Bhagat Phool Singh Mahila Vishwavidyalaya, Haryana
B.E./B.Tech ECE Sem 2 syllabus

Basic Electrical Engineering

CODE: ESC – 101
Basic Electrical Engineering
CREDITS: 4

UNIT-1

Module 1: DC Circuits
Electrical circuit elements (R, L and C), Voltage and current sources, Kirchoff current and voltage laws, Analysis of simple circuits with de excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits
Representation of sinusoidal waveforms, Peak and rms value, Phasor representation, Real power, Reactive power, Apparent power, Power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Resonance, Three phase balanced circuits, Voltage and current relations in star and delta connections.

UNIT-2

Module 3: Transformers
Magnetic materials, BLL characteristics, Ideal and practical transformer, Equivalent circuit, Losses in transformers, Regulation and efficiency, Auto-transformer and three-phase transformer connections.

UNIT-3
Module 4: Electrical Machines
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip

characteristic, Loss components and efficiency, Starting and speed control of induction motor, Single-phase induction motor, Construction, Working, torque-speed characteristic and speed control of separately excited de motor, Construction and working of synchronous generators.

UNIT-4
Module 5: Power Converters
DC-DC buck and boost converters, Duty ratio control, Single-phase and three-phase voltage source inverters: Sinusoidal modulation.

Module 6: Electrical Installations
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Important Characteristics for Batteries, Elementary calculations for energy consumption, Power factor improvement and battery backup.

Suggested Text/Reference Books
(i) D.P. Kothari and I.J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.

(ii) D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
(iii) L.S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

(iv) E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
(v) V.D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India 1989.

MATHEMATICS 2

Code: BSc-104
Mathematics-II: probability and statistics
Credits : 4

Basis of statistics
Unit 1
Module 1: basic probability:
Probability spaces, conditional probability, independence; discrete random variables, independent random variables, the multi normal distribution, poison approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random

variables: expectation of discrete random variables, moments, variance of a sum, correlation coefficient, chebyshev's inequality.

Unit 2

Module 2: continuous probability distributions:
Continuous random variables and their properties, distribution functions and densities, normal exponential and gamma densities.

Module 3: bivariate distributions:
Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes; rule.

Unit 3

Module 4: basic statistics:
Measures of Central tendency: moments, skewness and kurtosis- probability distributions: binomial, poison and normal- evaluation of statistical parameters for these three distributions, correlation and regression- rank correlation.

Module 5: applied statistics:
Curve fitting by the method of least squares- fitting of straight lines, second degree parabola and more general curves.

Unit 4

Applied statistics: test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Module 6: small samples:
Test for single mean, difference of means and correlation coefficients, test for ratio of variances- chi square test for goodness of fit and independence of attributes

Suggested text/reference books

1) Erwin Kreyszig, advanced engineering mathematics, 9th edition, John wiley and sons 2006.
2) P.G. Hotel, S.C. Port and C.J. Stone, introduction to probability theory, universal Book stall, 2003
3) S. Ross. A first course in probability, 6 th edition , Pearson education India, 2002.
4) W.Feller, an introduction to probability theory and its application, vol I, third edition wiley, 1968.
5) N.P. Bali and Manish Goyal, a textbook of engineering

mathematics, Lakshmi publications,
6) B.S. Grewal, higher engineering mathematics, Khanna publishers, 35th edition 2000.
7) Veerarjan T.. Engineering mathematics (4 semester III), Tata mcgraw hill, New Delhi

Physics

Module 1: Electronic Material (8)

Free electron theory, Density of state and energy band diagrams, Kronig-penny model (to introduce origin of band gap). Energy bands in solids.E-k diagram. Direct and indirect bandgaps. Types of electronic materials semiconductors, and insulators. Density of states. Occupation probability. Fermi level. Effective mass. Phonons.

Module 2: Semi conductors (10) (equilibrium carrier statistics

Intrinsic and extrinsic semiconductors. Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics). Carrier generation and recombination. Carrier transport: diffusion and drift. P-n junction. Metal – semiconductor junction (Ohmic and Schottky) Semiconductor materials of interest for optoelectronic devices.

Module 3: Light-semiconductor interaction (6)

Optical transitions in bulk semiconductors: absorption. Spontaneous emission and stimulated emission: joint density of states. Density of states for photons. Transition rates (Fermi's golden rule). Optical loss and gain: Photovoltic effect. Exciton. Drude model.

Module 4: Measurements (6)

Four-point probe and van der pauw measurements for carrier density. Resistivity. And hall mobility: Hot-point probe measurement. Capacitance-voltage measurements. Parameter extraction from diode I-V characteristics. DLIS. Band gap by UV-V is spectroscopy absorption/ transmission.

Module 5: Engineered semiconductor materials(6)

Density of states in 2D. 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells. Wires and dots:

design. Fabrication. And characterization techniques. Heterojunctions and associated band-diagrams.

References:

1. J. Singh , Semiconductor Optoelectronics: Physics and Technology, McGraw Hill Inc(1995).
2. B.E.A Salch and M.C.Teich, Fundamentals of Photonics, John wiley & Sons. Inc (2007).
3. S.M.S/c Semiconductor Devices: Physics and Technology, Wiley (2208).
4. A. Uariv and P.Yeh Photonics: Optical Electornics in Modern communicaitons, Oxford university press, New York(2007)
5. P.Bjattacharya, Semi conductor Opto electronic Devices Prentice Hall of India (1997).
6. Online Course: “Semiconductor Optoelectornic ” by MR shenoy on NPTEL
7. Online Course: “Optoelectornic Materials and Devices” by Moncial Katiyar and Deepak Gupta on NPTEL