

# Revised F.Y. Curricula

(From the academic year 2009-10)

## Structure A

Semester - I						
Course Code	Course Title	Lectures	Tutorials	Practical	Credits	Institute/Dept
MA101	Engineering Mathematics- I	3	1	0	4	Institute core
AS101	Applied Physics	3	0	2	4	Institute core
IN101	Elements of Electrical Engineering	3	0	2	4	Institute core
CW101	Elements of Civil Engineering	2	0	0	2	Institute core
PR101	Thermodynamics	2	0	0	2	Institute core
CS101	Introduction to Computer Programming	1	0	2	2	Institute core
PR102	Workshop Practice	0	0	2	1	Institute core
CW102	Environmental Studies (Audit)	3	0	0	0	Institute core
<b>Contact Hours: 26</b>		<b>17</b>	<b>1</b>	<b>8</b>	<b>19</b>	
Semester - II						
MA102	Engineering Mathematics- II	3	1	0	4	Institute core
AS102	Applied Chemistry	3	0	2	4	Institute core
EC101	Basic Electronics	3	0	2	4	Institute core
CW103	Applied Mechanics	3	1	2	5	Institute core
PR103	Engineering Drawing	2	0	4	4	Institute core
<b>Contact Hours: 26</b>		<b>14</b>	<b>2</b>	<b>10</b>	<b>21</b>	

## Structure B

Semester - I						
Course Code	Course Title	Lectures	Tutorials	Practical	Credits	Institute/Dept
MA101	Engineering Mathematics- I	3	1	0	4	Institute core
AS102	Applied Chemistry	3	0	2	4	Institute core
IN101	Elements of Electrical Engineering	3	0	2	4	Institute core
CW101	Elements of Civil Engineering	2	0	0	2	Institute core
PR101	Thermodynamics	2	0	0	2	Institute core
CS101	Introduction to Computer Programming	1	0	2	3	Institute core
CW102	Environmental Studies (Audit)	3	0	0	0	Institute core
<b>Contact Hours: 24</b>		<b>17</b>	<b>1</b>	<b>6</b>	<b>18</b>	
Semester - II						
MA102	Engineering Mathematics- II	3	1	0	4	Institute core
AS101	Applied Physics	3	0	2	4	Institute core
EC101	Basic Electronics	3	0	2	4	Institute core
CW103	Applied Mechanics	3	1	2	5	Institute core
PR103	Engineering Drawing	2	0	4	4	Institute core
PR102	Workshop Practice	0	0	2	1	Institute core
<b>Contact Hours: 28</b>		<b>14</b>	<b>2</b>	<b>12</b>	<b>22</b>	

**Examination system:** Theory courses (except CS101) shall be evaluated twice during a semester as specified in the academic calendar in the proportion of 30:70 (Mid Term: End Term). The courses having practical component will be evaluated continuously and the weightages shall be as specified in the rules and regulations.

## MA101 Engineering Mathematics I

### CALCULUS

**Sequences, Continuity and Limits:** Basic properties of real numbers and functions. Sequences (of real numbers), bounded sequences, convergent sequences, monotonic sequences, Cauchy sequences, basic results and examples. Continuity of real-valued functions of a real variable, basic properties of continuous functions. The concept of limit, relation with continuity.

**Differentiation:** Derivative of a function of real variable, basic properties, Rolle's Theorem, Lagrange's Mean Value Theorem, Taylor's Theorem and its applications. L'Hospital's Rule.

**Integration:** The Riemann integral, integrable functions, the Fundamental Theorem of Calculus.

**Infinite Series:** Infinite series (of real numbers), notion of convergence, Cauchy criterion, absolute convergence and conditional convergence, test for convergence, Power series, radius of convergence, Taylor series, real analytic functions.

**Improper Integrals:** Improper integrals of  $f(x)$  on the interval  $(0, \infty)$  as an analogue of infinite series, notions of convergence, absolute convergence and conditional convergence, tests for convergence of improper integrals, improper integrals of the first kind and second kind, notion of Cauchy principal value. Gamma functions, beta functions.

#### References:

1. S. R. Ghorpade and B. V. Limaye, *A Course in Calculus and Real Analysis*, Springer, UTM Series.
2. G. B. Thomas and R. L. Finney, *Calculus*, Addison-Wesley, 1996
3. J. Stewart, *Calculus, Early Transcendentals*, Fifth Edition (India Edition), Thompson Books/Cole

## MA102 Engineering Mathematics II

### LINEAR ALGEBRA and MULTIVARIATE CALCULUS

**Linear Algebra:** Systems of linear equations, solution space, homogeneous and non homogeneous systems, Gaussian Elimination method. Notion of a vector space, subspaces, linear independence, basis, finite dimensional vector spaces, dimension. Linear transformations of (finite dimensional) vector spaces, matrix of a linear transformation, effect of a change of basis. Eigen values of a matrix, characteristic polynomial, eigenvectors, Eigen spaces, diagonalization

**Functions of Several Variables:** Real-valued functions of two and more variables, continuity and limits, partial derivatives and directional derivatives, Chain Rule, Jacobians, Euler's Theorem for homogeneous functions. Maxima, minima, and saddle points of functions of two variables, Discriminant Test, Lagrange's multiplier method.

**Multiple Integrals:** Double integrals, Fubini's Theorem, application to areas, polar coordinates, change of variables formula. Extensions to triple (and multiple) integrals, applications to surface area and volumes of solids, cylindrical and spherical coordinates.

**First Order Differential Equations:** Basic Concepts and ideas, Geometric meaning of  $y' = f(x, y)$ , direction fields, Exact differential equations, Linear differential equations, Bernoulli equation, Modeling: electrical circuits, Orthogonal trajectories of curves.

#### References:

1. H. Anton and C. Rorres, *Elementary Linear Algebra, Applications Version*, Ninth edition, Wiley India Pvt. Ltd
2. J. E. Marsden, A. J. Tromba, and A. Weinstein, *Multivariate Calculus*, Springer UTM Series
3. E. Kreyszig, *Advanced Engineering Mathematics*, Fifth Edition, John Wiley and Sons, Inc, New York.
4. G. B. Thomas and R. L. Finney, *Calculus*, Addison-Wesley, 1996
5. J. Stewart, *Calculus, Early Transcendentals*, Fifth Edition (India Edition), Thompson Books/Cole

## AS101 Applied Physics

**INTERFERENCE:** Interference in thin films –both reflected and transmitted systems (of plane Parallel thin film & wedge shaped thin film). Anti reflection coatings. Newton's rings-theory and applications (testing of a lens surface, optical flatness, measurement of thickness of thin films, diameter of thin wires, refractive index of liquids, coefficient of linear expansion of crystals). Michelson's interferometer- construction, working & applications (measurement of length, resolution of spectral lines, determination of w.l of monochromatic light, thickness & r.i of thin transparent plates, r.i of gases)

**DIFFRACTION:** Difference between interference & diffraction. Fraunhofer diffraction at a single slit, formation of maxima & minima, quantitative treatment of intensity variation, diffraction at a circular aperture, diffraction at multiple slits, diffraction grating & its application to find out w.l of monochromatic light.

**POLARISATION:** Resultant of two plane polarised waves perpendicular to each other (mathematical treatment), production & detection of circularly & elliptically polarised light. Retardation plates. Optical activity, Biot's law of rotator polarisation, Fresnel theory of rotation of ppl. Faraday effect, Kerr effect, Pockels effect, Cotton-Mouton effect, LCD'S.

**FIBER OPTICS & LASERS:** Propagation of light from one end to the other of an optical fiber, T. I. R, acceptance angle & acceptance cone, F.R.I, N.A., modes of propagation, types of optical fibers, applications. Ordinary light vs laser light, difference bet spontaneous & stimulated emission, coherence (special & temporal), meaning of population inversion, meta stable states, active medium, pumping mechanism, Ruby laser, He-Ne laser and applications.

**X-RAYS:** Bragg's law, construction & working of Bragg's X-ray spectrometer, determination of interplaner spacing of crystals, identification of type of cubic crystal (whether it is simple, body centred or face centred), powder method Debye-Scherrer experiment.

**ELECTRIC AND MAGNETIC FIELDS:** Motion of electron in uniform electric field (parallel, perpendicular & inclined fields), electrostatic deflection, motion of electron in uniform magnetic field (parallel, perpendicular & inclined fields) magnetostatic deflection, motion of electron in electric & magnetic fields in crossed configuration. Velocity filter, shortcomings of Thomson's expt, Dunnington's method for  $e/m$  of electron. Determination of charge of electron. Positive rays, charge to mass ratio of positive ions, Thomson's parabola method, calculation of mass of positive ions, study of isotopes, Bainbridge mass spectrograph.

**ATOMIC STRUCTURE:** Failure of Bohr's theory to explain the fine structure of H-alpha spectral line, explanation of the same by Sommerfeld's theory (its drawbacks) & finally by vector atom model.

#### LIST OF EXPERIMENTS:

- 1) Newton's rings.
- 2) Michelson's Interferometer.
- 3) Diffraction Grating.
- 4) Production & Detection of,
  - a) Plane Polarised light.
  - b) Circularly Polarised light.
  - c) Elliptically Polarised light.
- 5) Experiment on application of optical fibre.
- 6) Experiment of single slit diffraction using laser.
- 7) Hydrogen spectrum (observation of H-Alpha spectral line).

#### REFERENCES:

- 1) M. N. Avadhanula, P. G. Kshirsagar, *A.T.B. of Engineering Physics*, S. Chand Publication.
- 2) Mathurs, *Optics*, S. Chand Publication.
- 3) Brijlal & Subramanyam, *Optics*, S. Chand Publication.
- 4) F. A. Jenkins & H. E. White, *Fundamentals of Optics*, Tata Mcgrhill Publication.
- 5) F. K. Richtmyer, E. H. Kennord & J. N. Cooper, *Introduction to Modern Physics*, Tata Mcgrhill Publication.
- 6) A. Beiser, *Concepts in Modern Physics*, Tata Mcgrhill Publication.
- 7) Kao, *Optical Fibre System: Technology Design & Application*, Tata Mcgrhill Publication.
- 8) Cherin, *An Introduction to Optical Fibres*, Tata Mcgrhill Publication.

### AS102 Applied Chemistry

**Water Treatment:** Hard and Soft water, Hardness – Types, Units, Estimation by EDTA, Numerical to calculate hardness,. Softening of water – Methods and Numerical, Boiler feed water and trouble.

**Lubricants:** Introduction, Classification, Mechanism of Lubrication, Important properties of lubricants – Viscosity, Viscosity Index, Flash and fire point, cloud and pour

point, Acid value, saponification value, Aniline point, Oxidation stability, Problems based on the properties, Criteria for selection of lubricants for I.C. engines, cutting tools, Gears etc.

**Polymers and Elastomer** - Plastics, Thermoplastics and Thermosetting, Compounding of plastic, Preparation, properties and uses of Polythene, PVC, Teflon, Bakelite, Elastomer – Natural rubber, Vulcanization, Synthetic rubber – Styrene rubber, Nitrile rubber.

**Fuels:** Classification, characteristics of good fuel, calorific value – Units and types, Determination of CV using Bomb and Boys calorimeter, Numerical, Coal – types and composition, Proximate and ultimate analysis with their significance. Petroleum Cracking, Knocking, Octane no., Cetane no., Antiknocking agents.

**Corrosion and its Control** – Definition, causes and consequences, Dry- and Wet – corrosion and their mechanisms, Types of corrosion Pitting, Waterline, soil. Material selection and design for corrosion control, Cathodic and anodic – protection, Metallic coating – galvanizing and tinning, paint coating.

**Phase rule:** Statement, Terms involved, Application of phase to one component System (water system) and two component system (Pb-Ag System).

- i) Cement - Portland cement – composition, manufacture process, Setting and Hardening, Heat of hydration.
- ii) Refractories – Classification, important properties and uses.

#### References:

1. Engineering Chemistry by P.C. Jain and M. Jain 15th Edition 2006, Dhanpat Rai and sons.
2. Engineering Chemistry by S.S. Dara, S. Chand and Company Ltd., 11th Edition 2006.
3. Fundamentals of Engineering Chemistry by S.K. Sing. New Age International Publishers.

#### List of experiments:

1. Determination of total hardness of water.
2. Determination of PH using PH-meter.
3. Proximate analysis of Coal. (ash determination).
4. Estimation of Chloride content in water.
5. Determination of dissolved Oxygen in water.
6. Determination of alkalinity in water.
7. Preparation of Urea – formaldehyde resin.
8. Preparation of Bakelite.
9. To determine coefficient of Viscosity of given liquid.
10. Determination of Acid value of lubricating Oil.
11. Determination of Chlorine in water.
12. Determination of Saponification value of an oil.
13. Estimation of Iron in given Iron alloy sample.
14. To demonstrate and explore the electrochemical nature of corrosion.

### CW103 Applied Mechanics

**Fundamentals of Statics:** Definition of force, Force system, Classification of force systems, Law of parallelogram of forces, Triangle law of forces, polygon of forces, Lami's Theorem, Principle of transmissibility, Principle of superposition, Resolution of a force, Varignon's theorem, Couple, Equivalent force system, Vectors – Vectorial re-

presentation of forces and moments, Vector operations, Free body diagram, Equilibrium of coplaner, collinear and concurrent force systems, Parallel and non parallel force systems, Conditions of equilibrium.

**Analysis of Frames:** Defining perfect and imperfect frames, Assumptions and approximations in analyzing frames, Method of joints, Method of sections and graphical applications.

**Centre of Gravity and Moment of Inertia:** Concept of center of gravity and centroid, Determination of centroid for regular geometrical figures and lines, Determination of Centroid for composite figures, Definition of moment of inertia, Radius of gyration, Theorem of perpendicular and parallel axis, Determination of moment of inertia for regular geometrical figures, Determination of moment of inertia of composite figures.

**Friction:** Definition of friction, Types of friction, Laws of friction, Angle of repose, Cone of friction, Analysis of rigid bodies and Connected rigid bodies on rough inclined surfaces, Analysis of ladder friction and wedge friction, Introduction to kinetic friction, Open flat belt drive, Cross belt drive, Compound belt drive, Power transmitted by belt drive and rope drive.

**Beams:** Types of beams, Types of supports, Types of loading, Support reactions, Shear force and bending moment diagrams for simple beams

**Fundamentals of Dynamics:** Linear motion, Equations for motion in a straight line, motion curves, Curvilinear motion, Angular velocity, Angular acceleration, Types of motions, Projectiles, Motion under gravity, Motion under variable acceleration, Laws of motions, Motion on incline smooth and rough surface, Momentum and angular momentum, D'Alembert's principle applied to plane motion.

**Work, Power and Energy:** Introduction to work, power and efficiency, Kinetic energy and potential energy, Work energy principle applied to particle and connected rigid bodies, Law of conservation of energy.

**Impulse and Momentum:** Linear Impulse–Momentum relation applied to particle, Principle of linear impulse momentum applied to connected rigid bodies, Conservation of linear momentum.

#### References:

1. Engineering Mechanics by Timoshenko and Young, McGraw Hill Publications
2. Applied Mechanics by I.B. Prasad, S. Chand and Co., New Delhi
3. Engineering Mechanics (Statics and Dynamics), by Ferdinand L Singer, Harper and Rowe Publications
4. Mechanics for Engineers (Statics and Dynamics) by Beer and Johnson, McGraw Hill Publications
5. Applied Mechanics by S.B. Junnarkar and H.J. Shah, Charotar Publications, Anand, Gujrat

#### TERM WORK:

Term Work Shall consists of a record of Laboratory/Practical work as listed below:

1. Graphical Solutions:
2. System of concurrent forces
3. System of non concurrent force –one problem with resultant as a force and one with resultant as a couple
4. Problem on Wedge and Block Friction
5. Problem on connected bodies on an incline
6. Analysis of frames two problems

#### Experiments:

1. Moment of Inertia of Flywheel
2. Belt Friction
3. Member Forces in Trusses
4. Study of any two Simple Machines

Assignments: Analytical solutions for at least two problems on each of the chapters to be regularly solved in the practicals.

#### EC101 Basic Electronics

**Semiconductor diodes:** Introduction to Semiconductors, PN junction diode, diode resistance, equivalent circuits, diode rectifiers: half-wave, full-wave, and bridge type, efficiency of rectifiers, ripple factor, filter circuits, clipper and clamper circuits. Zener diode, block diagram of dc regulated power supply, three terminal IC regulators (78XX series), light-emitting diode, photo diode, tunnel diode. (8 hours)

**Transistors:** BJT fundamentals, Common Base (CB), Common Emitter (CE) and Common Collector (CC) configurations with their characteristics, comparison of CB, CE, CC configurations, transistor as a switch, transistor as an amplifier, Field effect transistors: Working principle, characteristics of JFET and MOSFET, comparison of BJT, JFET and MOSFET. (8 hours)

**Transistor biasing:** Load line analysis, operating point, biasing, base resistor biasing, biasing with feedback resistor, voltage divider bias method. (3 hours)

**Transistor amplifiers:** Single stage CE amplifier, phase reversal, dc and ac equivalent circuits, load-line analysis, input and output impedance of an amplifier, gain concept of an amplifier, amplifier equivalent circuit. Multistage RC coupled amplifier. (6 hours)

**Amplifiers with feedback:** Principles and advantages of negative feedback, voltage and current feedback, Darlington amplifier, positive feedback, Barkhausen's criteria, various sinusoidal oscillator. (4 hours)

**Operational amplifier:** I.C, Op-Amp as a black box, ideal Op-Amp, characteristics of INV and non INV, summing and difference amplifier, Unity gain buffer, Op-Amp as a comparator, Black box concept of IC 555 as timer. (5 hours)

**Digital electronics:** Number systems, logic gates AND, OR, NOT, NOR, NAND, XOR with symbols, Boolean algebra, flip-flops. (4 hours)

**Electronic Instruments:** Block diagram of CRO, signal generators, multi meter (4 hours).

#### References:

1. Electronic Circuit Analysis and Design, Donald A. Neamen, Tata McGraw-Hill.
2. Robert Boylestad and Louis Nashelsky, Electronic devices and circuit theory: Pearson Ed., 2004
3. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill Publishing Company.
4. Malvino and D. Leach, Digital Principles and Application, Mc Graw Hill, 1991.
5. FLOYD : Electronic Devices 7th edition, pearson education.

6. Mehta V.K., Principals of Electronics, S. Chand Publications, Revised Edition 2005.
7. R P JAIN :modern digital electronics, tata McGraw-Hill, Publishing company limited
8. Ramakant Gaikwad, OPAMPS and Linear Integrated Circuits, PHI/Pearson Education.

#### List of Experiments:

1. Study of electronic instruments: Regulated power supply, Function generator, Multimeter, Cathode Ray Oscilloscope (CRO), other instruments: LCR meter, frequency counter, voltmeter, and ammeter.
2. Study of Electronic components: Resistor, Potentiometer, Trimmer, Capacitors, Inductors, Diodes: p-n junction diode, Zener diode, light emitting diode (LED), Transistors: BJT and FET, transformers, Probes and connecting wires, Breadboard.
3. Diode characteristics: p-n junction and Zener diode.
4. Rectifiers: Half wave and full wave rectifier.
5. Filters: C, RC, LC, PI etc.
6. Zener diode as a voltage regulator.
7. clipper circuits
8. clamper circuits
9. Plot input and output characteristics of CB and CE configuration
10. CE Transistor amplifier.
11. RC coupled amplifier
12. Verification of truth table of logic gates: NOT, AND, OR, NOR, NAND, EX-OR.
13. Op-amp as INV and NINV amplifier.

#### CW101 Elements of Civil Engineering

**Building Construction:** Introduction to civil engineering, general study of Bricks, Rubble, Sand, Aggregate, Cement, Mortar and Concrete as a building materials. Types of loads and supports, introduction to Framed Structure and Load Bearing Structures.

**Substructure:** Building Foundations, Safe Bearing Capacity of Soils, Spread Footing, R.C. Footings.

**Superstructure:** Masonary in superstructure and substructure in bricks and rubble. Technical terms in masonry, Precautions in masonry, English and Flemish bond for One as well as One and Half Brick wall, Coursed and Uncoursed rubble masonry, D.P.C., R.C. Lintels, Bands, Chajja and Sun shades.

**Doors and Windows:** Definition and Technical terms of Doors and Windows, Framed and Panelled doors, Single and Double leaf shutters, Glazed or Sash doors, Flush doors and Sliding doors, Casement windows, Sliding windows, Metal windows.

**Stairs:** Definitions and requirements of stairs, Technical Terms, Geometrical classification of stairs. Details of RCC dog-legged staircase.

**Roofs:** Pitched roofs; King Post truss, Steel trusses, G. I. sheets and A.C. Sheets as roofing materials.

**Earthquake:** Introduction to earthquakes, causes and effects of earthquakes, Epicenter, Focus, Seismograph, Richters scale for measurement of intensity of earthquakes, Earthquake zones.

**Surveying:** Linear Measurements: Principles of surveying, Purpose of surveying, Measurement of distances by Chain

& Tape, Survey Figures, Base Lines and offsets, Equipment for laying offsets, Ranging,

**Angular Measurements:** Construction and study of Prismatic compass, Types of bearings, Measurement of bearings and angles, Determination of included angles for a traverse and simple problems.

**Levelling:** Study and use of Dumpy Level, Levelling staff, Levelling procedure and Determination of R.L. by Line of Collimation and Rise and Fall Method and simple problems, Contours, Uses and characteristics of contours.

**Water Resources Engineering:** Water availability studies and its components in brief, Hydrologic Cycle, Study of Symon's Raingauge. Rainwater harvesting and rooftop rainwaterwater harvesting.

#### References:

1. Fundamentals of Building Construction, by S.P. Arora & S.P. Bindra, Dhanpat Rai Pub., New Delhi
2. Building Construction, Part I, by S. C. Rangwala, Charotar Pub., Anand.
3. Building Construction, by B.C. Punmia, Dhanpat Rai and Sons Pub., New Delhi
4. Building Construction, by Sushil Kumar, Standard Pub., New Delhi.
5. Surveying Vol I, by B. C. Punmia, Laxmi Pub., New Delhi
6. Surveying and Levelling Part I by T. P. Kanetkar & S. V. Kulkarni, PVG Prakashana, Pune
7. Irrigation Engineering, by B. C. Punmia and Pande, Laxmi Pub., New Delhi

#### PR103 Engineering Drawing

**Introduction to engineering drawing:** Principles of Engineering Graphics and their significance, Engineering Drawing, Drawing Instruments and their use, conventions in drawing etc.

**Projections of lines:** Concept of reference planes and quadrants, projections of lines inclined to both the reference planes, locating H.T. and V.T. Determination of true length and true angle of inclination(s).

**Projections of planes:** Projections of regular and composite planes inclined to both the reference planes. Projections of solids: Projections of solids having their axes inclined to both the reference planes.

**Sections of solids:** Projection of solids having their axes inclined to one of the reference planes and cut by a section plane inclined to one of the reference planes, true shape of section.

**Development of surfaces:** The development of lateral surface of solids or cut solids.

**Orthographic projections:** Conversion of pictorial view of simple parts and patterns into orthographic projections, drawing of sectional views.

**Isometric projections:** Conversion of the given orthographic views into isometric view/projection of simple objects

**NOTE:** First angle method of projections is recommended for chapter 3 onwards.

#### References:

1. N. D. Bhatt and V. M. Panchal, *Elementary Engineering Drawing*, 43<sup>rd</sup> edition, Charotar Publisher, 2001

2. N. D. Bhatt and V. M. Panchal, *Machine Drawing*, 43<sup>rd</sup> edition, Charotar Publisher, 2001
3. M. B. Shah and B. C. Rana, *Engineering Drawing*, Pearson Education, 2005
4. Dhananjay Jolhe, *Engineering Drawing*, TMH, New Delhi, 2008

#### **Tutorials:**

Two hours per week per batch shall consist of problem solving sessions on above syllabus. Solutions for at least two problems on each of the chapters to be regularly solved in the tutorials.

#### **Term Work/Sectionals:**

Term work shall consist of minimum four sheets covering all the topics in the syllabus. Sheets will be drawn on: Projection of lines, Planes and Developments, Solids and section of solids, Orthographic and a Sketchbook containing two/three problem from each chapter.

### **CW102 Environmental Studies**

#### **The Multidisciplinary nature of environmental studies.**

Definition, scope and importance, Need for public awareness. Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems

**Forest resource:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

**Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies

**Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture fertilizer-pesticide problems, water logging, salinity, case studies.

**Energy resources:** Growing energy needs, renewable & non renewable energy resources, use of alternate energy sources, case studies

**Land resources:** Land as resources, land degradation, man induced landslides, soil erosion and desertification.

**Role of an individual in conservation of natural resources,** equitable use of resources for sustainable lifestyles.

**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: Forest ecosystems, Grassland ecosystem, Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and its conservation:** Introduction – Definition: genetic, species and ecosystems diversity Biogeographical 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-spots 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.

**Environmental pollution:** Definition; Causes, 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.

**Social Issues and Environment:** From unsustainable to sustainable development, urban problems related to energy, Water conservation, rain water harvesting, and 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 Acts:** Air (Prevention and 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

**Human Population and the Environment:** Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

**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.

#### **References:**

1. Environmental Science by John, Tata McGraw Hill publications, New Delhi
2. Environmental engineering and Management by S K Dhameja, S K Kataria and sons, New Delhi

### **PR102 Workshop Practice**

1. Introduction to Workshop practice. Different tools used for fitting, carpentry plumbing, forging, tin smithy.
2. Practical Job based on different carpentry joints
3. A job on fitting practice demonstrating various fitting operations such as fitting, marking, cutting, fitting, drilling tapping etc.
4. Demonstration of at least one job from Welding, plumbing, smithy / Tin smithy.
5. Demonstration of machining processes, on lathe, shaper, drilling.
6. Demonstration of advance manufacturing on CNC Milling Machine.

#### **References:**

1. Workshop Practice I & II By – Hajra Chaudhary
2. Workshop Practice By – Chapman & Hall

## IN101 Elements of Electrical Engineering

**Energy Sources:** Ideal and practical voltage and current sources, independent and dependent sources.

**DC Networks:** Kirchhoff's laws, Loop current methods, Nodal Analysis, Superposition Theorem, Thevenin Theorem, Maximum power transfer theorem, Network Reduction by delta to star and star to delta transformations, DC Transients: RC and RL, Faradays law of Electromagnetic induction, Self and mutual induction, Magnetic circuits (with basic calculations)

**AC Networks:** Equations of AC quantities, basic definitions of cycle, time period, frequency, amplitude, phase and phase difference, RMS value, Average value, Form factor. Vector diagrams, R, L, C, and their series and parallel combinations, and resonance.

Balanced Three-Phase Circuits: Current and voltage relations for the Star connection, Current and voltage relationships in a Delta connected three phase system,

**Basic Electrical Drives and Devices:** Working principles of DC Generator (in Brief), DC Motor (with basic calculations), Transformer: Theory of operation, Open circuit test. Short-circuit test, Efficiency and Voltage Regulation, Auto transformers, introduction to 3-phase induction motor, single phase induction motor, synchronous machines (AC Generators only)

**Basic Electrical Measuring Instruments:** Working principle of Permanent Magnet Moving Coil (PMMC) meters, Basic voltmeter, ammeter, wattmeter, multimeter and energy meter, Tachogenerators and stroboscope

### References:

1. B. L. Theraja and A.K. Theraja, *A text book of electrical technology*, Volume I and II, S. Chand and company Ltd. New Delhi, 2004.
2. Hughes Edward, *Electrical and Electronic Technology*, VIII Edition, Pearson Education, New Delhi, 2003.
3. Vincent Del Toro, *Electrical Engineering Fundamentals*, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2006.
4. Van Valkenburgh, *Basic Electrical Engineering*, 2009.

### Terms Work

The term work for the subject shall consist of a report on the performance of any eight experiments (minimum) from the following:

1. Determination of temperature rise of a field winding, and estimation of its absolute temperature.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Determination of Performance of R-L Series and R-C Series circuits for DC transients.
6. Determination of Performance of R-L-C Series and A. C. parallel Circuit.
7. Measurement of power in single phase circuit with R-L load and calculations of A.C. Parameters.
8. Determination of efficiency and Regulation of a single phase transformer by O.C & S.C. tests and by direct loading.
9. Measurement of speed by tachometers and stroboscope.
10. Determination of unknown resistance by DC Bridge.

11. Study of different types of Resistors, Capacitors and Inductors. Components identification, and specification for I. Wires, Cables, Conductors, II. Fuses, line testers, III. Pliers of different type and IV. Wiring components like holders, switches plug tops, plug sockets, junction boxes, ceiling roses MCBs etc.
12. Testing of components and assembly of a fluorescent tube.
13. Wiring exercises / Stair case wiring and control of two lamps by two switches.
14. Study and use of Megger Insulation tester.
15. Dismantling, assembly and fault finding of Ceiling fans or table fan or automatic electric iron or plate tube water heater (Megger testing included)
16. Dismantling, assembly and fault finding of Mixer or single phase (capacitor start split phase) or identification of winding and polarities.
17. Winding and testing of small transformer
18. Earthing of Electrical Installation: Requirements, procedure and testing

## PR 101 Thermodynamics

**Fundamentals of thermodynamics:** System and control volume, property, state and process, work –thermodynamic definition of work, examples, displacement work, other forms of work – gravitational, electrical, magnetic, spring and shaft.

**Temperature and Heat:** Definition of thermal equilibrium, Zeroth law of thermodynamics, temperature scales, various thermodynamics, Heat –definition, examples of heat work interaction in systems.

**The first law of thermodynamics:** Cyclic and non-cyclic processes, concept of total energy E, demonstration that E is a property, various modes of energy; pure substance – two property rule, enthalpy and internal energy, first law for flow processes- derivation of general energy equation for control volume, steady flow processes and examples of steady flow devices; ideal gases and mixtures of ideal gases; properties of water-steam system- constant temperature and constant pressure heating.

**The second law of thermodynamics:** Definitions of direct and reverse heat engines – definitions of thermal efficiency and COP, Kelvin-Planck and Clausius statements, definition of reversible process, internal and external irreversibilities, Carnot cycle, absolute temperature scale.

**Entropy:** Clausius inequality, definition of entropy S, demonstration that entropy is a property.

**Thermodynamic cycle:** Basis Rankine cycle, basic Braton cycle, basic vapor compression cycle.

**Introduction to internal combustion Engines.**

### References:

1. Yunus A. Cengel and Michel A. Boles, "Thermodynamics an Engineering Approach", Tata McGraw Hill Publishing
2. Nag P.K., "Engineering Thermodynamics", Tata McGraw Hill
3. Michel J. Moran and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", John Wiley & Sons

4. Sonntag R. E. ,Borgnakke C. and Van Wylen G. J. "Fundamentals of Thermodynamics" John Wiley 2003
5. Spalding D.B. and Cole E.H. ," Engineering Thermodynamics" Edward Arnold  
B.K.Sarkar ," Termal Engineering ",Tata McGraw Hill Publishing

### CS101 Introduction to C Programming

Programming languages, algorithms and flowcharts, character set, identifiers and keywords, operators and expressions, standard I/O, decision making statements, control statements, arrays, functions, mathematical functions, structures and unions, pointers, pointers and arrays, pointers and functions, pointers and structures, static variables, header Files, file Handling, dynamic memory allocation, preprocessor directives, graphics programming, drawing figures, graphs, charts etc.

#### References:

1. Yashavant Kanetkar Let us C
2. B. W. Kernighan and D. M. Ritchie, The C Programming Language, Second Edition PHI, 2001.
3. E. Balgurusamy, Programming in ANSI C, Third Edition, TMH, 1999.
4. K. R. Venugopal and S. R. Prasad, Programming with C, First Edition, TMH, 2000.
5. N. Kamthane, Programming with ANSI and TURBO C, Pearson Education, 2003
6. Ramkumar and R. Agarwal, Programming in ANSI C, First Edition, TMH, 2001.

#### Terms Work

The term work for the subject shall consist of report on the performance of any fifteen computer programmes in C programming language based on above syllabus. A list of sample programmes is given below.

1. Programs using operators
2. Solving an algebraic equation
3. Largest number using if-else statements.
4. Test whether a given string is palindrome or not?
5. List of prime numbers up to n
6. Reverse the given number
7. Count total even and odd numbers out of N entered numbers
8. Display the given numbers in ascending number.
9. Shift the entered number by few bits right/left
10. Recognition of entered letter in upper or lower case
11. Calculation of electricity bill based on different consumption units
12. Program using switch case statements-Trigonometric problems etc
13. Pascal's triangle
14. Find the values of sin x, cos x, exp(x) by using sum of series.
15. Reverse pyramid of digits.
16. Generate Fibonacci numbers up to n
17. Tower of Hanoi using recursion
18. Use mathematical and string functions to develop programs-abs( ), ceil( ), strlen( ), strcpy( ), strcmp( ), strcat( ), strrev( ), etc
19. Addition ,multiplication of matrices and inversion of a matrix
20. Sorting methods
21. Use functions and pointers
22. Call by value and call by reference
23. Swap two numbers using pointer
24. Use of structures and unions- Declaration and initialization of structures, structures within structures, Arrays within structures, structures and functions
25. Program to implement a structure for an employee
26. Dynamic memory allocation
27. Programmes using file I/O use of fprintf, fscanf, fget, fput, fread, fwrite etc
28. Graphics programmes –To draw Triangle, Circle, Ellipse etc