver – Introduction to Basic Concept of Parallel port & Serial port Device Drivers.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing - Interprocess Communication – synchronization between processes - semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: VxWorks, µC/OS-II, RT Linux

UNIT V EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT
Case Study of Washing Machine- Automotive Application – RFID - System, Application, Tag, Reader - Embedded Product Development Life Cycle, Objective, Need, different Phases & Modelling of the EDLC

OUTCOMES:
At the end of the course, the student should be able to:
- Gain knowledge on selection of processor and software for embedded applications and get exposed to serial and parallel communication protocols.
- design RTOS based embedded system
**TEXT BOOKS:**

**REFERENCES:**

**PTEI8011**  
**REAL TIME OPERATING SYSTEMS**  
**LT P C**  
**3 0 0 3**

**OBJECTIVES:**
The student should be made to:
- study the concepts of embedded programming and its implementation using C, C++
- learn the services provided by real time Operating systems.
- know about inter task communication and synchronization.
- understand Micro COS-11 and Vx works and its supported system level functions.
- learn the concept of RTOS using typical case studies.

**UNIT I**  
**CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++**  
10


**UNIT II**  
**REAL TIME OPERATING SYSTEMS– PART - 1**  
11


**UNIT III**  
**COMMUNICATION AND SYNCHRONISATION**  
8

Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).

**UNIT IV**  
**REAL TIME OPERATING SYSTEMS – PART - 2**  
9

Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level
Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions –

UNIT V CASE STUDIES

Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks and their functions – Creating a list of tasks – Functions and IPCs – Exemplary Coding Steps.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the concepts of embedded programming and its implementation using C,C++ and get exposed to Micro COS-11 and Vx works and its supported system level functions.
- Understand the concept of RTOS using typical case studies.

TEXT BOOKS


REFERENCES


PTEI8012 ROBOTICS AND AUTOMATION

OBJECTIVES :
The student should be made to:
- To study and understand the evolution of robot technology and their classification.
- To introduce the methodology for mathematical representation of different types of robots.
- To acquire knowledge on construction of manipulators and their types.
- To learn the procedure for carrying out kinematics and path learning techniques.
- To expose knowledge on the case studies and design of robot machine interface.

UNIT I BASIC CONCEPTS

Brief history -Types of Robot – Technology - Robot classifications and specifications - Design and control issues- Various manipulators – Sensors - work cell - Programming languages

UNIT II DIRECT AND INVERSE KINEMATICS

Mathematical representation of Robots - Position and orientation - Homogeneous transformation - Various joints - Representation using the Denavit Hattenberg parameters - Degrees of freedom - Direct kinematics - Inverse kinematics - PUMA 560 & SCARA robots-Solvability - Solution methods-Closed form solution
UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS
Linear and angular velocities - Manipulator Jacobian - Prismatic and rotary joints – Inverse
-Wrist and arm singularity - Static analysis - Force and moment Balance

UNIT IV PATH PLANNING
Definition - Joint space technique - Use of p-degree polynomial - Cubic polynomial -
Cartesian space technique - Parametric descriptions - Straight line and circular paths -
Position and orientation planning

UNIT V DYNAMICS AND CONTROL
Lagrangian mechanics - 2 DOF Manipulator - Lagrange Euler formulation - Dynamic
model -Manipulator control problem - Linear control schemes - PID control scheme - Force
control of robotic manipulator

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the evolution of robot technology and mathematically represent different
types of robot.
• Get exposed to the case studies and design of robot machine interface.

TEXTBOOKS
Reprint, 2005
Education, 2009

REFERENCES
1. Ashitava Ghoshal, Robotics - Fundamental Concepts and Analysis’, Oxford University
Press, Sixth impression, 2010
4. R. D. Klafter, T. A. Chimielewski and M. Negin, Robotic Engineering – An Integrated
Approach, Prentice Hall of India, New Delhi, 1994
Hill Singapore, 1996
6. B.K. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied
Publishers, Chennai, 1998
OBJECTIVES:
The student should be made to:
• understand non parametric methods of system identification
• gain knowledge about different types of parametric estimation methods such as prediction error and instrumental variable methods.
• Learn about the recursive identification methods and their applications
• Know the design procedure of adaptive control schemes for linear and non linear systems
• explore the case studies on adaptive control system

UNIT I  NON PARAMETRIC METHODS  9
Nonparametric methods : - Transient analysis – frequency analysis – Correlation analysis – Spectral analysis.

UNIT II  PARAMETER ESTIMATION METHODS  9

UNIT III  RECURSIVE IDENTIFICATION METHODS  9
The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identifiability considerations – direct identification – indirect identification

UNIT IV  ADAPTIVE CONTROL SCHEMES  9

UNIT V  ISSUES IN ADAPTIVE CONTROL AND APPLICATIONS  9
Stability – Convergence – Robustness – Application of adaptive control
TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand parametric and non parametric methods of system identification
• design appropriate adaptive control schemes for linear and non linear systems and get exposed to case studies of adaptive control system

TEXT BOOKS:
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OBJECTIVES:
The student should be made to:
- study the unit operations involved for transportation, mixing and separation.
- Understand the basic operations involved with heat exchangers, evaporators and crystallisers.
- gain knowledge on the operation of dryers, distillation column, refrigerators and chemical reactors.
- study about the different unit operations involved in paper and pulp, steel industry, thermal power plant, pharmaceutical and leather industries

UNIT I  UNIT OPERATIONS
Unit operations - transport of liquids, solids and gases adjusting particle size of bulk solids – mixing processes – separation processes.

UNIT II  COMBUSTION PROCESSES

UNIT III  OTHER OPERATIONS
Drying – distillation – refrigeration process – chemical reactions.

UNIT IV  CASE STUDY – I
Operations in the manufacture of paper and pulp – operations in steel industry.

UNIT V  CASE STUDY – II
Operations in thermal power plant – operations in pharmaceutical industry and leather industry.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge of unit operation involved for transportation mixing and separation, heat exchangers, evaporators, crystallizers etc.
- Gain knowledge on unit operations involved in paper & pulp, steel, thermal power plant, pharmaceutical and leather industry
OBJECTIVES:
The student should be made to:
- gain knowledge about basic concepts in Virtual Instrumentation and its related software.
- understand the concepts of Data acquisition, Timers and Counters for carrying out real time projects.
- study about the different communication networked modules
- know the procedure and implementation of modelling and control of real time processes in LabVIEW Platform.
- learn PC based digital storage oscilloscope, spectrum analyser, distributed monitoring and control devices.

UNIT I   INTRODUCTION
Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II   VI PROGRAMMING TECHNIQUES
VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT III   DATA ACQUISITION
Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements – Issues involved in selection of Data acquisition cards – Data acquisition cards with serial communication - VI Chassis requirements. SCSI, PCI, PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT IV   VI TOOLSETS
Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, windowing and filtering. Application of VI in process control designing of equipments like
UNIT V  APPLICATIONS  9
Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Gain knowledge about basic concepts in Virtual Instrumentation and ability to design and implement process.
• Get exposed to PC based digital storage oscilloscope, spectrum analyser, distributed monitoring and control devices.

TEXTBOOKS:

REFERENCE:

PTGE8071  DISASTER MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
• To provide students an exposure to disasters, their significance and types.
• To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
• To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
• To enhance awareness of institutional processes in the country and
• To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I  INTRODUCTION TO DISASTERS  9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global
trends in disasters: urban disasters, pandemics, complex emergencies, Climate change-
Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness
community based DRR, Structural- nonstructural measures, Roles and responsibilities of-
community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre,
and other stake-holders- Institutional Processess and Framework at State and Central
Level- State Disaster Management Authority(SDMA) – Early Warning System –
Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND
DEVELOPMENT 9
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such
as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC
Scenario and Scenarios in the context of India - Relevance of indigenous knowledge,
appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food,
Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation,
Response and Preparedness, Disaster Management Act and Policy - Other related
policies, plans, programmes and legislation – Role of GIS and Information Technology
Components in Preparedness, Risk Assessment, Response and Recovery Phases of
Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND
FIELD WORKS 9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of
Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal
Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies;
Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for
Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and
  society
- Assess vulnerability and various methods of risk reduction measures as well as
  mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context,
  Disaster damage assessment and management.

TEXTBOOKS:
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk
Management, NIDM, New Delhi, 2011
OBJECTIVES:
• To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOMES:
• Engineering students will acquire the basic knowledge of human rights.

REFERENCES: