

**INSTITUTE OF ENGINEERING,
JIWAJI UNIVERSITY, GWALIOR
SEMESTER – I
COURSE CONTENTS**

Course Title	Course Code	Credits – 6				Theory Marks
		Engineering Chemistry	B.E.-101	L	T	P
3	1			2	6	Min. Marks - 35 Duration – 3 Hrs.

UNIT – I

Water Analysis & Treatment : Source, impurities; hardness and its units, industrial water requirement, characteristics, softening of water by various methods (L.S., zeolite, ion exchange resin) boiler trouble (carry over, scale and sludge, caustic embrittlement). Boiler corrosion causes, effect & remedies, internal treatments to boiler feed water, characteristic of municipal water & its treatment, water analysis (determination of alkalinity, temporary and permanent hardness by complexometry, D.O., B.O.D., C.O.D., chlorides, sulphates, dissolved CO₂ & residual chlorine, T.D.S.) numeric problems based on water analysis and water softening processes.

UNIT – II

Fuels and Combustion : fossil fuels & classification, calorific value & its determination by Bomb Calorimeter & its numerical, proximate and ultimate analysis data, Rankin of solid fuel, carbonization manufacturing of coke & recovery of by product petrochemicals derived from alkenes alkenes, benzene & its homologues. Cracking of higher hydrocarbon & mechanism of cracking, Knocking, relationship between knocking and structure of hydrocarbon, improvement of anti knocking characteristics of IC engine fuels, Diesel engine fuels, octane number, fuel gas analysis, combustic and it related numerical problems.

UNIT – III

Lubricants : introduction, mechanism of lubrication, classification of lubricant, lubricating oils, grease and semisolid lubricant, solid lubricant, synthetic lubricant, properties and testing of lubricating oils (viscosity & viscosity index, flash and fire points, cloud and pour point, Aniline value steam emulsion number, neutralization No., specification value, Iodine value, Carbon residue) numerical problems based on viscosity index.

* At coal and the signification, calorific value computation based at utilization analysis data.

UNIT – IV

Polymer (Fibers, Rubbers & Elastomers, Plastic) Introduction, Classification, type of polymerization, reaction mechanism, fibers cellulose & synthetic Nylon, Deco ran, polyvinyl, Isolation from latex, Vulcanisation & its mechanism cis-trans rubber Elastomers - Styrene rubber (GR-S) and nitrile rubber (GR-A) Neoprene, Butyle rubber, Thicols, Polyurethanes:

Plastic: Classification, thermoplastic & thermosetting plastics, manufacturing of polythene, PVC, PVA, polyacrylates, acrylonitrils, phenol formaldehyde resins, urea formaldehyde resin & glyptals, silicone resin & its flow sheet diagrams.

UNIT – V

Cement and Refractories : Classification of cement, I.S.I. specification, composition and manufacture of Portland cements, setting & hardening of lime mortor, plaster of Paris, magnesium oxy chloride, Decay of cements.

Refractories : Definition, classification, properties & uses of silica bricks, fire clay, dolomite, magnetite, carborundum, chromites bricks.

UNIT – VI

Instrumental techniques in chemical analysis: Introduction, Infrared, Ultraviolet, NMR spectrophotometry, Gas chromatography, colorimetry, Lamberts and Beer's law.

PRACTICAL :

1 Water Testing :

- (i) Determination of total hardness by complex metric, titration method.
- (ii) Determination of mixed alkalinity (a) OH^- & CO_3^{2-} (b) CO_3^{2-} (c) CO_3^{2-} & HCO_3^-
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- (iii) Chloride ion estimation by Argentometric method.

2 Fuels & Lubricant Testing :

- (i) Flash & fire points determination by
 - (a) Pensky Martin Apparatus,
 - (b) Abel's Apparatus
 - (c) Cleveland's open cup Apparatus
- (ii) Viscosity and Viscosity index determination by
 - (a) Redwood viscometer No. 1
 - (b) Redwood viscometer No. 2
- (iii) Proximate analysis of coal
 - (a) Moisture content
 - (b) Ash content
 - (c) Volatile matter content
 - (d) Carbon residue
- (iv) Stream emulsification No. & aniline point determination
- (v) Cloud's and pour point determination of lubricating oil.

3 Alloy Analysis :

- (i) Determination of percentage of Fe in an iron alloy by redox titration using N-Phenyl anthracitic acid as internal indicator.
- (ii) Determination of Cu and or Cr in alloys by Iodometric titration.

SUGGESTED FURTHER READINGS :

- 1 Kuriacose & Rajaram – Chemistry in Engineering & Technology – Vol.II
- 2 S.S.Dara – A text book of Engineering Chemistry
- 3 Gopalan Venkappaya – Engineering Chemistry

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Course Title	Course Code	Credits – 6				Theory Marks
Engineering Mathematics – I	B.E.-102	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	0	4	

UNIT - I

Maclaurin's and Taylor's theorem, Partial differentiation. Euler's theorem and its application in approximation and error. Maximum and minimum one and two variables. Tangents and normal, curvature, in determinants form.

UNIT - II

Definite Integral as limit of a sum, Application in summation of series, Beta and Gamma function, Double and triple integral, length of the volumes and surfaces.

UNIT - III

Ordinary differential equation of first order, linear higher order differential equation with constant coefficients, Homogeneous linear differential equation. Simultaneous differential equations.

UNIT – IV

Rank, solution of simultaneous equation by elementary transformation, Consistency of equation, Eigen value and Eigen vectors, Cayley – Hamilton theorem. Algebraic logic, fuzzy logic.

UNIT - V

Boolean Algebra, Principle of Duality basic theorem. Boolean expression and function. Graph theory, Graph, Sub graph, degree and distance, Tree, Cycles Network.

SUGGESTED FURTHER READINGS :

- 1 Gorakhprasad – Differential calculus
- 2 B.S. Grawal – Higher Engineering Mathematics
- 3 A.R. Vashishta & H.K. Sharma – Integral calculus
- 4 Thakur & Shrivastava – Booleam algebra

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COURSE CONTENTS**

Course Title	Course Code	Credits – 6				Theory Marks
Communication Skill	B.E.-103	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	0	4	

UNIT – I

Languages as Skill of Communication: Linguistic Techniques, Modern usage and style comprehension skill, English phonetic symbols/signs, Oral Presentation – Audition.

UNIT – II

Application of Linguistic Ability : Writing of definitions of engineering terms, Objects, processes and principles (Listening) Topics of General Interest, Reproduction from business, daily life, travel, health buying & selling, company structure, systems etc.

UNIT – III

Letter Writing : Application, Enquiry, Calling quotations, Tenders, Order and complaint.

UNIT – IV

Precise Writing, Noting and drafting, Technical descriptions of simple engineering objects and processes (Writing) Report writing, Precise writing, note writing, slogan writing comment, speech advertising.

UNIT – V

Writing technical reports of the type of observation report, Survey report, Report of trouble, Laboratory report and project report on the subjects of engineering (speaking) Vocabulary,

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presentation, Demonstration, Conversation – Telephone media, Socializing, Cultural events, Debates, Speech.

SUGGESTED FURTHER READINGS :

- 1 Krishna Mohan, Prentice Hall India – Business correspondence and report writing
- 2 W. Stannard Allen, Longmans – Living English Structure
- 3 Dev Willys Collin (Harper) – Student’s Grammer
- 4 R.K.Bansal & I.B. Harrison (Orient Longman) – Spoken English for India
- 5 Joans and Alexande (OUP) – New International Business English
- 6 David P. Harris (McGraw Hill Pub.) – Testing English as a Second Language

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Course Title	Course Code	Credits – 6				Theory Marks
		L	T	P	C	
Basic Electrical Engineering	B.E.-104	3	1	2	6	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.

UNIT – I

AC Circuits : Review of I phase as circuits under sinusoidal steady state. Active, reactive and apparent power, power factor, 3-phase AC circuits, star and delta connection, 3-phase source and load. Analysis of balanced and unbalanced system. Power in 3-phase circuits and their measurements.

UNIT – II

Magnetic Circuits : Review of laws of electromagnetism. Flux, mmf and their relation, Analysis of magnetic and electric circuits. Saturation, B-H curves, fringing and leakage. AC excitation in magnetic circuits. Induced voltage, Hysteresis effect and eddy currents.

UNIT – III

Transformers : Single – phase transformer, Basic concepts and construction features, types of transformers. Voltage, current and impedance transformation. Equivalent circuits. Per unit system, voltage regulating, losses and efficiency. Testing of transformers Autotransformers.

UNIT – IV

Semi Conductor Electronics : Method of element emmiton, application formation of PN Junction condition in PN Junction effect of temp., construction and char. Junction diode, Zener diode, Tunnel diode, Photo diode and varature.

UNIT – V

Transistor : PNP 2 NPN current in transistor char. In diff char. (CB, CE, CC) 22H Parameters and application. Transistor as amplifier, Method of biasing. Voltage 2 current gain. Types of feed blue FET amplifier. Introduction to SCR, DIAC, TRIAC and other power semiconductor devices.

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Course Title	Course Code	Credits – 6				Theory Marks
Engineering Graphics	B.E.-105	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		2	2	2	6	

UNIT – I

Scales : Representative fraction, plain scales, diagonal scale, scale of chords.

Conic Section : construction of ellipse, parabola and hyperbola by different method and logarithmic spirals.

UNIT – II

Projection of point and line, true inclinations and true length of straight lines, traces of straight lines, auxiliary planes.

UNIT – III

Projection of plains and solid: Projection of plains, projection of polyhedra pyramids, cylinder, cone and sphere.

UNIT – IV

Section of Solid: Section of right solid by normal and inclined planes.

Development of Surfaces: parallel line and radial line method for right solid method of triangulation for oblique pyramids, cones and transition pieces.

UNIT – V

Intersection of surfaces: Intersection of prisms, pyramids, cylinder, cone, by line method, and cutting plane method.

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Isometric projection: isometric scale, isometric axes, and isometric projections of planes and solids.

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COURSE CONTENTS**

Course Title	Course Code	Credits – 6				Theory Marks
Engineering Physics	B.E.-201	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	2	6	

UNIT - I

Quantum Physics : matter waves and its experimental verification, wave group and particle velocity their relations. Uncertainty principle with elementary proof and application microscope & single slit. Characteristics and continuous X – ray. Duan limits, Moseley's law, Bragg's equation, Laws of diffraction Bragg's spectrum Compton effect. Electron reflection, Bethe's law, electron gun, working application of CRT & CRO viz measurement of voltage, frequency and phase etc. Bain bridge mass spectrograph & electron microscope.

UNIT – II

Ray & Wave Optics : Cardinal point of co-axial lens system. Nodal slide experiment. Identify spherical & chromatic aberration, coma, astigmatism and distortion ramsden & Huygen's eyepieces and their cardinal points, Fresnel's biprism, Newton's ring and Michelson's interferometer experiments. Diffraction at single slit Double slit and diffraction grating. Concept of polarized light, brewsrer's laws, Double reflection, Nicol prism, Quarter & half wave plate. Idea about circularly & elliptically polarized light, Ray light criteria, RP of telescope, Microscope, Grating and Prism.

UNIT – III

Nuclear Physics : Static properties and applications of nuclear models: Gammow, liquid and shell models, linear particle accelerator, cyclotron, synchrotron, synchrocyclotron &

betatron, differential cross section, chain reaction, critical size, nuclear fusion & fission nuclear reactors, its sight select and working, Giger – Muller counter, mass spectrographs, idea of cosmic rays.

UNIT – IV

Digital Electronics : Number system used in digital electronics: decimal, Binary, Octal, Hexadecimal, Conversion of decimal to binary, octal & hexadecimal, and vice versa, addition, subtraction, multiplication, division floating points, numbers, signed and unsigned numbers 2's & 1's compliment, Boolean algebra AND, OR, NOT, NOR, NAND, EX-NOR, EX-OR gates & their representation, truth table, laws of Boolean algebra, DE-morgan theorem, De-morganization conversion of logic circuit from one type to universal logic gates circuits.

UNIT – V

Dielectrics : Dielectric constant, moment of charge distribution, potential and field due to dipole. Torque & force on a dipole in an external field. Works done in rotating a dipole. Dielectric polarization, polar & non – polar dielectric. Gauss's law, E,P & D vectors, different type of polarization. Concept of internal fields. Clausius – Mossotti relationship. Langevin theory of dipolar orientation. Ideal & loss dielectrics. Loss tangent & idea of complex permitivity.

Laser & Fiber Optics : stimulated & spontaneous emission, active medium, population inversion pumping, optical resonators, properties of laser beam, principal of ruby, Nd: YAG, He – Ne & carbon dioxide lasers & their engineering uses and application. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, Propagation of light through fiber (Ray theory), pulse dispersion, attenuation, losses & various uses.

SUGGESTED FURTHER READINGS :

(1) Brij lal & Subhraminyan – A text book of Optics

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- (2) Brij lal & Subhraminyan – Atomic & Nuclear physics
- (3) S. H. Patel – Elements of modern physics
- (4) A. Beiser - Concepts of modern physics
- (5) P.G. KSHIRSAGAR- Engg. Phy.
- (6) S.L. Gupta-Concepts of Morden Physics
- (7) Malnino- Leech- Digital Electronics.

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Course Title	Course Code	Credits – 6				Theory Marks
		L	T	P	C	
Engineering Mechanics – II	B.E.- 202	3	1	2	6	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.

UNIT- I

Statics : Concurrent, Non concurrent and parallel force in plane, Composition resolution of force, free body diagrams, moment of a force and varignons theorem, condition of equilibrium, polygon of forces and funicular of forces, principal of virtual work.

UNIT - II

Trusses: analysis of forces in the members of a truss, method of joints, method of section, graphical method for perfect trusses.

UNIT - III

Centroid and moment of Inertia: location of Centroid and moment of Inertia of plane bodies, Parallel of perpendicular axis theorem, product of inertia, principal moment of solid bodies.

Shear force and bending moment diagram in cantilever, simply supported beam and overhanging beam with concentrated load distributed load and couple, point of contrafluxer, relationship between bending moment and shear force pure bending.

Unit – IV

Friction : Coulombs law of friction, friction on inclined planes, screw and nut friction, ladder and wedge friction, friction in journal collar bearing, uniform pressure and uniform wear, lifting machines.

Unit – V

Transmission of Power : Transmission of power through belt, rope and gear, ratio and tension on tight side and slack side, centrifugal tension, spur, bevel, worm gearing, rack and pinion gear, gear trains, epicyclic gear train.

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Course Title	Course Code	Credits – 6				Theory Marks
Basic Mechanical Engineering	B.E.-203	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	2	6	

UNIT - I

Introduction to thermo dynamics: heat and work, I & II law of thermodynamics, carnot cycle and efficiency of heat engines.

UNIT – II

Steam : Sensible heat, latent heat, internal heat, enthalpy, dryness, fraction and determination, steam process at constant pressure, constant volume and constant enthalpy.

UNIT – III

Boilers : Name and function of principle parts, classification, boiler mountings and accessories, draught – natural and artificial, height of chimney, equivalent evaporation and boiler performance.

UNIT – IV

Steam Engines : Description and working, hypothetical and actual indicator diagram, diagram factor, HP developed and efficiency e.g. Mechanical efficiency, brake thermal efficiency and indicated thermal efficiency, governing, cut off and throttle, compound engines (description and working only).

UNIT – V

IC Engines : description and working of four stroke petrol engines, four stroke diesel engine and two stroke diesel engine, petrol engine & relative merits and demerits.

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Course Title	Course Code	Credits – 6				Theory Marks
Basic Civil Engineering	B.E.-204	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	2	6	

UNIT - I

Engineering Materials : Stones, Bricks, Timber, Cement, Cement concrete, Concrete proportioning, mixing, curing, properties, tests & uses.

UNIT – II

Elements of building construction, planning with respect to orientation, Foundation, footings, grillage and arch foundations, pile foundation, foundation on black cotton soil.

UNIT – III

Building Construction : Super structure – stone and brick masonry walls, plastering and pointing, floors, roofs, doors, windows, lintels, staircases – type and their suitability, Dampness and its prevention, cost effective construction techniques in mass housing schemes.

UNIT – IV

Introduction to surveying, instruments used in chaining, plane table and related device. Measurements of distances – conventional and EDM method, measurement of directions by different method, measurements of elevations by different method.

UNIT – V

Mapping details and contouring, measurements of areas, volumes, application of measurements in quantity computation, introduction of remote sensing and its applications.

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Course Title	Course Code	Credits – 6				Theory Marks
Engineering Mathematics – II	B.E.-205	L	T	P	C	Max. Marks - 100 Min. Marks - 35 Duration – 3 Hrs.
		3	1	0	4	

UNIT - I

Fourier Series and half range Fourier series, Fourier Integral.

Laplace transforms and their basic properties, Application in solution of ordinary differential equation.

UNIT – II

Second order differential equation with variables coefficient, Solution by series method with emphasis on legendre's and bessel's equation analytic function and conformal transformation.

UNIT – III

Linear and Non-linear Partial Differential equation of first and second order with constant co-efficient, separation of variable method, application in solution of wave and heat conduction equation.

UNIT– IV

Vector calculus, Vector Differential Divergence, Gradient and curl, Vector Integration, Gauss Divergence and stoke's theorem.

UNIT – V

Bionomial, Normal and poisson's distribution, Curve fitting, Index number, Reliability for casting and decision theory.

SUGGESTED FURTHER READINGS :

- (1) Vashishta & Gupta – Integral Transform
- (2) Spiel – Laplace Transform
- (3) A.R. Vashishta – Vector Calculus
- (4) B.S. Grawal – Higher Engineering Maths

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