

DR. BABASAHEB AMBEDKAR KARATHWADA UNIVERSITY  
SYLLABUS OF FIRST TEAR ENGINEERING

The Following shall be the scheme of Instruction and Examination for First Engineering  
(First Year common to all branches)

Subject No.	Subject	Teaching Scheme Hrs/ Week			Examination Scheme		
		Theory	Practical	Total	Theory	Term Work	Total
	Semester-I						
1.	Engineering Mathematics-I	4	--	4	100	--	100
2.	Applied Science-I	4	2	6	100	50	150
3.	Engineering Graphics	4	2	6	100	50	150
4.	Elements of Civil Engineering	4	2	6	100	50	150
5.	Elements of Electrical Engineering	4	2	6	100	50	150
6.	Workshop-I	-	2	2		50	50
	Total	20	10	30	500	125	750
	Semester-II						
7	Engineering Mathematics -II	4	--	4	100	--	100
8	Applied Science -II	4	2	6	100	50	150
9	Elements of Mechanical Engineering	4	2	6	100	50	150
10	Engineering Mechanics	4	2	6	100	50	150
11	Elements of Electronics & Computer Engineering	4	2	6	100	50	150
12	Workshop-II	--	2	2	--	50	50
	Total	20	10	30	500	250	750

## PART - I

### ENGINEERING MATHEMATICS – I

Theory: 04 Hours/weeks                      Theory Exam: 100 Marks

1. Complex Number: Argand's Diagram, polar form, De-Moivre's Theorem, Exponential, Circular, Hyperbolic Functions, Inverse Hyperbolic Functions, Separation of real and imaginary parts of a circular and hyperbolic functions, Logarithm of complex quantity. (8 hours).
2. Successive Differentiation:  $N^{\text{th}}$  Derivatives, Taylor's and Maclaurin's Theorem, Expansion of functions using: 1) Standard Series 2) Method of differentiation and integration 3) Method of substitution, Indeterminate forms. (6 hours).
3. Differential equations of First order and First Degree: Solution of linear Differential equation, Reducible to linear differential equation, exact differential equations. Applications to mechanics, Electrical Engineering, orthogonal trajectories (6 hours).
4. Partial differentiations: Partial differentiation, Total differentiation Euler's Theorem, change of independent variables, Jacobian, Chain Rule, Maxima and minima of two independent variables, Lagrange's method of undetermined multipliers. (10 hours).
5. Curve Tracing: Curve tracing of Cartesian (explicit functions), Parametric and polar form (6 hours).
6. Rectification: Cartesian System, Parametric System and Polar System.' (4 hours).

Note: More stress should be given on Engineering Application

Section (A) : Chapter Nos: 1,2 and 3

Section (b) : Chapter Nos: 4,5 and 6

#### Recommended books :

1. A Textbook of Applied Mathematics Volume I and II  
Author: P. N. Wartikar, J. N. Wartikar
2. Higher Engineering mathematics  
Author: Dr. B.S. Grewal
3. Advanced Engineering mathematics  
Author: H.K. Dass
4. A Text book of engineering mathematics Volume I and II  
D.T. Deshmukh
5. Engineering mathematics Volume I, II and III  
Author: M. L. Bhatiya
6. A Textbook on Engineering Mathematics  
Author: Bali, Saxena, Iyengar

## APPLIED SCIENCE - I

Theory Exam. -100 Marks                      Term Work:50                      Theory: 2 Hrs/week

### Section A - Applied Physics

1. Electron Physics: Millikan's Oil drop method for determination of charge of an electron,. Positive rays- production and properties, Thomson's parabolic method for determination of Bainbridge mass spectrograph. Electron refraction (Beth's Law) Electrostatic and Magnetostatic focusing, cathode Ray Oscilloscope and its application's, Election Microscope (4 hours)
2. X-rays: Continuous & characteristic spectra, diffraction of X-rays, Bragg's law, Bragg's X-ray spectrometer, industrial application. Compton effect, derivation for Compton shift. (3 hours).
3. Optics: Newton's rings by reflected light, applications of interference Measurement of wave length of monochromatic light, measurement of refractive index of a liquid, testing of optical flatness of surfaces. Michelson's interferometer, determination of refractive index of thin film. Diffraction of light, classes of diffractions, theory of plane transmission grating (normal incidence), Rayleigh's criterion for resolution, resolving. power of telescope. Polarization of light, types of polarization,-Brewster's law, double refraction, Nicol prism. Optical activity, specific rotation, Laurent's' half shade polar meter. (6 hours)
4. Architectural acoustics & Ultrasonic: Reverberation and reverberation time, absorption coefficient, Sabine formula acoustical design of a hall, acoustical materials, limits of audibility. Production of ultrasonic waves by piezoelectric & magneto striation method. Properties of ultrasonic waves, detection of ultrasonic waves, applications of ultrasonic wavers. (4hours)

5. Dielectrics: Introduction, dielectric parameters, dielectric constant, strength, dielectric loss, and polarization. Types of polarization, effect of temperature & frequency 011 polarization, effect of moisture on insulation system, protection of 1nsulation against moisture. (3 Hours)

Note :- Weightage To every topic is proportionate to hours allotted to each topic.

Term Work shall consist of any five experiments of the following.

1. Determination of "e" by Millikan's oil drop method.
2. Determination of "e/m" of electrons by Thomson method.
3. Determination of radius of curvature of a Plano-convex lens by Newton's ring.
4. Measurement of wavelength of source using plane diffraction grating.
5. Resolving power of Telescope.
6. Measurement of specific rotation of sugar solution by Laurent's half shade polarimeter.
7. Determination of velocity of ultrasonic in liquid by ultrasonic interferometer.
8. Measurement of dielectric constant.

Reference Books:

1. Engineering Physics: R K. Gaur & S.L: Gupta
2. Engineering Physics: M.N. Avandhrnulu & P. G. Kshirsagar
3. A textbook of Optics: Subhramanyam & Brijlal
4. A textbook of sound: Khanna & Bedi
5. Fundamentals of Modern Physics: Agrawal & Agrawal
6. Solid state physics: Pillai

SECTION B: APPLIED CHEMISTRY

Theory: 2 hours / week

1. Solid state Chemistry : Transition between the main types of Bonding, metallic bonds & metallic structures, elementary account of crystal structure, crystalline & non crystalline state. Elements of symmetry, space lattice, unit cell law of symmetry. (4 Hours)
2. Environmental pollution & control: Introduction, atmospheric pollution, sources of air pollution & water pollution. Industrial effluents & waste water, solid waste management. Metal pollutants. Pollution due to radioactive materials. noise pollution & its control. (4 Hours).
3. Electro chemistry : Introduction, conductivity of electrolytes, specific conductivity, molar conductivity & their relationship. Effect of dilution on conductivity. Cell constant, Kohlrausch's law & application. Conductometric titration & its advantages. Common types of cells Dry cells. Lead accumulator. Fuel cells. (4 Hours)
4. Water treatment: Hardness of water, types of scales of hardness. Determination of hardness by E.D.T.A. simple numerical Scale & sludge. Scale formation in boilers, priming 3c foaming. Boiler water . treatment, effluent treatment process. Softening methods. (4 Hours)
5. Corrosion: Introduction, definition, types of corrosion, mechanism of chemical & electro chemical corrosion. factors affecting rate of corrosion. Corrosion. control, organic coating, paints, galvanizing & tin coatings, cathodic & anodic coatings, use of inhibitors, cathodic protection.

Term work shall consist of any five experiments of the following.

1. Study of crystal structure with models.
2. Determination of conductance & conductor metric titration
3. Determination of dissolved Oxygen (D.O.) in water sample
- 4, Determination of Calcium & Magnesium hardness using E.D.T.A.
5. Determination of free Chlorine in water sample.
6. Determination of PH values of solution by indicator & PH meter
7. Study of various factors affecting rate of elector-chemical corrosion
8. Study of various factors responsible for water pollution

Reference Books.

1. A textbook of Engineering Chemistry by S. S. Dara
2. Engineering Chemistry' by Jain & Jain
3. A Solid state Chemistry & its application by R. West. John Wiley & Sons
4. Applied Chemistry by N. Krishnamurthy, P. Vallimangaman, K. Jeya Subramaniam (TMH Publications)

ELEMENTS OF CIVIL ENGINEERING

Theory 3 Hours / Week

Theory Exam 100' Marks

Term Work 50 Marks

SECTION "A"

1. Civil Engineering Material and Building Planning : Study of the properties, uses of the following engineering materials (i) Bricks, (ii) Stones, (iii) Natural Aggregate and Artificial Aggregate, (iv) Cement, (v) Mortar, (vi) Concrete and (vii) Steel. Site selection, principles of planning, plinth area, carpet area, floor space Index, cost of building and building byelaws (4 hours)
2. Building and Road Construction:
  - a) Building Construction: Loads coming on, structure, types of structure, load bearing structure and framed structure. Function and Construction of the following elements:
    - i) Building Foundation: Isolated column footing, combined footing cantilever or strap footing, mat or Raft Foundation, Machine Foundation. (2 hours)
    - ii) Building Superstructure.: a) Masonry in superstructure and foundation in bricks and rubble, English and Flemish bond of one and Half brick wall, construction and precautions to be taken in brick masonry, coursed and uncoursed rubble masonry. (3 hours)
    - iii) Lintels, RCC lintels, cast in site and precast. (1 hours)
    - iv) Doors and windows, definitions and technical terms-, study of doors and windows in public and residential building of following types battened, ledged and braced door, Paneled door and flush door, paneled windows and glazed window, steel windows, Aluminum windows. (3 hours)
    - v) Stairs: Definitions of technical terms, different types of stairs used in residential and Public building thumb rules for rise and tread relation. (2 hours)
    - vi) Floors: different types of floors used in residential, Public and industrial building, tiled and R.C.C. flooring. (2 hours)
    - vii) Plastering and painting: objectives and requirements, methods of plastering with cement mortar, listing of various types of paints, painting of plastered surface, doors and grills. (2 hours)
    - viii) Flat R.C.C. Roof. (1 hours)
    - b) Road Construction: Classification of roads, Rigid and flexible pavements, Typical Road section, Camber Function of Camber.

SECTION-B

1. Earthquake Engineering: Causes of earthquake, changes in Earth crust during earthquake, technical terms related with earthquake such as focus, epicenter, magnitude, Intensity and seismograph. Factors affecting damage, consideration of earthquake forces In design, General construction aspects. Precautions to be taken during occurrence of an earthquake. (4 hours)
2. Elementary Surveying : a) Length measurement- Introduction, different instruments used for length measurement, 20 m. chain, metallic tape. Ranging a line. b) Angular measurement -- Use of Prismatic compass, measurement of bearing and simple problems. c) Level measurement - Definitions, study and use of Dumpy level, calculation of Reduced levels using plane of collimation method simple problems. (7 hours)
3. Water supply and Drainage: Water demand, introduction to treatment unit, disinfectant, of water, Population forecasting methods, Arithmetic increasing method. Geometrical increase method, incremental increase method, simple problems, Drainage of water from building construction of septic tank and soak pits. (4 hours)
4. Irrigation Engineering :Necessity, multipurpose irrigation projects benefit, typical section of earthen and gravity dam. Introduction of Water Shed Management, building roof top rainwater " harvesting. (3hrs)

Term work: Term work shall consist of sketches on 1/2 imperial size sheets. (minimum 15 sketches)

1.	Foundation types	1 sketch
2.	Stone masonry	1 sketch
3.	Brick masonry	2 sketch
4.	Doors	2 sketch
5.	Windows	2 sketch
6.	Stairs	2 sketch

7.	Floors	2 sketch
8.	Roofs	2 sketch
9.	Machine foundation	2 sketch
10.	Section through wall	1 sketch
11.	Flow diagram of conventional water & waste water & treatment	1 sketch
12.	Section of dams	1 sketch
13.	Chair and compass survey	1 sketch
14.	Practical use of dumpy level	1 sketch

List of Text Books:

•	Building and construction	Arora S.P. and Bindra S.P.
•	Highway Engineering	Justo and Khanna
•	Elementary seismology	Richter C.F.
•	Surveying and leveling	Duggal A.K.
•	Water Supply and Sanitary Engineering	Birdi
•	Irrigation Engineering and Hydraulic Structures	Garg S.K.

ENGINEERING GRAPHICS

Theory: 4 hours / week

Practical: 2 hours / week

Theory examination: 100 marks

Term work: 50 marks

SECTION – A

- Engineering curves: Different methods to draw conic curves. Ellipse by concentric circles, oblong, arcs of circle, focus & directrix methods. Parabola by focus & director, oblong, tangent methods. Hyperbola by focus & directrix method, rectangular hyperbola. Cycloids (Simple, epicycloids, hypocycloid) spirals, involutes. Drawing tangent and normal to above curves. (5 Hours)
- Projections of straight lines: Projections of Points in different, quadrants. Lines inclined to both planes in different quadrants. H.T. & V. T. of lines. (5 Hours)
- Projections of planes,: Perpendicular & oblique planes. Regular & irregular polygons like triangle, pentagon, hexagon, circles, semicircles etc ( 1<sup>st</sup> quadrant Only) (4 Hours)
- Projections of solids: Regular geometrical solids like prisms, pyramids, cylinders, cones, frustums of cones & pyramids having axis inclined to both H.P. & V. P. ( 1st quadrant Only) (5 Hours)
- Projections of composite solids: A solid placed above another solid having combined axis parallel to one plane & inclined to another plane. Assembly of equal spheres, equal spheres placed around prism. pyramid, among equal cones. ( 1st quadrant Only) (3 Hours)

SECTION – B

- Sections of solids: Projections of solids cut by a section plane perpendicular to one reference plane, showing sectional view, true shape of section. ( 1st quadrant Only) (4 Hours)
- Development of surfaces: Parallel line & radial line methods. Development of prism, cylinder, cones, pyramids. Determination of shortest distance, drawing two views from given development. (4 Hours)
- Orthographic Projection : Drawing different\_ views including sectional views from given isometric view,
- Missing Views: Redrawing the given views, adding missing adding section to given view or adding sectional view. (1<sup>st</sup> quadrant only) (3 Hours)
- Isometric Projections: Drawing Isometric Views & Projections, from the given two views (4 Hours)

Term work : Term work shall consist of

- Half imperial size sheets containing at least 2 problems on each topic.
- A sketchbook having problems on applications of straight lines.
- Introduction to CAD: Hardware devices used in CAD, introduction to anyone drafting software, A print cut of 2 D drawings (at least 2 ) using CAD software.

Reference books:

Elementary Engineering drawing-N.D. Bhatt Engineering drawing - Mali & Chaudhary Engineering Drawing - N. H. Dubey

A Text Book of Engineering Graphics - M. L. Dabhade

## ELEMENTS OF ELECTRICAL ENGINEERING

Theory Exam – 100

Term - work 50 Hours - 4 / week

1. Basic Circuit Elements : Resistance, Inductance, Capacitance, Resistance temperature coefficient, self inductance, mutual inductance, coefficient of coupling, charging & discharging of capacitor, Energy stored in inductor & capacitor (5 hours)
2. Network Theorems: Law of division of current, loop analysis node analysis, superposition theorem, Thevenin's theorem, maximum power transfer theorem, Star / Delta transformation (6 hours)
3. Magnetic Circuits: Properties of Magnet, flux, flux density, field strength permeability, simple magnetic circuit, composite magnetic circuit (series & Parallel magnetic circuit) magnetic hysteresis. Area of hysteresis loop, magnetic losses. (6 hours)
4. A.C. Fundamentals: Generation of alternating emf, ms value, average value, form factor, peak factor pure resistive, inductive & capacitive circuit. (3 hours)
5. A.C.Circuits : a) Single phase A.C. circuits: R-L,R-C & R-L-C Series circuit, parallel circuit's, phasor method, admittance method, resonance, comparison of series & parallel resonance.  
(b) Three phase A.C. circuits: Generation of three phase emf, star & delta connection, voltage & current relationships. (6 hours)
6. Transformer: a) Single phase transformer, construction, working principle, emf. equation, types ideal & practical transformer,phas or diagram on no-load, & on-load, equivalent circuit, losses & efficiency, b) 3 phase transformer connection, star /star, star /delta/delta/star & delta/delta connections. (5 hours)
7. Electrical wiring System: Types of wiring system, wiring accessories, earthing, Measurement of insulation resistance (Meggers). (3 hours)
8. Illumination System: Lighting system, different types of lamps, high pressure sodium vapour lamp, CFL, CFT, WLED, metal Halide lamp, electronic choke, lux Meter. (4 hours)
9. Introduction to measuring instruments: Ammeters, Voltmeters, Wattmeter's, Energy meters & Mutimeters. (2 hours)

### Term Work:

The term work will be evaluated on the basis of continuous assessment, performance during the practical in the semester. The term work consists of a record of minimum eight experiments based on the above syllabus.

### List of Experiments:

1. Study of house & stair case wiring.
2. Study of different types of lamps.
3. Study of Multimeter.
4. Effect of temperature on resistance.
5. Measurement of power & energy in 1 phase circuit.
6. Verification of superposition theorem.
7. Verification of the Thevenin's theorem.
8. Measurement of Power factor of R-L-C Circuit.
9. Determination of efficiency of 1 Phase transformer.
10. Verification of transformation ratio.
11. Measurement of insulation resistance.
12. Measurement of Earth resistance.

### List of reference books :

1. Electrical technology: B. L. Thereja
2. Basic electrical Engineering: V. N.Mittal
3. Basic electrical Engineering : Edward Hughes.

### WORK SHOP PRACTICE-I

Practical: 2 Hours / Week

Marks - 50

1. Fitting : study of different tools of fitting & the processes involved in fitting. One composite job involving simple fitting operations like sawing, marking, filing using different types of files. Drilling, tapping & use of die for external threading.
2. Welding : Study of arc welding & gas welding equipments, demonstration of gas welding, brining, soldering. One job each involving butt joint, lap joint, Tee joint & angle joint. Edge preparation to be done wherever required.

3. Slack smithy : Study of smithy tools & the process. One job each involving operations of Changing cross section in size & shape (round to square <1 square to round), bending & forming etc.

Term work:

1. Submission of jobs as specified above
2. Submission of workshop diary showing details of the jobs done
3. Submission of Journal consisting information about the processes & tools.

Reference books:

1. A course in work shop technology by B.S. Raghuwala
2. Elements of work shop technology by S.K. Hazra Choudhury
3. Work shop technology part G1 by W.A. J. Chapman
4. Gerlin skip series No.1

PART -II

### ENGINEERING MATHEMATICS-II

Theory Exam: 100 marks

Theory: 4 hours / week

- a) Reduction Formulae: Reduction Formulas for  $\int \sin^m x \cos^n x dx$ ; Beta, Gamma functions relation between Beta and Gamma functions (6 hours)
- b) Multiple Integrals and its Applications: Double Integration Cartesian and polar Co-ordinates, Change of order of integration and triple integration. Application of integral Calculus to find area by double integration, surface area and volume of revolution, volume by triple integration, Mean value of a function, Root Mean square value ( 14 hours)
- c) Fourier Series: Dirichelet's conditions, Expansion of functions as a Fourier series, change of intervals, Even and odd functions, Half range Fourier series. ( 10 hours)
- d) Matrices: Rank of matrix, normal form, consistency of equations (Homogeneous and non-Homogeneous), Characteristic equations, Eigen values, Eigen Vectors, Inverse of a Matrix by Cayley Hamilton theorem, linear dependence and Linear independence of vectors, linear transformations, orthogonal transformation of a quadratic form. (10 hours).

Note:

More stress should be given on engineering Applications

Section (a) : Chapter Nos. : 1 and 2

Section (b) : Chapter NoS. : 3 and 4

1. A textbook of Applied Mathematics Volume I and II  
Author: P.N. Wartikar, J. N. Wartikar .
2. Higher Engineering Mathematics  
Author: Dr. B.S. Grewal
3. Advanced Engineering Mathematics  
Author: H. K. Dass
4. A textbook of Engineering Mathematics Volume I and II  
Author: D. T. Deshmukh
5. Engineering Mathematics Volume I, II and III  
Author: M. L. Bhatiya
6. A text book on engineering Mathematics  
Author: Bali, Saxena, Iyengar

### APPLIED SCIENCES- II

Theory Examination: 100 marks

Term Work :50 marks

Theory-2 Hours/Week

#### SECTION A-APPLIED PHYSICS

1. Matter Waves: Wave & particle duality of radiation, De-Broglies concept of matter waves and properties of matter waves, G. P. Thomson experiment on matter of waves. Heisenberg's uncertainty principle, experimental illustration of uncertainty principle. Schrodinger's time independent & time dependent wave equations, physical significance of wave function. (3 hours)
2. Band Theory of Solids : Energy band formation in solids, classification of solids on the basis of band theory. Fermi-Dirac distribution functions, position of Fermi Level in Intrinsic & Extrinsic semiconductor at various temperatures (with derivations). P.N. Junction diode depletion region &

- potential barrier, V-I characteristics. Bipolar junction transistor –working of transistor, transistor characteristics in CE configuration. Hall effect & Hall coefficient. (5 hours)
3. Laser & Fiber Optics : Interaction of radiation with matter, population inversion, pumping schemes & methods optical resonator, laser characteristics, applications of laser. Ruby Laser, He Ne Laser. Basic structure of optical fiber, propagation of light through fiber, acceptance angle & acceptance cone, numerical aperture (general) , step index & graded index fibers, advantages. (5 hours)
  4. Nuclear Physics : Nuclear fission in natural uranium, chain reaction, nuclear reactor, Nuclear fusion P-P cycle, C-C cycle. Particle accelerators – Cyclotrons, Betatron, Particle detector –G.M. counter. (4 hours)
  5. Theory of Relativity: Introduction , frame of reference ,Galillean coordinate transformations of space & time. (3 hours)

Note: Weightage To every topic is proportionate to hours allotted to each topic.

Term Work shall consist of any five experiments of the following.

1. Semiconductor diode characteristics.
2. Transistor input & output characteristics in CE configuration.
3. Determination of band gap of a semiconductor.
4. Determination of wavelength of laser source.
5. Refractive index of liquid using laser.
6. Measurement of electrostatic & magnetic sensitivity of CRT or CRO.
7. USE of CRO for measurement of electrical parameters.
8. Determination of Hall coefficient & study of hall effect.

Reference Books :

1. Engineering Physics: R.K.Gaur & Gupta
2. Engineering Physics: M.N. Avadharnulu & P.G.Kshirsagar
3. Optical fiber & Fiber optics communication system Subir Kumar & Sarkar
4. Fibre optics- Agrawal.
5. Perspective of modern physics – Arthur Besiser.

## SECTION B - APPLIED CHEMISTRY

Theory : 2 hours /week

1. Phase rule : Gibbs's phase rule, terms involved one component systems, water system, sulfur system. Two component systems, silver lead system, lead tin system, lever rule, iron carbon system. Use & limitations of phase rule.
2. Polymers: Introduction, nomenclature of polymers, classification of polymers. Types of polymerization, mechanism of addition polymerization, plastic properties. Thermoplastics & thermosetting resins. Resins: Cellulose derivatives, polytechnic or vinyl resins, polyamides. Thermosetting resins - Phenolic resins, epoxy resins, acrylic polymers. Rubber : Natural rubber, compounding of rubber, synthetic rubber.
1. Lubricants: Introduction, friction & Wear, classification of lubricants, mechanism of lubrication. Solid lubricants, graphite, molybdenum disulphide. Semi solid lubricants, liquid lubricants. Properties like viscosity flash & fire point, acid value, cloud & pour point. Selection of lubricants.
2. Ceramics: General properties, Structures, classification, Refractory, requirements of good refractory, classification, applications. Abrasives, properties of abrasives, classification & application. Portland cement, chemical composition, requirement of good cement, setting & hardening.
3. Fuels & combustion : Definition, classification, calorific value solid fuels, coal, proximate & fractional distillation Gaseous fuels petroleum origin, refining & fractional distillation, Gaseous fuel L.P. G. coal gas & biogas.

Term work shall consist of any five of the following experiments.

1. Study of micro structures of steel
2. Determination of viscosity of lubricant by Redwood viscometer .
3. Determination of acid value of lubricating oil.
4. Determination of percentage of iron in plain carbon steel.
5. Determination of acid value of plastic material.
6. Preparation of phenol formaldehyde resin.

7. Determination of Molecular weight of a polymer..
8. Preparation of urea formaldehyde resin.

Reference Books:

1. A textbook of Engineering Chemistry by S.S. Das.
2. Engineering Chemistry by Jain & Jain.
3. A solid State chemistry & its application by r. West, John Wiley & Sons
4. Applied Chemistry by N. Krishnamurthy, P. Vallimangaman, K. Jeya Subramanian (TMH Publication).

ENGINEERING MECHANICS

(One Paper: 3 Hours, Theory: 100 Marks, Term Work 50 marks)

STATICS

- a) Force System:
  - a) Force, Rigid body, Principles of transmissibility. Moment Principles of Superposition, Varignon's theorem. (2 hours.)
  - b) Coplanar Force System, Resultant by Analytical Method, Equivalent Force couple, Free body diagram, Equilibrium (Analytical methods) plane frames with joints. (2 hours)
  - c) Non Coplanar System: Resultant, Equivalent force couple, conditions of equilibrium of non coplanar forces. (3 Hours)
- 2) Friction: Definition, Significance, laws of Friction, Angle of Friction, cone of friction wedge friction, rolling friction, Belt friction and their application. (3 Hours)
- 3) Virtual Work: Principle application to different situations, such as Beams, Bodies in equilibrium etc. (3 Hours)
- 4) Plane Trusses: Analysis of plane determinate trusses, analytical methods. (3 Hours)
- 5) Properties of plane surfaces: Central Second Movement of area, transformation theorems, radius of Gyration. (4 Hours)

DYNAMIC

- a) Introduction to simple machines:
  - a) Worm and worm wheel
  - b) Differential axle and wheel
  - c) Single and double purchase crab.
  - d) Screw Jack.
- b) Kinetics of Particles:
  - a) Tangent & normal acceleration in Cartesian & Cylindrical Coordinates Projectiles: Study of motion if bodies thrown freely from any position. Linear Motion;/ Motion with constant and variable acceleration, Motion diagrams. Curvilinear Motion relation between Linear and curvilinear motion. Relative motion on parallel paths in like direction, relative velocity and resultant velocity (only introduction). (5 Hrs)
  - b) Kinematics of Rigid Bodies: Plane motion of rigid body, translation, rotation, instantaneous axis of rotation. (4 Hrs)
- 1) Kinetics of Particles:
  - a) Kinetics of Particles: Newton's Laws of Motion, Linear Motion of Particles and connected bodies, Principle of work and Energy and its application, Principle of impulse and Momentum conservation of Momentum, Impact: direct, central and Oblique (6 Hrs)
  - b) Kinetics of Rigid Bodies: Plane motion of a rigid body 'D' Alemberts Principle of Work and energy, Principle of impulse and momentum and their application (4 Hrs)

*Term work*

1. Graphical solution for:
  - a. System of non concurrent forces, One problem with resultant as a force and One problem with resultant as a couple.
  - b. Equilibrium of Non Concurrent force systems: One problem.
  - c. Friction: Wedge & Block: one problem.

d. Analysis of Trusses: Two Problems.

2. Any Five Experiments from below:-

a) Moment of Intertia of fly wheel.

1. Belt friction
2. Member forces in Trusses.
3. Differential axle & Wheel or Differential Pulley Block.
4. Single purchase crab or spur gear pulley block.
5. Worm & Worm Wheel
6. Screw Jack.

3. Assignments:

- a. Three assignments of static's.
- b. Two Assignments of Dynamics.

Text Books.

- A) Mechanics for Engineers: Static's of Dynamics by Bear & Johnston.
- B) Engineering Mechanics by F.L.Singer.

Reference books:

- b) Engineering Mechanics by Nelson (Schaum Series)
- c) Engineering Mechanics by V.S.Mokashi Vol. I & II
- d) Engineering Mechanics by Tayal A.K.
- e) Applied Mechanics by I.B.Prasad.

### ELEMENTS OF MECHANICAL ENGINEERING

Theory Marks: 100

Term Work: 50

Hours: 4/ weeks

1) Introduction to Engineering Materials:- Introduction properties and Application of Materials, Steels, Alloy Steels, Stainless steel, Non Ferrous Metals Copper, Aluminum, Nickel, Zinc, Composite materials.  
(Hours 4)

2) Manufacturing processes: Working Principle and Applications of – Casting, Forging, Welding, Brazing, Soldering and Rolling, Machining Processes- Turning, Shaping, Milling, Drilling, Planning, Boring, Grinding, Broaching.  
(Hours 5)

3) Machine Tools:- Working Principle, Operation and application of- simple lathe Machine, Shaping Machine, Milling Machine, Drilling Machine, Planning Machine, Broaching Machine, Boring Machine, and Grinding Machine.  
(Hours 5)

4) Power Transmitting Elements:- Working Principle and Application of Axle, and Spindles, Couplings. Friction Clutches types of clutches. Bearings, Brakes, types of brakes. Drives, Belt drives, construction, geometrical relationship, chain drives, Gears classification of gears, terminology of Spur Gear, Velocity ratio.  
(Hours 7)

5) Fundamentals of Thermodynamics: Thermodynamic system, types of systems. Thermodynamic properties, state, state function, path function, process & cycles, thermodynamic equilibrium, quasi static process. Pressure & Pressure measurement (Analytical Treatment). Temperature, Zeroth law of thermodynamics, Measurement of temperature, Thermometer, Forms of Energy, Work transfer, Pdv work, other forms of work transfer, Heat Transfer, Concept of Specific Heat, Sensible Heat, Latent heat, Entropy.  
(Hours 6)

6) First Law of Thermodynamics: Law of conservation of Energy, Joule's experiment, PMM-1 first law for cyclic and non cyclic processes (non-flow processes) concept of internal energy, enthalpy. Ideal Gases-

Concept of constant pressure, constant volume, constant temperature, Adiabatic, Polytropic, Throttling Processes and their representation on P-v & T-s diagrams (fundamental numerical treatment) (8 Hours)

7) Introduction to Thermal Machines: Working principle and application of internal combustion (2 stroke and 4 stroke engines) Steam Turbines, Compressor, Refrigerator and Air Conditioner. (Description with Block Diagrams) (Hours 4)

8) Sources of Energy: Renewable & Non renewable energy, Principle & Working of Steam Power Plant, Nuclear Power Plant, (Description with block diagrams). (Hours 3)

#### Term work

Term work shall consist of Eight experiments & Assignments based on chapter 3,4,& 8.

1. Study and demonstration of Simple Lathe Machine,
2. Study and demonstration of Drilling Machine.
3. Study and demonstration of Shaping Machine.
4. Study and demonstration of I. C. Engine.
5. Study and demonstration of Refrigerator.
6. Study and demonstration of Compressor.
7. Study and demonstration of Different types of Gears.
8. Study and demonstration of Clutch.
9. Study and demonstration of Types of Brakes.
10. Study and demonstration of Simple Lathe Machine.
11. Assignments shall be based on Units 3, 4 and 8.

#### Recommended Books.

1. Engineering Thermodynamics by P.K. Nag Published by Tata Mc-Graw Hill Publication.
2. Engineering Thermodynamics by R.K.Rajput Published by Laxmi Publication.
3. Engineering Thermodynamics by V.M. Domkundwar.
4. Thermal Engineering by P.L. Ballaney Published by Khanna Publishers.
5. Machine Design by R.S.Khurmi Published by Eurasia publishing House.
6. Machine Design by V.B.Bhandari Published by Tata Mc-Graw Hill Publication.
7. Work Shop Technology ( Vol I & II) By Hajra Choudhary, Bose
8. Manufacturing Technology P.N.Rao.
9. Production Technology by R.K.Jain, Published by Khanna Publishers.

### ELEMENTS OF ELECTRONICS AND COMPUTER ENGINEERING SECTION – A (ELECTRONICS ENGINEERING)

- 1) Electronics Components :- Review of semiconductor devices like diode, transistor, optoelectronics devices, LED, LCD, Photodiode 7 Segment displays, Zener Diode, MOSFET, UJT, JFET & SCR (3 hours)
- 2) Power Conversion :- Rectifiers, Rectifier types, Filter Types Regulated Power supply. (2 hours)
- 3) Introduction to Amplifier :- Ideal Amplifier and its Characteristics, Performance measures like gain, frequency response, distortion and stability, CE, CB, AND CC CONFIGURATION AND COMPARISON AND THEIR USES. Introduction to power amplifiers and oscillators. (4 hours)
- 4) Operational Amplifier :- Properties and characteristics of Ideal and practical operational amplifiers basic parameters and elementary applications. (2 hours)
- 5) Logic gates and Number System :- Decimal, Binary, Octal, Hexadecimal and their Conversion, Binary addition, Binary Subtraction using Complement, Basic Logic Gates, Universal gates, Boolean Algebra and their implementation, introduction to logic families. (5 hours)
- 6) Transducer & Measuring Systems :- Measurement system and their characteristics, Digital Multi meter Cathode Ray Oscilloscope Introduction to transducer for temperature, Measurement Flow & Level measurement, Thermocouple, thermistor, orifics plate & capacitive type. (4 hours)

Note :- The Subject should be treated in descriptive manner only

#### Experiment List :-

Term Work shall consist of any 5 experiments of the list.

3. Testing of Active & passive Electronic Components
4. Regulation Characteristics of Rectifier with filters.
5. Study of Op-Amp and their different circuits like adder, inverter, and differentiator integrator.
6. Study of Logic gates, Verification of logic circuits using truth table.

7. Study of transducer like temperature, flow & level (any two).
8. Study of CRO and measurement of voltage, frequency etc, using CRO

References Books :-

- Millman & Halkies : Integrated Electronics.
- Ramakant Gaikwad : Linear Integrated circuits & Op-Amp.
- S. K. Khedkar : Electronics Instrumentation.
- P.K. Jain : Modern Digital Electronics.
- Nakara & Choudhari : Instrumentation measurement and analysis.
- Millaman & Taub : Pulse, Digital & Switching wave form (TMH)
- B.L. Theraja : Basic Electronics (S Chand)

## SECTION B – COMPUTER PROGRAMMING

Theory hours : 2/week

Marks : 50

### PROGRAMMING IN C LANGUAGE :

1. Introduction to C, importance to C, to write algorithm, Drawing flowchart, Basic structure of C program, creating a simple C program, executing a C program, why to include header files? Date types, Operators and Expressions : Character Set, keywords and variable, defining symbolic constants Arithmetic operator, relational operators, logical operators, assignment operator, increment and decrement operators, conditional operator, library functions, arithmetic operators, operators, operator precedence and associativity. (4 hours)
2. **Data Input output, Branching and loops** : Reading a character, writing a character, formatted input and formatted output. Decision making and if else statement, nesting of if else statement, the switch statement the ? : Operator, the go to statement The While statement, the do statement, the for statement (4 hours)
3. **Arrays and Function** : One dimensional arrays, two dimensional arrays, sorting algorithm bubble sort and insertion sort. Defining a function, function prototype, return type, passing arguments, call by value, call by reference, recursive function, passing array to function, scope rule. (6 hours)
4. **Introduction to Open Source Internet Technology** : What is open source? Advantage of open source, Internet terminology : e-mail, website, web page, web browser, web server etc., introduction to web server "Apache" basic syntax of PHP simple web pages using PHP, Introduction to Database My Sql, simple table creation in Mysql. (6 hours)

### Term Work :

The term work consists of a record of minimum 10 programs based on above syllabus. The term work will be evaluated on the basis of continuous assessment, performing the practical during the semester and an internal oral conducted by the subject teacher.

### **Reference Books :**

1. Yashwant Kanetkar, "Let us C" , BPB Publications.
2. Vikram Vaswani, "How to do everything with PHP and Mysql" TMH publication
3. Dennis Ritchie Brian W Kernighan, "The C Programming Language" PHI Publications.

### Suggestive list of programs : Computer Programming (in "C")

1. Program to find the sum of individual digits in a integer.
2. Program to find Largest of three numbers.
3. Program for sorting the numbers in ascending/ descending order.
4. Program to find the roots of Quadratic equation.
5. Program to convert decimal number to binary and vice-versa.
6. Program to construct pyramid of digits.
7. Program to reverse the given string.
8. Program to find factorial of given number using function.
9. Program to generate the specified mathematical series.
10. Creation of simple web pages using PHP.
11. Creation of website of 2/3 pages using My Sql.

## **WORK SHOP PRACTICE –II**

Marks :50

Practical: 2 hours/week

- a) **Plumbing** : Study of various tools used in plumbing like pipe die wrench etc. study of various pipe joints. Preparation of a job amongst a group of students ( not more than four ), involving thread cutting on G. I. pipe & construction of a plumbing pipe line from a source to the outlet point involving at least 4 pipe accessories & a cork.
- b) **Carpentry** : Study of different carpentry tools & the process study of different types of wood, laminations, adhesives, polish & wood furniture material. importance of trees in environment with their contribution to human life is to be told to the students. Preparation of one composite job involving three different joints. One job involving wood turning operation on wood Turin lathe.
- c) **Sheet metal working** : Study of different tools, hand fly press, simple die. Gauges & materials. Study of different joints, folds & bending. Preparation of one job involving development of surfaces, marking, cutting bending, joint preparation by folding & soldering.

### **Term work :**

3. Submission of jobs as specified above.
4. Submission of a workshop diary having details of the jobs completed.
5. Submission of a journal consisting of information about various tools used & processes studied.

### **Reference Books:**

1. A course in work shop technology by B.S. Raghuwanshi.
2. Elements of work shop technology by S.K. Hazra Choudhury.
3. Work shop technology part 01 by W.A. J. Chapman.
4. Gerlin skip series No. 1.

### **FE List of Experiment**

#### **PART – I**

#### **1. Applied Science –I**

##### **Section A – Applied Physics.**

Term Work shall consist of any five experiments of the following.

1. Determination of "e" by Millikan's oil drop method.
2. Determination of "e/m" of electrons by Thomson method.
3. Determination of radius of curvature of a Plano-convex lens by Newton's ring.
4. Measurement of wavelength of source using plane diffraction grating.
- 5: Resolving power of Telescope.
6. Measurement of specific rotation of sugar solution by Laurent's half shade polarimeter.
7. Determination of velocity of ultrasonic in liquid by ultrasonic interferometer.
8. Measurement of dielectric constant.

##### **Section B – Applied Chemistry**

Term work shall consist of any five experiments of the following.

1. Study of crystal structure with models.
2. Determination of conductance & conductor metric titration
3. Determination of dissolved Oxygen (D.O.) in water sample
- 4, Determination of Calcium & Magnesium hardness using E.D.T.A.
5. Determination of free Chlorine in water sample.
6. Determination of PH values of solution by indicator & PH meter
7. Study of various factors affecting rate of elector-chemical corrosion
8. Study of various factors responsible for water pollution.

#### **2. Elements of Civil engineering.**

**Term work:** Term work shall consist of sketches on 1/2 imperial size sheets. (minimum 15 sketches)

1.	Foundation types	1 sketch
2.	Stone masonry	1 sketch
3.	Brick masonry	2 sketch
4.	Doors	2 sketch
5.	Windows	2 sketch
6.	Stairs	2 sketch

7.	Floors	2 sketch
8.	Roofs	2 sketch
9.	Machine foundation	2 sketch
10.	Section through wall	1 sketch
11.	Flow diagram of conventional water & waste water & treatment	1 sketch
12.	Section of dams	1 sketch
13.	Chair and compass survey	1 sketch
14.	Practical use of dumpy level	1 sketch

### 3.Engineering Graphics.

Term work : Term work shall consist of

1. Half imperial size sheets containing at least 2 problems on each topic.
2. A sketchbook having problems on applications of straight lines.
3. Introduction to CAD: Hardware devices used in CAD, introduction to any one drafting software, A print cut of 2 D drawings (at least 2 ) using CAD software.

### 4. Elements of electrical engineering.

Term Work:

The term work will be evaluated on the basis of continuous assessment, performance during the practical in the semester. The term work consists of a record of minimum eight experiments based on the above syllabus.

List of Experiments:

1. Study of house & stair case wiring.
2. Study of different types of lamps.
3. Study of Multimeter.
4. Effect of temperature on resistance.
5. Measurement of power & energy in 1 phase circuit.
6. Verification of superposition theorem.
7. Verification of the Thevenin's theorem.
8. Measurement of Power factor of R-L-C Circuit.
9. Determination of efficiency of 1 Phase transformer.
10. Verification of transformation ratio.
11. Measurement of insulation resistance.
12. Measurement of Earth resistance.

### 5. Work Shop Practice I.

Term work:

1. Submission of jobs as specified above
2. Submission of workshop diary showing details of the jobs done
3. Submission of Journal consisting information about the processes & tools.

### PART – II

#### 1. Applied Science –II

Section A – Applied Physics.

Term Work shall consist of any five experiments of the following.

1. Semiconductor diode characteristics.
2. Transistor input & output characteristics in CE configuration.
3. Determination of band gap of a semiconductor.
4. Determination of wavelength of laser source.
5. Refractive index of liquid using laser.
6. Measurement of electrostatic & magnetic sensitivity of CRT or CRO.
7. USE of CRO for measurement of electrical parameters.
8. Determination of Hall coefficient & study of hall effect.

Section B – Applied Chemistry

Term work shall consist of any five of the following experiments.

1. Study of micro structures of steel
2. Determination of viscosity of lubricant by Redwood viscometer .

3. Determination of acid value of lubricating oil.
4. Determination of percentage of iron in plain carbon steel.
5. Determination of acid value of plastic material.
6. Preparation of phenol formaldehyde resin.
7. Determination of Molecular weight of a polymer..
8. Preparation of urea formaldehyde resin.

## 2. Engineering Mechanics.

*Term work*

1. Graphical solution for:
  - a. System of non concurrent forces  
One problem with resultant as a force and  
One problem with resultant as a couple.
  - b. Equilibrium of Non Concurrent force systems: One problem.
  - c. Friction: Wedge & Block: one problem.
  - d. Analysis of Trusses: Two Problems.
2. Any Five Experiments from below:-
  - a) Moment of Intertia of fly wheel.
  - A) Belt friction
  - B) Member forces in Trusses.
  - C) Differential axle & Wheel or Differential Pulley Block.
  - D) Single purchase crab or spur gear pulley block.
  - E) Worm & Worm Wheel
  - F) Screw Jack.
3. Assignments:
  - a. Three assignments of static's.
  - b. Two Assignments of Dynamics.

## 3. Elements of Mechanical. Engineering.

*Term work:*

Term work shall consists of Eight experiments & Assignments based on chapter 3,4,& 8.

1. Study and demonstration of Simple Lathe Machine,
2. Study and demonstration of Drilling Machine.
3. Study and demonstration of Shaping Machine.
4. Study and demonstration of I. C. Engine.
5. Study and demonstration of Refrigerator.
6. Study and demonstration of Compressor.
7. Study and demonstration of Different types of Gears.
8. Study and demonstration of Clutch.
9. Study and demonstration of Types of Brakes.
10. Study and demonstration of Simple Lathe Machine.
11. Assignments shall be based on Units 3, 4 and 8.

## 4. Elements of Electronics And Computer Engineering.

Section A- ( Electronics Engineering)

Note :- The Subject should be treated in descriptive manner only

Experiment List :-

Term Work shall consist of any 5 experiments of the list.

- Testing of Active & passive Electronic Components
- Regulation Characteristics of Rectifier with filters.
- Study of Op-Amp and their different circuits like adder, inverter, and differentiator integrator.
- Study of Logic gates, Verification of logic circuits using truth table.
- Study of transducer like temperature, flow & level (any two).
- Study of CRO and measurement of voltage, frequency etc, using CRO

## Section B– Computer Programming.

### Term Work :

The term work consists of a record of minimum 10 programs based on above syllabus. The term work will be evaluated on the basis of continuous assessment, performing the practical during the semester and an internal oral conducted by the subject teacher.

### Suggestive list of programs : Computer Programming (in “C”)

1. Program to find the sum of individual digits in an integer.
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3. Program for sorting the numbers in ascending/ descending order.
4. Program to find the roots of Quadratic equation.
5. Program to convert decimal number to binary and vice-versa.
6. Program to construct pyramid of digits.
7. Program to reverse the given string.
8. Program to find factorial of given number using function.
9. Program to generate the specified mathematical series.
10. Creation of simple web pages using PHP.
11. Creation of website of 2/3 pages using My Sql.

### **WORK SHOP PRACTICE –II**

#### Term work :

1. Submission of jobs as specified above.
2. Submission of a workshop diary having details of the jobs completed.

Submission of a journal consisting of information about various tools used & processes studied