EE 4201 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

MODULE – I

Introduction: Definition of measurement, Generalized input-output configuration of measuring instruments and instrumentation systems. Performance characteristics (static and dynamic), Accuracy, Precision, Types of error, Statistical analysis, Standards of measurement. Systems of units, Fundamental and derived units. Dimensions. (5)

MODULE – II

Analog Instruments: Basic requirement of a measuring instrument. Introduction to D'Arsonval galvanometer, Construction and principle of Moving coil, Moving iron, Induction types of instruments, Measurement of voltage, current and power, phase, frequency, Range extension including current and potential transformers. (10)

MODULE – III

Bridge: DC bridges for measurement of resistance Wheatstone bridges, Kelvin's double bridges and AC bridges for measurement of L, R, C & M, Maxwell's bridges, Anderson's bridges, Wein's bridges. Measurement of frequency, localization of cable fault. **Potentiometers:** DC and AC potentiometers, Principles, Standardization and application. (9)

MODULE – IV

Electronic Instruments: Electronic voltmeter, Digital voltmeter, vector voltmeter, Vector Impedance meter and Q-meter.
(5)

MODULE – V

Display Devices & Recorders: Digital display, LED, LCD, Strip chart recorder, X-Y recorder

(5)

MODULE – VI

Transducers: Classification, Inductive, Resistive and Capacitive transducers, Analog and Digital Transducers with applications. Hall effect, Piezo Electric, Photovoltaic transducer. Measurement of temperature and pressure. (8)

MODULE – VII

Oscilloscopes: CRT, Construction, Basic CRO circuits, Block diagram of a modern oscilloscope, Y-amplifiers, X-amplifiers, Triggering, Oscilloscopic measurement.
Special CRO's: Dual trace, Duel beam, Sampling oscilloscope, storage CROs. (5)

Text Books:

1. Helfrick and Copper - Modern Electronics Instrumentation and Measurement, Pearson Education, New Delhi.
2. Sawhney A.K. - Electrical & Electronic Measurement and Instrumentation, Dhanpat Rai & Son's.

Reference Book:

1. Patranabis D – Sensors and Transducers, Wheeler, 1996.
2. Kalsi - Electronics Instrumentation, TMH Publication, New Delhi.
3. Deoblin - Electrical Measurement.
4. Patranabis D – Principles of Industrial Instrumentation, TMH Publication, New Delhi, 1976.

EE 4203 ELECTRICAL MACHINES – I 3 Credits

MODULE – I

Basic Concepts of Electrical Machines: Introduction, Electromagnetic induction, flux linkage, Statistically and dynamically induced emf, Classification and description of electrical machines, Heating and cooling of electrical machines. (5)

MODULE – II

Elements of Rotating Machines: Introduction, Basic Components, Rotor, Stator and field excitation. Generator and motor action, EMF and torque equations, Leakage flux, Losses and efficiency, Rating and loss dissipation, Electrical and mechanical degrees. (4)

MODULE – III

Introduction to D.C. Machines: Constructional parts of d.c. machines and their function, Principle of operation, Armature winding- Lap and wave, Simplex and duplex, Method of excitation, Classification, Derivation of emf and torque equations, Process of commutation, Armature reaction, Interpoles, Compensating winding and equalizer rings. (8)

MODULE – IV

DC Generators: Operating Characteristics- Magnetization, Internal and external characteristics, Critical resistance and critical speed, Process of building up of voltage, Causes of failure of voltage build-up and remedies, Parallel operation of d.c. generators, Applications. (7)

MODULE – V

D.C. Motors: Basic equation for voltage, Power, Torque and speed, Condition for maximum power, Operating characteristics- Torque-current, Speed-current and Torque-speed characteristics. Comparison, Starters, Speed control methods, Testing of d.c. machines-Swinburn's, Hopkinson's and Series field tests. Calculation of efficiency, Applications. (7)

MODULE – VI

Transformers: Principle of operation, Construction and practical considerations, Ideal and physical transformer, emf equation, transformation ratio, Phasor diagram. Performance analysis, Equivalent circuit, Losses and efficiency, Condition for maximum efficiency, Determination of equivalent circuit parameters by O.C. and S.C. tests, Per unit calculation, Polarity test, Voltage regulation, all day efficiency. (8)

MODULE – VII

Transformer Connections and Operation: Back-to-back test, Parallel operation, Autotransformer, 3-phase transformer, Three-phase transformer connections- Star-star, Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection, Transformer cooling. (6)

Text books:

1. Electric Machinery - Fitzgerald
2. Performance and Design of DC Machines - A.E. Clayton

Reference books:

1. Electrical Machines – Bimbhra, Khanna Publishers, Delhi
2. Parker Smith's - Series in Electrical Engineering.
3. Electrical Machines - Nagrath& Kothari, TMS Delhi

EE 4207 DIGITAL SIGNAL PROCESSING 4 Credtis

MODULE – I

Introduction: Discrete-Time Signals, Shanon's sampling theorem, Difference equation description, characteristics of digital filters and time domain analysis, properties of discrete time system (linearity, time-variance, convolution), BIBO stability, Z-transformation and their application in solving difference equations, Relationship between Laplace and Z-transforms.

(7)

MODULE – II

Frequency Domain Analysis: Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT), Periodic convolution, Direct evaluation of DFT, FFT algorithms-decimation in time and frequency, Relationship between Fourier and Z-transforms

(8)

MODULE – III

Digital Filter Structures: Direct form I&II, cascade, parallel and ladder realizations.

(5)

MODULE – IV

Filter Function Approximations and Transformations.
Review of approximations of ideal analog filter response, Butterworth filter, Chebyshev Type I & II.

(6)

MODULE – V

Frequency Transformations: Frequency transformation in analog domain, frequency transformation in digital domain.

(4)

MODULE – VI

Design of IIR Filter: Design based on analog filter approximations, Impulse invariance method, Matched Z-transformation, Bilinear transformation.

(7)

MODULE – VII

Design of FIR Filters: Symmetric and antisymmetric FIR filters, design of linear phase FIR filters using windows and frequency – sampling methods, design of optimum equiripple linear phase FIR filters, comparison of FIR and IIR filters.

(8)

Text Books:

1. John G. Proakis, Dimitris G. Mamalakis, Digital Signal Processing, Principles, Algorithms and Applications
2. Alan V. Oppenheim Ronald W. Schafer, Digital Signal Processing, PHI, India.

Reference Book:

1. Antonious, Digital Filter Design, Mc-Graw-Hill International Editions.

EE 4209 ENGGINERING ELECTROMAGNETICS 4 Credits

MODULE – I

Electrostatic and Magnetostatic Energy, Forces and Torques: Electrostatic energy. Electrostatic forces and torques in terms of stored electrostatic energy. (Chapter 3, pp. 133-143)

Magnetic energy. Magnetic forces and torques in terms of stored magnetic energy.(Chapter 6, pp. 277-281, pp. 289-294).

(6)

MODULE – II

Electrostatic Boundary-Value Problems: Introduction. Poisson's and Laplace's equations.Boundary conditions.Uniqueness theorem.Solution of one-dimensional Laplace's and Poisson's equations. Solution of two-dimensional Laplace's equation by method of separation of variables in cartesian, cylindrical and spherical coordinates. (Chapter 4, pp. 152-159, pp. 174-192)

(8)

MODULE – III

Plane Electromagnetic Waves: Wave equations. Helmholtz equations.Plane waves. Propagation of uniform plane waves in dielectric and conducting media. Polarization of plane waves. (Chapter 8, pp. 354-379)

(8)

MODULE – IV

Reflection and Refraction of Plane Waves: Electromagnetic boundary conditions. Reflection of normally and obliquely incident plane waves from perfect conductor and dielectric.Total reflection.Total transmission. (Chapter 8, pp. 386-401, pp. 406-417)

(6)

MODULE – V

Rectangular Waveguides and Cavity Resonators: Introduction. General wave behaviors along uniform guiding structures.TEM, TM and TE waves.Rectangular waveguides.Rectangular cavity resonators.(Chapter 10, pp. 520-533, pp. 547-558, pp. 582-588).

(8)

MODULE – VI

Radiation and Antennas: Introduction. Scalar and vector potentials.Retarded potentials.Radiation from elemental electric dipole.Antenna pattern and antenna parameters.Thin linear antennas.Half-wave dipole.Effective antenna length.Antenna arrays.Two-element arrays. (Chapter 11, pp. 600-605, pp. 607-625)

(6)

MODULE – VII

Solution of Two-Dimensional Problems: Method of images (Chapter 4, pp. 159-174). Conformal transformations (Ref. Class notes)

(5)

Text Book:

1. Cheng, D.K., “Field and Wave Electromagnatics”, Pearson Education (Singapore) Pte. Ltd., 2nd Edn., 1989.
2. Hayt, W.H., J.A. Buck, “Engineering Electromagnetics”, Tata McGraw Hill.

BT 3009 Biological Sciences Credit: 3

Module-1

Nature of living things: Definition of life, Miller's experiment, theories and evidences about origin of life, levels of biological organization, classification of living world.

Module-2

Biomolecules: composition of living matter, water, carbohydrates, lipids, proteins, nucleic acids, vitamins and minerals.

Module-3

Biochemistry: Bioenergetics and thermodynamics, biological oxidation-reduction reactions, glycolysis, citric acid cycle, fatty acid metabolism, electron transport chain, aerobic and anaerobic respiration

Module-4

Molecular organization of cell: Viruses, cellular structure of microorganism, animal and plant, salient features of intracellular organelles, cell division and cell cycle, structure of chromosomes, difference between prokaryotes and eukaryotes.

Module-5

Molecular biology: Structure of DNA and RNA, DNA as genetic material, central dogma of molecular biology, DNA replication, transcription and translation, Introduction to bioinformatics and drug designing.

Module-6

Enzymology:, Mechanism of enzyme action, Lock and key model and induced fit model, active site, Michaelis Menten equation, reversible and irreversible inhibitors, competitive, non-competitive and uncompetitive inhibition.

Module-7

Techniques in biological sciences: Centrifugation, chromatography, gel electrophoresis, spectroscopy, thermal analysis,.

Books Recommended

1. Purves et al, Life: The Science of Biology

2. R. Dulbecco, The Design of Life.

3. Lehninger A, Principals of Biochemistry

4. Stryer L, Biochemistry

5. K. Wilson & K.H. Goulding, A biologist's guide to Principles and Techniques of Practical Biochemistry.