Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES301	**Energy & Environmental Engineering**	**3L-1T-0P**	**4 Credits**

The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

- Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

***Module2*: Ecosystems**

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

***Module 3*: Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

***Module 4:* Environmental Pollution**

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

***Module 5:* Social Issues and the Environment**

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Instrumentation Engineering, III-Semester

EI302 Signals and Systems

CLASSIFICATION OF SIGNALS & SYSTEMS

Continuous-Time and Discrete-Time Signals- Unit Impulse, Unit Step, Ramp, Exponential & Sinusoidal Signals. Periodic & aperiodic signals, Deterministic and random signals, Energy and Power signals. Continuous-Time and Discrete-Time Systems. Classification, Static & dynamic, Linear and non-linear, Causal and non-causal, Time variant and invariant, Continuous-Time LTI Systems: The Convolution Integral. Discrete-Time LTI Systems: The Convolution Sum.

ANALYSIS OF CONTINUOUS & DISCRETE TIME SIGNALS

Fourier series Representation of Continuous-Time Periodic Signals, Properties, Continuous-Time Fourier Transform (CTFT), The Fourier Transform for Periodic Signals, Properties of the CTFT, Duality, Sinc and signum function, Sampling Theorem, Aliasing, Discrete Time Fourier series Properties, Discrete-Time Fourier Transform (DTFT). Properties of the DTFT. Parseval's Theorem, Central ordinate theorem.

LAPLACE TRANSFORM

Definition, Region of Convergence, Inverse Laplace Transform, Properties, Analysis and Characterization of LTI Systems Using the Laplace Transform, The Unilateral Laplace Transform, Casualty and stability in continuous time LTI system, System realization through Block-diagram representation and system interconnection, State variable analysis, State space Models, Solution of State equation, The state-transition matrix, Concept of Controllability and Observability.

Z-TRANSFORM

Definition, Region of Convergence. Inverse z-Transform. Properties, Some Common z-Transform Pairs. Analysis and Characterization of LTI Systems Using z-Transforms. System Function Algebra and Block Diagram Representations. The Unilateral z-Transforms. Casualty and stability in continuous time LTI system, Group delay, Phase delay.

RANDOM VARIABLES & RANDOM PROCESS

Sets and Sample Spaces Random Variables Continuous and Discrete, Cumulative distribution Function (CDF), Probability Density Function (PDF), Expectation and Moments, Types of Random Processes, Ergodicity, Auto-correlation Function (ACF) & Cross correlation Function (CCF), Power Spectral Density, Wiener–Khinchin–Einstein theorem, Central limit theorem, Transmission of a random process through a Linear Filter. Central Limit Theorem, Mixing of a Random process with sinusoidal process.

TEXT BOOKS

1. Allen. V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
3. Venkatarama Krishnan, "Probability and Random Processes", ohn Wiley & Sons, 2006

REFERENCE BOOKS

1. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
2. S. Palaniammal, "Probability and Random Processes", PHI Learning, 2012

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Electronics & Instrumentation Engineering, III-Semester

EI303 Electronic Devices and Circuits

Basics of semiconductor devices

Intrinsic & Extrinsic semiconductors, Mobility and Conductivity, Hall effect, E-K diagram, Current Densities, Diffusion, Generation & Recombination of electron-hole pair, Continuity equation, Conductivity Modulation, Mass-action Law, Injected Minority Carrier Charge, p-n junction diode, V-I characteristics & their temperature dependence, Diode resistances, and capacitance, Breakdown diodes, Photodiodes, LEDs, Varacter Diode, Schottky Diode, Tunnel Diode,

Diode and Transistor circuits

Clippers, Clampers, Clamping theorem, Rectifiers & filters, Model of diode, Bipolar junction transistor (BJT), Potential profile in PNP & NPN structures, Current components, Configurations, Early Effect, Eber's Moll Model, Transistor as an amplifier, Biasing & Thermal Stabilization, The Q point stability, Stabilization against variation of I_{CO}, V_{BE} & β, Bias compensation, Millers theorem and its dual, Thermal runway, Schottky and Photo-transistors.

BJT Modelling and Introduction to FET

Hybrid model, Simplified model, Common emitter with emitter resistor, high i/p impedance circuits, Emitter follower, comparison of CB, CE, CC configuration, Darlington pair, Bootstrapping, Cascode Amplifier, Field effect transistors(FET), JFET, pinch off, V-I Characteristics, Small signal model, MOSFET, Derivation for drain current I_D for E-MOSFET, Threshold voltage and body effect, CS & CD amplifiers, Biasing techniques, FET as VDR,

MOS Structure and Short channel effect theory

Band diagram for a MOS junction under accumulation, Depletion & inversion, MOS capacitor, C-V of an ideal & non- ideal capacitors, Characterization of MOS capacitors, MOS field effect transistor (MOSFET) V-I characteristics in three regions of operation & equivalent circuit. Short channel MOSFET: Effect of scaling of MOSFET, Short & narrow channel effects on V-I characteristics, Hot electron effect in MOSFET.

Silicon Processing and Introduction to Power electronic devices

Silicon Planar technology, Oxidation, Diffusion, Metallization, Ion-Implantation & chemical vapor deposition, Lithographic process, Typical Bipolar & MOS IC process sequence, Silicon controlled Rectifier, Holding and Latching current, di/dt triggering and other triggering methods & Unijunction Transistor (UJT) and UJT relaxation oscillator.

Text Books Recommended:

1. Jacob Millman & Christos C. Halkias Electronic Devices & Circuits McGraw-Hill 1967.
2. Robert L. Boylestad, Electronic devices and Circuits, PHI.
3. Ben G. Streetman, Solid State Electronics Devices, Prentice Hall of India, 5th edition.
4. Tyagi M. S., Semiconductor Materials and Devices, John Wiley, 4th edition.

Reference Books:

1. S. M. Sze, Physics of Semiconductor Devices, Wiley-Interscience, 1969.
2. Sedra & Smith L, Electronic circuits, McGraw Hill.
3. John D. Ryder, Electronics fundamentals & Applications, PHI.
4. Milliman and Grabel, Microelectronics, TMH.

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Electronics & Instrumentation Engineering, III-Semester

EI304 Fundamentals of Measurement

Fundamentals of measuring instruments: Fundamental methods of measurement, Classification of measuring instruments, Static and Dynamic characteristics, Error Classification and analysis, Standards for displacement, force, time, frequency, temperature and electrical standards. IEEE standards.

Cathode Ray Oscilloscope: construction and operation, measurement of amplitude, phase and frequency with cro, lissajous patterns. Fundamentals of EMI, RF measurements techniques, Network analyzers, Noise reduction techniques, compatibility of measuring instruments.

Analog Instruments: Analog indicating type instruments based on various operating principles, ammeters, voltmeters, ohmmeters. Extension of instrument range, instrument transformers.

Measurement of low resistances, voltage, current, phase, frequency, power and energy, Q factor, resistance, noise etc; compensation, calibration and testing of measuring instruments.

A.C. Bridges: A.C bridges for measurement of inductance, capacitance, Q factor and loss angle, universal impedance bridge. Design aspects. Design aspects of digital Multimeter and panel meters, Distortion and spectrum analysis.

TEXT BOOKS RECOMMENDED:

1. A.K. Sawhney, Electrical & Electronic Measurement & Instrumentation.
2. D.S Kumar, “Measurement Systems: Applications & design”
3. B.C.Nakra & K.K.Choudhary, “Instrumentation measurement & analysis”

REFERENCE BOOKS:

1. W.D. Cooper, Electronic Measurement, Pearson Education
2. Terman & Petit, Electronic Measurement.
3. Carr, Instrumentation, Pearson Education

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Electronics & Instrumentation Engineering, III-Semester

EI305 Circuits Analysis and Synthesis

Basics of electrical Networks

Network elements: E.M.F., Potential and Potential difference, Current and Current density, Ideal and practical Voltage and Current Source and their characteristics, source transformations, Various network elements and their behavior, Power and energy relations, Kirchhoff's laws, Current and voltage division, Nodal and Mesh analysis, Graph theory, Incidence and Reduced incidence matrix, isomorphic graph, Tie-set and Cut-set matrix.

Network Theorems & Filter circuits

Superposition, Reciprocity, Thévenin's, Norton's and Maximum power transfer, Compensation, Tellenge's. Δ-Y transformation, Polyphase analysis, Power relation in AC Circuits, Power factor, Apparent and reactive power, Power triangle, Sinusoidal steady state analysis of RLC circuits, Passive filters, High pass and Low pass, Band pass & Band stop filter, Prototype & m-derived filters, Fundaments of active filters.

Analysis of Coupled Circuits & Resonance

Magnetic coupling, Study of ideal transformer, Time domain, natural response and forced response, Dot convention, electrical equivalent of magnetically coupled circuits, single and double tuned coupled circuits, Resonance: Series and parallel resonance, bandwidth &selectivity, Q-factor, Effect of resistance on frequency response curve, Parallel resonance of RLC circuit.

Two port network analysis & Network Functions

Various network parameters: Z, Y, Hybrid, ABCD & their relationships condition of reciprocity and symmetry, Input and output impedances, Equivalent T and Π sections representation in parameter form, Ladder network, Network Function, Driving point and transfer impedances, Interpretation of poles and zeros, effect of their location in complex plane. Routh-Hurwitz Criterion of stability.

Time Domain Analysis of Circuits and Concept of Network Synthesis

Transient and steady state response of electrical circuits, Initial conditions & final condition, step and impulse response, Network Synthesis: Hurwitz polynomial, Positive Real (PR) function, Properties of LC, RC, RL immittances, Foster realization of LC circuits, Ladder development and Cauer forms, Significance of elements in Foster & Cauer forms, Determination of end elements, Applicability of Foster and Cauer forms.

TEXT BOOKS

1. John D. Ryder & Charles M. Thomson Electronic Circuits & Systems Prentice-Hall Inc. 1976
2. Van Valkenburg M.E., Network Analysis, Third Edition, Pearson Education.
3. D. Roy Choudhury, Networks and Systems, New Age International, 1988
4. William H. Hayt & Jack E. Kemmerly Engineering Circuit Analysis McGraw-Hill Book Company Inc. 1971

REFERENCE BOOKS

1. Desoer and Kuh, Basic Circuit Theory, McGraw Hill.
2. Franklin F. Kuo Network Analysis & Synthesis Wiley Toppan 2nd.ed. 1966
3. Van Valkenburg M.E., Introduction to Modern Network Synthesis, PHI.