



**Harcourt Butler Technical  
University, UP B.E./B.Tech CSE  
Sem 1 syllabus**

## **Electrical Engineering**

### **ELECTRICAL ENGINEERING (EEE-101/102)**

#### **Credits 4**

**Unit-1:** DC Circuit Analysis and Network Theorems: Circuit Concepts: Concepts of Network, Active and Passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements. R L and C as linear elements. Source Transformation. Kirchhoff's Law; loop and nodal methods of analysis; star - delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. (Simple Numerical Problems)

**Unit-2:** Steady State Analysis of Single Phase AC Circuits: AC Fundamentals: Sinusoidal, Square and Triangular waveforms - average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series - parallel RLC Circuits: Apparent, Active & Reactive Powers, Power factor, causes and problems of low power factor, power factor improvement. Resonance in Series and Parallel Circuits, Bandwidth and Quality Factor. (Simple Numerical Problems)

**Unit-3:** Three Phase AC Circuits: Three Phase System - its necessity and advantages, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase

voltage / current relations, three phase power and its measurement. (Simple Numerical Problems)  
Measuring Instruments: Types of instruments: Construction and Working Principles of PMMC and Moving Iron type Voltmeter & Ammeters, Single Phase Dynamometer Wattmeter and Induction Type Energy Meter, use of Shunts and Multipliers. (Simple Numerical Problems on Energy Meter, Shunts and Multipliers)

**Unit-4:** Introduction To Power System: General layout of Electrical Power system and functions of its elements, standard transmission and distribution voltages, concept of grid. Magnetic Circuit: Magnetic circuit concepts, analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitations, Magnetic leakage. B-H curve, Hysteresis and Eddy Current losses, Magnetic circuit calculations mutual Coupling. Single Phase Transformer: Principle of Operation, Construction, e.m.f. equation, equivalent circuit, Power losses, efficiency, introduction to auto transformer. (Simple Numerical Problems)

**Unit-5:** Electrical Machines: Principles of electro mechanical energy conversion.  
DC Machines: Types of DC machines, e.m.f. equation of generator and torque equation of motor, characteristics and applications of dc motors. (Simple Numerical Problems). Three Phase Induction Motor: Types, Principle of Operation, Slip - torque Characteristics, applications. (Simple Numerical Problems). Single Phase Induction Motor: Principle of Operation and introduction to methods of starting, applications. Three Phase Synchronous Machines: Principle of Operation of alternator and synchronous motor and their applications.

**Text and Reference Books:**

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I. J. Nagarath, "Basic Electrical Engineering" Tata Mc - Graw Hill
3. D. E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc - Graw Hill

4. Edward Hughes, "Electrical Technology" Longman
5. T. K. Nagsarkar & M. S. Sukhija, "Basic Electrical Engineering" Oxford University Press
6. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing
7. W. H. Hayt & J. E. Kennely, "Engineering Circuit Analysis" Mc - Graw Hill

## **Professional Communication**

### **PROFESSIONAL COMMUNICATION (HHS-103/104)**

#### **Credits 3**

#### **Unit-1: Fundamentals of Technical Communication:**

Process of communication, language as a tool of communication, levels of communication, flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

#### **Unit-2: Elements of Written Communication:**

Words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

#### **Unit-3: Forms of Technical Communication:**

(A) Business letters, job application letter and resume, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc.

(B) Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, complaint report, Joining Report, laboratory report, research papers, dissertations and theses. E-mail writing, Technical Proposals: purpose, characteristics, types, structure.

#### **Unit-4: Presentation Strategies:**

Defining the subject, Scope and purpose, analysing audience & locale, collecting materials, preparing

outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, non-verbal strategies.

### **Unit-5: Value-based Text Reading:**

(A) Study of the following essays from the text book with emphasis on writing skills:

1. Man and Nature by J. Bronowski
2. The Language of Literature and Science by Aldous Huxley
3. The Aims of Science & the Humanities by Moody E Prior
4. Gods in this Godless Universe by Bertrand Russell
5. Science and Survival by Barry Commoner

(B) Readings of selected short stories:

1. The Renunciation by Rabindranath Tagore
2. The Lament by Anton P. Chekhov
3. The Barber's Trade Union by Mulk Raj Anand
4. The Eyes Are Not Here by Ruskin Bond

### **Text and Reference Books:**

1. „Improve Your Writing“, V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
2. „An Anthology of English Short Stories“, edited by R P Singh, Oxford University Press.
3. „Technical Communication- Principles and Practices“, Meenakshi Raman & Sangeeta Sharma, Oxford University Press, New Delhi.
4. Effective Technical Communication, by Barun K Mitra, Oxford University Press.
5. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan, Tata McGraw Hill, N.D.
6. Developing Communication Skills by Krishna Mohan & Meera Banerjee, Macmillan India.
7. „Technical Communication- Principles and Practices“ by M R S Sharma, Oxford University Press, New Delhi.
8. Sethi and Dhamija, „A Course in Phonetics and Spoken English“, Prentice Hall of India, New Delhi.
9. Joans Daniel, „English Pronouncing Dictionary“, Cambridge University Press.
10. R. K. Bansal & J.B. Harrison, Spoken English for India, Orient Longman.
11. Excellence in Business Communication, Boeueve & Thill and Courtland.

## **English Language & Composition**

# ENGLISH LANGUAGE AND COMPOSITION (HHS-101/102)

## Credits 2

### **Unit-1: Basic Applied Grammar and Usage (Sentence Structure-1)**

Constituent of a sentence- noun, verb, adjective, preposition, etc.; use of articles, adjectival forms, prepositions, adverbs; verb forms; finite and non-finite verbs, gerund and participles, auxiliary verbs.

Tense and mood, Subject- verb concord, pronoun concord

### **Unit-2: Sentence Structure-2**

(i) adverb clause, adjective clause, noun-clause; (ii) negation and interrogation; (iii) passive; (iv) exclamatory; (v) transformations; (vi) tense forms; (vii) varieties of sentences; (viii) placement of modifiers

### **Unit-3: Paragraph Writing**

Structure of Paragraph, Topic Sentence, Construction of Paragraph, Technique of Paragraph writing, Unity, Coherence, Emphasis

### **Unit-4: Comprehension and Précis Writing**

Reading and listening comprehension, improving comprehension skills, précis writing

### **Unit-5: Short Essay Writing**

Dimension of essay writing- literary, Scientific, Comparison and Contrast, Narrative, Descriptive, Reflective, Expository, Argumentative and Imaginative

### **Text and References Books:**

1. Das, B K and A David, „A Remedial Course in English for Colleges“, (Book -1, 2, 3) Oxford University Press, New Delhi.
2. Sinha, R P, „Current English Grammar and Usage with Composition“, Oxford University Press, New Delhi.
3. Wren, P C & Martin, „English Grammar and Composition“, S Chand & Co Ltd. New Delhi.
4. A. S. Horne, Guide to Pattern and usage in English, Oxford University Press, N.D.
5. M. L. Tickoo & A. E. Subramanian, Intermediate Grammar, usage & composition, Orient Longman



# Physics

## PHYSICS (BPH-101/102)

Credits 4

### **Unit-1: Introductory Mechanics & Theory of Relativity:**

Potential energy function, equipotential surfaces, meaning of gradient, divergence, curl and their physical significance, Conservative and Non-Conservative forces, Curl of a force, Central forces, Examples of Central forces, Conservation of Angular Momentum, Inertial and Non-Inertial Frames of reference, Galilean transformation, Michelson Morley Experiment, Lorentz Transformation, Length contraction, Time dilation and Evidences for time dilation, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of mass variation with velocity, Einstein's Mass energy equivalence, Examples from nuclear physics, Relativistic energy momentum relation.

### **Unit-2: Quantum Mechanics-Schrodinger Equation and its Applications:**

Dual Nature of matter & Radiation, Heisenberg's uncertainty Principle and their applications, wave group concept, Davisson Germer experiment, Postulates of quantum mechanics, Significance of wave function, Derivation of Schrodinger equation for time independent and time dependent cases, Application of Schrodinger wave equation for a free particle, Particle in a box (one dimensional and three dimensional), Simple harmonic oscillator (one dimensional).

### **Unit-3: Electromagnetic Theory:**

Ampere's law and Faraday's law of electromagnetic induction, Maxwell's equations, Correction of Ampere's law by Maxwell (concept of displacement current), transformation from integral to differential form, Physical significance of each equation, Poynting theorem, Maxwell's equations in free space, velocity of electromagnetic wave, Transverse character of the wave and orthogonality of E, H and V vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media, Solution of differential equation in this

case, penetration depth, its significance.

#### **Unit-4: Materials of Technological Importance:**

**Dielectric Materials:** Electric field in presence of dielectric medium, concept of electric polarization, different types of polarizations, dielectric in A. C. field, concept of dielectric loss and loss energy.

**Semiconducting Materials:** Concept of energy bands in solids, carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence, Hall effect in semiconductors, compound semiconductors.

**Nano Materials:** Basic principles of nano science and technology, preparation, structure and properties of fullerene and carbon nanotubes, applications of nanotechnology.

#### **Unit-5: Statistical Mechanics & Lasers:**

Phase space, the probability of distribution, most probable distribution, Maxwell-Boltzmann Statistics, Applications of Maxwell-Boltzmann Statistics, derivation of average velocity, RMS velocity and most probable velocity in the above case, Bose-Einstein Statistics, application to black body radiation, distribution law of energy, Planck's radiation formula and Stefan's law, Fermi - Dirac statistics, application in case of free electrons in metals, energy distribution, Fermi energy.

**Lasers:** Spontaneous and stimulated emission of radiations, Einstein's theory of matter-radiation interaction, Einstein's coefficients and relation between them, Population inversion, components of a laser, different kinds of lasers, Ruby laser, He-Ne laser, properties of laser beams, mono-chromaticity, coherence, directionality, and brightness, applications of lasers.

#### **Text and Reference Books:**

1. Physics, Marcelo Alonso, J. Finn Edwards, Addison Wesley
2. Perspectives of Modern Physics, Arthur Beiser, McGraw Hill
3. Engineering Physics, R. K. Shukla, Pearson Education
4. Electrical Engineering Materials, R.K. Shukla, McGraw Hill
5. Introduction to Electrodynamics, David Griffiths, Cambridge

University Press

6. Principles of Engineering Physics, R.K. Shukla, Ira Books

7. Introduction to Solid State Physics, Charles Kittel, Willey

## **Mathematics-I**

### **MATHEMATICS (BMA-101)**

**Credits 4**

#### **Unit-1: Functions of One Real Variable**

Successive differentiation, Leibnitz theorem, Mean value theorems, sequences and series, Expansion of functions, Improper integrals and their convergence.

#### **Unit-2: Functions of Several Real Variables**

Limit, Continuity, Partial differentiation, Total differential and approximations, Jacobian, Euler's theorem Expansion of functions, Beta and Gamma Functions, Multiple integral, Change of order, Change of variables, Applications to area, volume, mass, surface area etc. Dirichlet's Integral & applications.

#### **Unit-3: Vector Calculus**

Point functions, differentiation, Gradient, Directional derivative, Divergence and Curl of a vector and their physical interpretations, Solenoidal & irrotational fields, Integration, Line, Surface and Volume integrals Green's. Stoke's and Gauss Divergence theorems (without proof) and applications.

#### **Unit-4: Matrices and Linear Algebra**

Vector space and subspace, linear dependence, dimensions and basis, Linear transformation and its matrix representation, Elementary transformations, Echelon form, rank & nullity, Consistency of linear system of equations and their solutions, characteristic equation, Cayley Hamilton theorem, Real and complex eigenvalues and eigenvectors, diagonalisation, quadratic forms, complex, orthogonal, and unitary matrices, Application to Cryptography, discrete, Compartmental models and system stability.



## **Unit-5: Optimization**

Engineering applications of optimization, statement and classification of optimization problems, Optimization techniques, single variable optimization, multi variable optimization with no constraint, with equality and inequality constraints, Linear Programming Problems, Graphical method and Simplex method.

### **Text and Reference Books:**

1. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House 2002.
2. Erwin Kreyszig: Advanced Engineering Mathematics. John Wiley & Sons 8th Edition.
3. Dennis G. Zill & Michael R Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers, 2nd 6. Edition.
4. S. S. Rao; Optimization: Theory & application Wiley Eastern Limited.
5. T. M. Apostol, calculus, Vol. I, 2nd ed., Wiley 1967.
6. T. M. Apostol, Calculus, Vol. II, 2nd ed., Wiley 1969.
7. Gilbert Strang, Linear Algebra & its applications, Nelson Engineering 2007.
8. Calculus & Analytic Geometry, Thomas and Finny.

## **Engineering Mechanics**

### **ENGINEERING MECHANICS (EME-101/102)**

#### **Credits 3**

#### **Unit-1:**

**Two Dimensional Force Systems:** Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

**Friction:** Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Applications.

#### **Unit-2:**

**Beam:** Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

**Trusses:** Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections.

### **Unit-3:**

**Centroid and Moment of Inertia:** Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

### **Unit-4:**

**Simple Stress and Strain:** Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy.

**Compound stress and strains:** Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle, Theories of Failure.

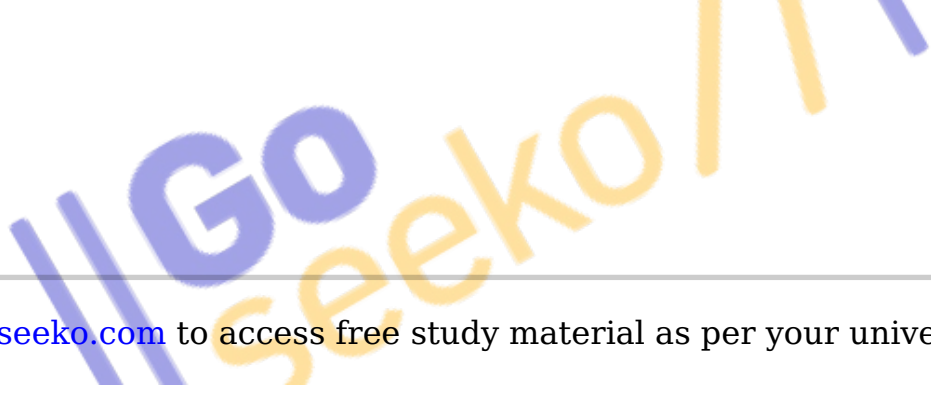
### **Unit-5:**

**Pure Bending of Beams:** Introduction, Simple Bending Theory, Stress in beams of different cross sections.

**Torsion:** Introduction to Torsion of circular shaft, combined bending & torsion of solid & hollow shafts.

### **Text and Reference Books:**

1. Engineering Mechanics by R.K.Bansal
2. Strength of Materials by R.K. Rajput
1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Materials by E. P. Popov, PHI
3. Strength of Materials by Ryder
4. Mechanics of Material by Gere & Timoshenko
5. Engineering Mechanics by A. Nelson
6. Engineering Mechanics by U.C. Jindal
7. Engineering Mechanics Statics by J. L. Meriam & L.G.Kraige



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