RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Instrumentation Engineering, IV-Semester

BE-3001 Energy, Environment, Ecology & Society

Unit –I
Energy-   Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

Unit –II
Ecosystem –   Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation,

Unit –III
Air Pollution & Sound Pollution -
Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain.
Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

Unit –IV
Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.
Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

Unit –V
Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3.Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6 BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunninghan WP and MA; principles of Environment Sc; TMH
11. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, Ane Books , Pvt.
    Ltd, New   Delhi
12. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.
13. Gour R.R, Sangal, R &Bagaria, G.P. , Excel Books, A-45, Naraina Phase-I
    New Delhi.-110028

Electronics & Instrumentation Engineering, IV-Semester

EI-4002 Analog Electronics

Low frequency analysis of RC coupled amplifiers, effect of coupling and bypass Amplifier at high frequencies, Hybrid-π model equivalent circuit in CE configuration, f_α, f_β, f_T parameter, High frequency response of single/two stage amplifiers using BJT & FET. Gain-band width product. Effect of cascading on gain & bandwidth, Transformer coupled and Direct coupled amplifier.

Feedback Amplifier: General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers. Oscillators: Principle of oscillation, Barkhausen stability criterion, Audio frequency oscillator: Phase shift & Wien bridge oscillators, RF Oscillator: Colpitts & Hartley, Crystal Oscillator..

Operational amplifiers: Differential Amplifiers, swamping resistor, Constant current source and current mirror circuit, Equivalent circuit of Op-amp, Virtual ground, Offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, PSRR, Slew rate, frequency response of Op-Amp, Study of Op-amp ICs like 741,324,308 etc., Linear and non-linear application of Op-amp, Integrator, Differentiator, Log& antilog amplifiers, Precision rectifier, comparators, Schmitt trigger , Sample & hold circuit, Instrumentation amplifiers.

Tuned RF voltage amplifiers: Single and double tuned amplifiers, Gain and bandwidth calculations, frequency response of under coupled, critically and over coupled circuits, Introduction to RFICs, Power supplies: Review of regulators using Zener diodes, series and shunt regulators, Over current protection using current limiting fold back and crowbar protection, Regulators using ICs,

Multivibrators circuit using BJT and Op-amp, Emitter coupled binary circuit, 555 – Timer IC, application, Square wave and Triangular wave and Sawtooth wave generators, Linear Wave shaping circuits, RC high pass & low pass circuit, Effect of Tilt or sage

TEXT BOOKS
1. Robert Boylsted Electronic devices and Circuits, PHI
2. Sedra & Smith L, Electronic circuits, McGraw Hill.
3. D Choudhury Roy, Linear Integrated Circuits, New Age International

REFERENCE BOOKS
1. John D. Ryder, Electronics fundamentals & Applications, PHI
2. Milliman and Grabel, Microelectronics, TMH
3. Johns and Martin, Analog Integrate Circuits design, Wiely.
4. Milliman& Halkias Integrated Electronics, McGraw Hill
5. Gayakwad R.A OpAmp 7 Linear Integrated Circuits, PHI

List of Experiments
1. Study of RC coupled CE amplifier and plot its frequency response.
2. Study of RC phase shift Oscillator and measure its frequency response.
3. Study of inverting and Non-inverting amplifier using OP-AMP 741/LM324.
4. Study of integrator and Differentiator using OP-AMP 741/LM324.
5. Study of instrumentation amplifier using OP-AMP 741/LM324.
6. Study of voltage regulator using IC723 and find its line and load regulation.
7. Study of Astable multivibrator using IC555 and measure its Duty cycle.
8. Study of high pass and low pass filter and measure its cut-off frequency.
9. Study of ALL-pass filter and calculate phase shift of it.

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Credit Based Grading System

Electronics & Instrumentation Engineering, IV-Semester

EI-4003 Sensors and Transducers

Role of transducers in instrumentation- Transducers construction, classification and characteristics. Principles of operation and characteristics, interfacing of transducers and signal conditioning

Transducers for measurement of displacement, strain, velocity, acceleration etc. Potentiometer, LVDT, Strain gauge, capacitance gauge, piezoelectric transducers and accelerometers.

Force and pressure measurement:

Force: Standards and Calibration, Basic methods of force measurement (Spring, beam, diaphragm) Strain gauge: basic principal, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor.

Pressure: Standards and calibration Units and relations.

Positive Pressure Sensors:

Manometers – U tube, Well type, inclined tube, Ring balance, Micro manometer, use of seal pots, range of measurement

Elastic – Bourdon, Diaphragm, Bellows and their types, materials and their properties, range of measurement

Electronic – LVDT, Strain gauge, Capacitive, Piezoelectric, Thin film, Variable reluctance, Vibrating element (Diaphragm and Wire),

High Pressure Measurement – Bulk modulus cell, Bridgeman type

Differential Pressure Measurement: Force balance, Motion balance, Capacitance delta cell, Ring balance DP cell.

Vacuum measurement

McLeod gauge, Thermal Conductivity (Pirani, Thermocouple), hot cathode ionization gauge, Molecular momentum (Knudsen) gauge, Cold Cathode ionization (Penning) gauge.

Calibrating Instruments – Dead Weight Tester (Pressure, Vacuum).

Temperature measurement:

Temperature Scales, Standards and Units and relations, Classification of temperature sensors.

Mechanical: Bimetallic Thermometer – Working Principle, Various types, Filled system thermometers – SAMA classifications, Sources of errors and their remedies, Dip effect.

Electrical: Resistance Temperature Detectors – Principle, materials and their properties, Types and ranges, different sources of errors and compensations.

Thermistor: Types (NTC, PTC), Measuring Circuits

Thermocouple: Terminology, Types (B, E, J, K, R, S, T), determination of polarity, Characteristics, Laws of thermoelectricity, Study of thermocouple tables (calculation of intermediate temperature and voltage), Lead wire compensation, Cold junction compensation techniques, Protection (Thermo well), EMF Measurement methods, Thermopiles

Non-contact Types: Pyrometers: Total Optical, Infrared.

Transducers for measurement of flow and level. Turbo magnetic, Electromagnetic and other flow meters. Various methods of level measurements, Ultrasonic level gauge. Measurement of humidity and moisture. Various sensors employed in instrumentation, introduction to MEMS, wireless sensors, finger print sensors.

Text Books:
   1. Nakra B.C. & Choudhory K.K., Instrumentation, Measurement & Analysis, TMH.
Reference Books:
   1. Patranabis D., Principles of Industrial Instrumentation. TMH.
   2. Murthy, Transducers.

List of Experiments:-
   1. Study and characteristics of various active & passive transducers
   2. Study and characteristics of LVDT & to measure the displacement using LVDT
   3. Study of strain gauge & determine its characteristics & gauge factor.
   4. Study and characteristics of Thermistor ,thermocouple &IC temperature sensor for measurement of temperat
   5. Study of potentiometer and draw its characteristics.
   6. Study of capacitive transducer and determine its characteristics.
   7. Study of resistive transducer and determine its characteristics.
   8. Study of Inductive transducer and determine its characteristics
   9. Study LDR, photodiode & LED and other optical sensor and determine the characteristics.

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Electronics & Instrumentation Engineering, IV-Semester

EI-4004 Digital Electronics

Minimization Techniques And Logic Gates
Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem -Principle of Duality - Boolean expression - Minimization of Boolean expressions-Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.
Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NORImplementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

Combinational Circuits
Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

Sequential Circuits
Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation–Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers– Shift register counters – Ring counter – Shift counters - Sequence generators.

Memory Devices
Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation. Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell. Implementation of combinational logic circuits using ROM, PLA, PAL.

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine.
Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits.

TEXT BOOKS RECOMMENDED:
1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 /
2. Pearson Education (Singapore) Pvt. Ltd., New Delhi.
3. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design.

REFERENCE BOOKS:
1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI
2. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications.
3. William H. Gothmann, Digital Electronics.

List of Experiments:

1. Study of various basic gates(IC 7400,7402,7404,7486,7408 etc.) & to verify its truth table.
2. Verify the operation of NAND and NOR gates as universal gates.
3. Study of half and full adder / half and full subtractor & verify its truth table.
4. Study of 4:1 and 8:1 MUX and verify its truth table.
5. Study of 2x4 and 4x8 DEMUX and verify its truth table.
6. Verify truth table of SR, JK, T and D flip-flops using IC 7473, IC 7474 and IC7476.
7. Study the decade counter using IC7490 and verify its operation using truth table.
8. Study the 4-bit ripple counter using IC7493 and verify its operation. Plot the waveform at output of each flip-
9. Study of RAM, ROM, PROM, and EPROM and determine their parameters.
10. Study of Mealy and Moore machine and to design state diagram and state table.

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Electronics & Instrumentation Engineering, IV-Semester

EI-4005 DATA STRUCTURES

COURSE CONTENT:

Basic Concept : Data Structure and algorithm preliminaries: Definitions; Data types, Time and Space analysis of Algorithms; Time and space trade-off, Pointers and dynamic memory allocation; Recursion.

Arrays and Structure: Concepts of Linear Search, Binary Search, Evaluation of Polynomial, Polynomial representation, Polynomial Addition, Structures: Internal representation of structure, Self–referential structure, Array: Definitions of Arrays and Lists, Strings, Row/Column major representation of Arrays.

Stack and Queues: Introduction to Stack, Static and Dynamic Representation, Operation, Application of Stack, Evaluation of Expression, postfix expression, Infix, prefix, Queue, Static and Dynamic Representation, Operation, Priority Queue, Circular Queue.

Linked List and Trees: Introduction to Linked List: Singly linked list, circular linked list, doubly linked list, operations on linked list, Introduction to Tree: Definition, Terminology, Generalised tree representation, Binary tree definitions and properties, Representation, Binary Tree Traversal In order, Pre order, Post order, Introduction to Binary Search Tree.

Graphs; Searching & Sorting: Introduction to Graphs: Representation, Adjacency Matrix and List, Indegree, out degree of Graph, Graphs Operation, DFS & BFS, Spanning Tree, Shortest path. Searching and Sorting Methods: Various Searching and Sorting algorithms with complexity analysis.

REFERENCES

1. E Balagurusamy, **Data Structures Using C**, Tata McGraw Hill Education
2. N.K. Tiwari, Jitendra Agrawal, Shishir K. Shandilya, **Data Structures**, I K International Publishing House
3. Achuthsankar S. Nair & T. Mahalekshmi, **Data Structures in C**, PHI
4. R. Venkatesan & S. Lovelyn Rose, **Data Structures**, Wiley India
5. Rajesh K. Shukla, **Data Structures Using C & C++,** Wiley India
6. Langsam, Augenstein & Tenenbaum, **Data Structures Using C & C++,** Pearson
7. Dharmender Singh Kushwaha & Arun Kumar Mishra **Data Structures: A Programming Approach with C**, PHI

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Electronics & Instrumentation Engineering, IV-Semester

EI-4006 Computer Programming-II (Software Tools)

List of Experiments

1. Study of SPICE commands and Simulate basic analog circuits using SPICE tools.
2. Write SPICE programme for half and Full wave rectifier and simulate using SPICE simulator.
3. Write SPICE programme for Clipper and Clamper and Simulate using SPICE simulator.
4. Write SPICE programme for CE amplifier and Simulate using SPICE simulator.
5. Study of XILINX tool flow and simulate basic digital circuits using VHDL.
6. Write basic VHDL code for MUX/DEMUX and simulate using XILINX simulator.
7. Write VHDL code for Synchronous counter and simulate it.
8. Study of MATLAB tool and implement basic electronics circuits.