BEA- 401 Energy Ecology Environment and Society

UNIT –I

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

UNIT –II

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

UNIT –III

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.

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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. Gandhiji M.K.- My experiments with truth

ECA- 402 Digital Electronics

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and DeMorgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT-II

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.

UNIT-III

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulsetrain generator, Pseudo Random Binary Sequence generator, Clock generation.

UNIT-IV

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

UNIT-V

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL ,Data type sand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

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

ECA-403 Signals and System

UNIT-I

Signals and systems as seen in everydaylife, and in various branches of engineering and science.Energy and power signals, continuous and discrete time signals, continuous and discreteamplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

UNIT-II

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, inputoutputbehavior with aperiodic convergent inputs. Characterization of causality and stability oflinear shift-invariant systems. System representation through differential equations anddifference equations.

UNIT-III

Periodic and semi-periodic inputs to an LSI system, the notion of a frequencyresponse and itsrelation to the impulse response, Fourier series representation, the Fourier Transform,convolution/multiplication and their effect in the frequency domain, magnitude and phaseresponse, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and theDiscrete Fourier Transform (DFT). Parseval'sTheorem.The idea of signal space and orthogonal Bases.

UNIT-IV

The Laplace Transform, notion ofeigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution todifferential equations and system behavior.The z-Transform for discrete time signals and systems- eigen functions, region of convergence,z-domain analysis.

UNIT-V

State-space analysis and multi-input, multi-output representation. The state-transition matrix andits role. The Sampling Theorem and its implications- Spectra of sampled signals.Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and itseffects. Relation between continuous and discrete time systems.

Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and

Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.

List of Experiments :-

1. Demonstration of diff. Signals and their properties.
2. Demonstration of sampling /reconstruction of signals and spectral analysis using dft.
3. Analysis of Fourier properties of signals.
4. Convolution and correlation of signals.
5. Demonstration of salient properties of signals.

ECA- 404 Analog Communication

UNIT-I

Review of signals and systems, Frequency domain representation of signals, Principles ofAmplitudeModulation Systems- DSB, SSB and VSB modulations. Angle Modulation,Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

UNIT-II

Review of probability and random process. Gaussian and white noise characteristics,Noise inamplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.

UNIT-III

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

UNIT-IV

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

UNIT-V

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Reference Books:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

List of Experiments: -

1.Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters.

2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters .

3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.

4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.

5. To Construct Frequency Multiplier Circuit and to Observe the Waveform

6. Study of AVC and AFC.

7. Study of PLL chip (566) and its use in various systems.

ECA- 405 Electronic Instrumentation

UNIT-I

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysterisis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC VoltmeterChopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

UNIT-II

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROsMulti input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

UNIT-III

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter. Non-Electrical Quantities (Transducer): Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

UNIT-IV

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

UNIT-V

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion (ADC) -Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References:

1. H. S. Kalsi: Electronics Instrumentation, TMH.

2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.

3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

List of Experiments:-

1. Study of CRO and Function Generator.

2. Displacement measurement by LVDT.

3. Force measurement by strain gauge.

4. Measurement of Capacitor, Self-induction using Q-meter.

5. Temperature measurement by thermistor, RTD and thermocouple.

6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor

7. Design of digital to analog converter.

8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)

ECA- 406 Simulation Lab-II

ADVANCED SIMULATION/ VERIFICATION SOFTWARE Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc)

Overview and Study of the key features and applications of the software.

Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication. Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).

2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc)

3. Realization of various signals and communication link etc.

Students should simulate and verify at least six circuits they are learning in the current semester.

ECA- 407- Industrial Training – I

The Industrial Training– I should be the outcome of the training done/performed during semester break of 4^{th} semester .It should be submitted in hardware form (proto type)or simulation form along with proper data and certificates issued during project training. It should cover the electrical engineering aspects learned during training. A Power point presentation should also be submitted at the time of submission.

To be completed during fourth semester break. Its evaluation/credit to be added in fifth semester