

PH102: Engineering Physics

L-T-P: (3-1-0)

Credit: 04

Module I

Electrostatics and Electrodynamics: Vector algebra and coordinate systems, Gauss's law and applications, Stoke's theorem, Green's theorem. Electric displacement, Magnetic induction and magnetic intensity, Ampere's circuital law, Displacement current, Faraday's law of electromagnetic induction, Ampere's law.

Maxwell's equation - Electromagnetic wave equations in differential and integral form, transverse nature and speed of EM waves, Electromagnetic energy density, Poynting theorem.

Module II

Interference: Coherent sources, Condition for interference, Division of wavefront - Fresnel's Biprism, Division of amplitude - Wedge shaped films, Michelson interferometer, Newton's rings.

Module III

Diffraction: Difference between Interference and diffraction, Fresnel's and Fraunhofer's Diffraction. Fraunhofer's diffraction by single slit and double slit. Resolving power of prism and grating.

Module IV

Polarization: Unpolarized, polarized and partially polarized lights. Polarization by reflection, Double refraction by uni-axial crystals, Polaroids, Half wave and quarter wave plates.

Module V

Relativity: Special theory of relativity, Length contraction, Time dilation, Doppler's effect, Twin paradox, Mass and energy equivalence.

Module VI

Quantum Mechanics: Inadequacy of classical mechanics, Origin of quantum hypothesis, De Broglie's hypothesis of matter waves, Davisson and Germer's Experiment, Wave function and its physical interpretation, Phase and group velocity, Examples to confirm De Broglie's hypothesis and applications, Energy of a particle in a box using De Broglie's postulate, uncertainty principle, Particle property of X-ray wave (Compton effect). Wave function and Schrödinger wave equation, boundary conditions, Physical application of Schrödinger wave equation: Particle in a box, quantum tunnelling.

Module VII

Solid State Physics: Bonding in Solids - Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond.

Crystal Structures - Crystalline and amorphous solids, Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices, Crystal Planes and Directions, Packing Factor of SC, BCC, FCC, Diamond and hcp, Structures, Structures of NaCl, ZnS, CsCl.

Band theory of solids – Kronig-penny model, Effective mass.

Ohm's law, electrical conductivity and Hall Effect, Photoconductivity, Photovoltaic.

Module VIII

Nanotechnology: Properties of nanoparticles, carbon nanotubes, synthesis of nanoparticles and their applications, thin film formation methods, Characterization tools for nano materials (Scanning electron Microscopy, Scanning tunnelling microscopy and Atomic force microscopy).

Module IX

X-ray diffraction: Bragg's law, Powder Method, Applications of X- ray Diffraction.

Module X

Thermodynamics: Calorie, Temperature units, Seebeck effect and its application, Low and High temperature measurements, Thermostat, Fusion and Latent heat, Vaporization, Condensation, Ebullition, Boiling, Refrigeration, Solid CO₂ (dry ice), Liquid N₂ and Liquid helium.

Zeroth law of thermodynamics, First law of thermodynamics-closed system, applications, Isothermal, adiabatic, Isochoric and Isobaric processes, Work done during Isothermal process, Work done during adiabatic process.

Thermopile, Thermos flask, Electromagnetic spectrum, solar spectrum.

Text Books:

1. D.J. Griffith "Introduction to Electrodynamics" (Prentice Hall India).
2. A. Beiser, "Concepts of Modern Physics" (Tata McGraw-Hill, New Delhi).
3. Malik and Singh, "Engineering Physics" (Tata McGraw-Hill, New Delhi).
4. Venkatesh and Nagraj , "Basic Thermodynamics" (New Age International).

Reference Books:

1. John David Jackson, "Classical Electrodynamics" (Wiley India) .
2. Eugene Hecht, "Optics" (Addison Wesley).
3. A. Ghatak, "Optics" (Tata McGraw-Hill, New Delhi).
4. Jenkins and White, "Fundamentals of Optics" (Tata McGraw-Hill).
5. C. Kittel, "Introduction to Solid State Physics" (Wiley india).
6. M A Wahab , "Solid State Physics" (Narosa Publishing House).
7. Resnick & Halliday, "Fundamentals of Physics" (Wiley Eastern Ltd).
8. J.J. Sakurai, "Modern Quantum Mechanics"(Addison Wesley).
9. Chattopadhyay and Banerjee, "Introduction to Nanoscience and Nanotechnology" (PHI, New Delhi).

MA102: Mathematics II

L-T-P: (3-1-0)

Credit: 04

Module I

Differential Equations: Linear differential equations of n th order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential equation by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Module II

Laplace Transform: Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step function, Dirac delta function, Laplace transform of periodic functions, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Module III

Fourier Series and Partial Differential Equations: Periodic functions, Trigonometric series, Fourier series of period $2p$, Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis, Solution of first order Lagrange's linear partial differential equations, Linear partial differential equations with constant coefficients of 2nd order and their classifications - parabolic, elliptic and hyperbolic with illustrative examples.

Module IV

Applications of Partial Differential Equations: Method of separation of variables for solving partial differential equations, Wave equation, Laplace equation, Heat conduction equation, Equations of transmission lines.

Test Books:

1. G. B., Thomas & R. L. Finney, Calculus and Analytical Geometry, Pearson Education Asia, 2000.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.

Reference Books:

1. C. Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd. 2003
2. G.F. Simmons, Differential Equations, Tata McGraw-Hill Publishing Company Ltd. 1981.
3. Chandrika Prasad Advanced Mathematics for Engineers, Prasad Mudranalaya, 1996.
4. W.E. Boyce & R.C. DiPrima, Elementary differential equations and Boundary Value Problems John Wiley & Sons, Eighth Edition.

CE102: Concepts of Built-environment

L-T-P: (2-1-0)

Credit: 03

Module I

Concepts of built-environment, History of Civil Engineering, Role of Civil Engineering in different type of constructions, Broad areas of specialization in Civil Engineering.

Module II

Different type of construction materials, Type and different stages of construction, Foundations, Type of loads, Automation in construction Industry

Module III

Use of maps and field surveys, Surveying equipments, Measurement of distance, direction and elevation, Introduction of remote sensing, GPS and GIS

Module IV

Ecosystem definition, relevance, structure and functions, Producers, Consumers and decomposers, Energy cycle in ecosystem; Ecological succession; Classification and characteristics of ecosystems.

Module V

Environmental pollution, Global warming, Climate change, Solid waste and its management, Environmental disasters, drinking water specifications, basic water treatment technologies, introduction to waste water treatment

Module VI

Renewable and non-renewable resources and related problems, Resource conservation and sustainable life cycle, Sustainable development, Urban environment problems, Water and energy conservation, Environmental ethics

Text Books:

1. Surveying and Levelling --- Kanetkar and Kulkarni, PVG Prakashana.
2. Environmental Studies D. L. Manjunath – Pearson Education.
3. Building Construction --- Bindra Arora; Dhanpat Rai publication.
4. Text book of Environmental Studies-Erach Bharucha-UGC, Universities Press.
5. Elements of Civil Engineering, Bhargab Mohan Das, Madan Mohan Das, Mimi Das Saikia

Reference Books:

1. Building Design and Drawing-Shah, Kale and Patki. TATA McGraw Hill.
2. Introduction to Surveying-Anderson-McGraw-Hill International Student Edition.
3. A Basic Course in Environmental Studies - S. Deswal and A. Deswal, Dhanpat Rai Publications, Delhi.

EE102: Electrical Technology

L-T-P: (2-0-0)

Credits: 02

Module I

Introduction: Sources of energy, General structure of electrical power systems, Fundamental Laws of electrical engineering, Types of electrical elements & sources, Kirchhoff's laws, Node voltage and mesh current methods, Delta-star and star-delta conversion and Network theorems.

Module II

AC Circuits: Single phase EMF generation, Average and effective values of sinusoidal, Solution of R.L.C series circuits, the j operator, Complex representation of impedances, Phasor diagram, Power factor, Power in complex notation, Solution of parallel and series circuits, Three phase EMF generation, Line and phase quantities, Solution of three phase circuits, Balanced supply voltage and balanced load, Phasor diagram, Measurement of power in three phase circuits.

Module III

Magnetic Circuits: Ampere's circuital law, B-H curve, Solution of magnetic circuits, Hysteresis and eddy current losses.

Transformers : Construction, EMF equation, Ratings, Phasor diagram on no load and full load, Equivalent circuit, Regulation and efficiency calculations, Open and Short circuit tests, Auto-transformers.

Module IV

Electrical Machines: Principle of Electromechanical energy conversion, General Description of Electrical Machines, Construction, EMF equations, Characteristics of DC generators and motors, Speed control of DC motors and DC motor starters, AC Motors(Introductory).

Module V

Electrical Measuring Instruments: DC PMMC instruments, Shunt and Multipliers, Multimeters, Moving iron ammeters and voltmeters, Dynamometer, Wattmeter, AC watt-hour meter, Extension of instrument ranges.

Text Books:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition.
2. A Textbook of Electrical Technology, volume 1, B.L.Theraja & A.K. Theraja, S. Chand.

Reference Books:

1. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH.
4. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

CE106: Ecology and Environment

L-T-P: (2-1-0)

Credit: 03

Module I

Definition, scope, importance and need for public awareness.

Module II

Natural Resources: Renewable and non-renewable resources, Different type of resources and related problems and issues, Resource conservation and sustainable life cycle.

Module III

Ecosystem: Definition and relevance, structure and function of ecosystem, producers, consumers and decomposers, Energy cycle in ecosystem, Ecological succession, Classification and characteristics of ecosystems.

Module IV

Biodiversity and its conservation: Definition and classification of ecological diversity, Hot spots of bio-diversity, Threats and conservation of bio-diversity.

Module V

Environmental Threats: Pollution, Global warming, Climate change, Solid waste and its management, Environmental disasters.

Module VI

Social Issues and Environment: Sustainable development, Urban environment problems, Water and energy conservation, Resettlement and rehabilitation of peoples, Environmental ethics.

Text Books:

1. Environmental Studies by R. Rajagopalan, Oxford University Press.
2. A textbook in Environmental Science by Arvind Kumar, A P H Publication Corporation.
3. Textbook of Environmental Studies for Undergraduate Courses By Erach Bharucha, University Press India.
4. A textbook in Environmental Science by V. Subramanian, CRC Press, 2002.

5. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha, Prentice-hall of India Pvt Ltd.
6. Essentials of Ecology and Environmental Science, 4th ed., by Rana, PHI.
7. Environmental Science and Engineering, 2nd ed., Henry & Heinke.

Reference Books:

1. Principles of Environmental Sciences by Jan J. Boersema, Lucas Reijnders, Springer.
2. Environmental Science by Daniel D. Chiras, Jones and Bartletts Publishers.

HU-102: Professional Communication

L-T-P: (2-0-0)

Credit: 02

Module I

Communication: Definition, Nature and Scope, Verbal and Non Verbal Communication, Attributes to Effective Communication, Barriers to Effective Communication, Gateways of Effective Communication.

Module II

Thesis, Dissertation and Report Writing, Technical (Business) Proposals, Research Articles, Internal/External Correspondence, Letters, Notices, Office Memos, Minutes, Tender Notices and Other Correspondences.

Module III

Role of Communication in Negotiation, Contents of Negotiations, Process of Negotiations, Attributes to Successful Negotiation, Negotiation Process, Negotiating with Various Stakeholders (Community/Groups/Society).

Module IV

Learning through Thematic Texts: (10 stories and 10 Essays to be selected).

Text Books:

1. Business Correspondence and Report Writing, Sharma and Mohan, TMH.
2. Basic Business Communication Skills for Empowering the Internet Generation, Lasikar, Flatley, TMH.

Reference Books:

1. Business Communication, Meenakshi Raman, Prakesh Singh, Oxford Higher Education.
2. Negotiations, Michael L. Spangle & Myra Warren Isenhardt, Sage Publications, South Asia Edition 2008.

SS102: History of Science and Technology

L-T-P: (2-0-0)

Credit: 02

Module I

Introduction: Science and technology: Definition and concepts, scientific methods, Science and technology in ancient civilization (Egypt, Greece ,Rome, China), Technology in the ancient India.

Module II

Medieval period: Dark ages in Europe, Church and science: the conflict and development, Renaissance as the new thought, Science and technology in Medieval India and impact of the neighboring countries on Indian technology, the technological marvel and construction of Indian temples and structures.

Module III

Modern science: Birth of modern science and the change in the society, Galilean revolution and Newton's contribution in the development of modern science, Industrial revolution, the growth of technology and its impact on the society, Impact of science and technology: intellectual, social and economic.

Module IV

Science and policies in India: Science policy of independent India, Government programme and institutions in development of science and technology, Indian science and technology: recent development and future prospect.

Reference books:

1. Tyler J.Veak -2006, Democratizing technology: Andrew Feenberg's critical theory of technology, State University of New York Press.
2. Helaine Selin – 1997, Encyclopaedia of the history of science, technology, and medicine, Kluwer Academic publisher.
3. Lourdasamy John Bosco (2004), Science and national consciousness in Bengal, Orient Longman.

4. Robert C.Scharff, Val Dusek (2003), Philosophy of technology: the technological condition : an anthology , Blackwell publication.
5. David M.Kaplan (2004). Reading in the philosophy of technology, Rawman & Littlefield publishers, INC.
6. Carl Mitcham, 1994, Thinking through technology: the path between engineering and philosophy, the University of Chicago Press.
7. Debiprasad Chattopadhyaya-1996, history of Science and technology in ancient India, Volume 1, Firma KLM.

PH104: Physics Lab

L-T-P: (0-0-2)

Credit: 01

List of Experiments

1. Measurement of basic constants: Length, Weight and Time.
2. Coupled pendulum.
3. Newton's 2nd Law / Demonstration Track.
4. Current Balance arrangement/ Force acting on a current-carrying Conductor.
5. Magnetic field of paired coils in a Helmholtz arrangement.
6. Measuring the velocity of light.
7. Dispersion and resolving power of a prism.
8. Wavelength of Mercury spectral lines using a grating.
9. Interference of light (Fresnel Biprism).
10. Diffraction at a slit and Heisenberg's uncertainty principle.
11. Malus's law (Polarization) experiment.
12. Photoelectric effect.
13. To study electron diffraction and verify de Broglie's equation.
14. Band Gap of Germanium.
15. Hall Effect in n and p-type Germanium.
16. Characteristic curves of a Solar cell.

CE104: Built-Environment Lab

L-T-P: (0-0-3)

Credit: 02

Experiments/exercises to be carried out:

1. Study of any 4 types of maps and writing their uses.
2. Exercise on use of dumpy level and auto level.
3. Measurement of area of irregular figures by digital planimeter.
4. Drawing of plan elevation & section for a residential building, single storeyed framed/ load bearing structure. Preparing schedule of openings.
5. Measurement of distance by EDM and comparing it with the distance measured using tape.
6. Visit to a construction site for studying the various construction materials used, type of structure, type of foundation and components of superstructure – submission of visit report.
7. Demonstration of use of any 4 Civil Engineering software's.
8. Making a poster (Full imperial sheet size) in a group of 4 students, related to Energy/ Environment.
9. Presentation in a group of 4 students, any case study related to Energy/Environment.

EE104: Electrical Technology Laboratory

L-T-P: (0-0-2)

Credit: 01

Laboratory Experiments:-

1. Use of basic measuring instruments, CRO, ammeter, voltmeter, wattmeter and energy meter.
2. Assembly and working of Tube light, electric iron, and Ceiling fan.
3. Assembly and working of DC Motor & Induction Motor.
4. Basic study of house wiring model and various components used in house wiring.
5. Study of Grounding or measurement of earth resistance.
6. Prove the ohm's law and find the mathematical relationship between voltage (V), current (I) and resistance (R).
7. Experiment based on Network theorems.
8. Step response of RLC circuits.
9. Steady state response of RLC circuits.
10. Assembly and working of Transformer and determine the transformation ratio in a Single Phase Transformer.
11. To perform open circuit and short circuit test on a single phase transformer.
12. Speed control of DC shunt motor.

ME102: Workshop Practices

L-T-P: (0-0-3)

Credits: 02

Module I

Basic Metals & Alloys (Properties and Applications): Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Fracture, fatigue & creep.

Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron, Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case-hardening.

Non-Ferrous metals & alloys: Common uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.

Module II

Machine Shop: Basic principles of Lathe-machine and operations performed on it, Plane turning, Step turning, Taper turning, Threading, Single point cutting tool, Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding.

Module III

Carpentry Shop: Study of tools & operations of carpentry shop. Woodworking lathe, study of different carpentry joints. To prepare half-lap corner joint, mortise & tennon joints.

Module IV

Fitting Bench Working Shop: Tools & operations of fitting shop. Make perfect male-female joint, drilling/tapping/dieing.

Module V

Black Smithy Shop: Tools & operations of Black Smithy Shop, exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

Module VI

Welding Shop: Importance & basic concepts of welding, classification of welding processes. Gas-welding, types of flames. Electric-Arc welding. Resistance welding. Soldering & Brazing and its uses. simple butt and Lap welded joints, Oxy-acetylene flame cutting.

Module VII

Sheet-metal Shop: Tools & operations of sheet-metal-shop, making Funnel complete with 'soldering', Fabrication of tool-box, tray, electric panel box etc.

Module VIII

Foundry Shop: Tools & operations, pattern making, mould making with the use of a core, casting.

Text Books:

1. Choudhury & Choudhury, Elements of Workshop Technology vol. I & II, Media Promoters and Publishers Pvt. Ltd.

Reference Books:

2. J. K. Gupta, Basic Mechanical Engineering, Dhanpat Rai & Co.
3. B. S. Raghuvanshi, Workshop Technology.