

### Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
Basic Science BS-1	Engineering Chemistry	BE101	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**Branch:** Common Semester

**Course:** BE101 Engineering Chemistry

#### Unit I

##### **WATER ANALYSIS & TREATMENT:**

Sources, Impurities, Hardness & 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. Characteristics of municipal water & its treatment, water analysis (determination of alkalinity, temporary and permanent hardness by complexometry,) Numerical problems based on water analysis and water softening processes.

#### Unit II

##### **FUELS & COMBUSTION:**

Fossil fuels & classification, Calorific value, Determination of calorific value by Bomb calorimeter Proximate and Ultimate analysis of coal and their significance, calorific value Computation based on ultimate analysis data, Carbonization, Manufacturing of coke & recovery of by products. Cracking of higher Hydrocarbons & mechanism of cracking, Knocking, relationship between' knocking & structure of hydrocarbon, improvement of anti knocking characteristics of IC engine fuels, Diesel engine fuels, Cetane number, combustion and it related numerical problems.

#### Unit III

##### **LUBRICANTS:**

Introduction, Mechanism of lubrication, Classification of lubricants, Lubricating oils, grease & semisolid lubricants, solid lubricants, synthetic lubricants, Properties and Testing of lubricating oils, Viscosity & Viscosity index, flash and fire points, cloud and pour point, Anline value, Steam Emulsion Number, Neutralization No., Saponification Value, Iodine value, carbon residue); Numerical problems based on Viscosity Index

#### Unit IV

**Polymerization:** Introduction, types and classification of polymerization, Reaction Mechanism, Natural & Synthetic Rubber; Vulcanization of Rubber, Preparation, Properties & uses of the following- Polythene, PVC, PMA, PMMA, Teflon, Poly acrylonitrile, PVA, Nylon, Nylon 6:6, Terylene, Phenol formaldehyde, Urea - Formaldehyde Resin, Glyptal, Silicone Resin, Polyurethanes; Butyl Rubber, Neoprene, Buna N, Buna S. Flow sheet manufacturing diagram of Nylon 6:6 & Decoran.

#### Unit V

##### (A) **INSTRUMENTAL TECHNIQUES IN CHEMICAL ANALYSIS**

Basic concepts of spectroscopy: IR,UV, Visible, Applications of EPR,NMR  
Chromatography- Gas Chromatography, Calorimetry, Lambert's and Beer's Law

##### (B) **Cement:** Portland Cement, Manufacturing, Setting & Hardening, Plaster of Paris ( Preparation properties & uses)

**Refractory:** Definition, Classification and important properties of refractories.

## Reference Books:

1. Chemistry for Environmental Engineering - Sawyer, McCarty and Parkin – McGraw Hill, International.
2. Engineering Chemistry - Gopalan Venkappayya, Vikash Publication.
3. 3000 solved problems in Chemistry-Goldberg, TMH
4. Engineering Chemistry - B.K. Sharma, Krishna Publication.
5. A Text Book of Engineering Chemistry - S. S. Dara & A.K. Singh, S. Chand Publication.
6. Applied Chemistry - Theory and Practice, O.P. Viramani, A.K. Narula, New Age Pub.
7. Polymer Science – Ghosh, Tata McGraw Hill.

## Engineering Chemistry Practical

**NOTE:** At least 10 of the following core experiments must be performed during the session.

### 1. Water Testing

- (i) Determination of Total hardness by Complexometric titration method.
- (ii) Determination of mixed alkalinity (a)  $\text{OH}^-$  &  $\text{CO}_3^{--}$  (b)  $\text{CO}_3^{--}$  &  $\text{HCO}_3^-$
- (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.
  - d) Calorific value by bomb calorimeter
- (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
  - c) Carbon residue
- (iv) Steam emulsification No & Anline point determination
- (v) Cloud 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 anthranilic acid as internal indicator.
- (ii) Determination of Cu and or Cr in alloys by Iodometric Titration.

### Course Contents

Category of Course	Course Title	Course Code	Credits- 4C			Theory Paper (ES)
			L	T	P	
Basic Sciences – BS-2	Engineering Mathematics - 1	<b>BE102</b>	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs

**Branch:** Common Semester

**Course:** BE102 Engineering Mathematics - I

#### Unit I

Maclaurin's and Taylor's theorem, Partial differentiation, Euler's theorem and its application in approximation and errors, Maxima and minima of two variables, Tangents and Normals; Subtangent and Subnormal, Curvature: Radius of curvature, Center of Curvature (Cartesian and polar coordinates).

#### Unit II

Definite Integral as limit of a sum, Application in summation of series, Double and Triple integral, Change of order of integration, Beta and Gamma functions, Length of the curves, Volumes and surfaces using double and triple integral.

#### Unit III

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

#### Unit IV

Rank of matrix, Solution of simultaneous equation by elementary transformation, Consistency of equation, Eigen Values and Eigen Vectors, Cayley-Hamilton theorem and its application to find the inverse.

#### Unit V

Algebra of logic, Boolean algebra, Principle of Duality, Basic theorems, Boolean expressions and function. Graph Theory: Graphs, Sub graphs, degree and distance, Tree, Cycles and Network. Elementary concept of Fuzzy logic.

#### Reference Books: -

1. Higher Engineering Mathematics. by B.V. Ramana, TMH
2. Higher Engineering Mathematics- By B.S. Grewal.
3. Matrix Operations- Bronson, Schaum Series TMH
4. Calculus- Ayres, Schaum series, TMH
5. Engineering Mathematics- By K.A. Laxminarayan, Vikas Pub. House Pvt Ltd. New Delhi.
6. Advanced Engineering mathematics by Erwin Kreyszig, John Willy & sons.
7. Advanced Engineering Mathematics- Wylie and Barrett, TMH

### Course Contents

Category of Course	Course Title	Course Code	Credits-3C			Theory Paper (ES)
			L	T	P	
Humanities & Social Sciences HS-1	Communication Skills	BE103	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	0	2	

**Branch:** Common Semester. **Course:** BE103 Communication Skills

#### Unit I

##### **Languages and skills of communication**

linguistic techniques, Modern usages, Reading comprehension, English phonetic symbols/ signs, Oral presentation, Audition Communication, Processes of communication, Verbal and Non Verbal Communication, Barriers to Communication.

#### 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 and selling, company structure, systems etc.

#### Unit III

##### **Letter Writing:**

Applications, 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, Précis 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, Presentations, Demonstrations, Conversation - Telephone media, socialising, cultural events, debates, speech.

#### **Reference Books and softwares: -**

1. Business Correspondence and Report Writing - By Sharma, TMH.
2. Living English Structure - By W. S. Allen, Longmans.
3. English Grammer- Ehrlich, Schaum Series, TMH
4. Spoken English for India - By R.K. Bansal and IB Harrison (Orient Longman).
5. New International Business English - By Joans and Alexander (OUP).
6. Effective Technical Communication- Rizvi, TMH
7. Globerina software for language laboratory

**Language Laboratory:** The objective of the language lab is to expose students to a variety of listening and speaking drills. This would especially benefit students who are deficient in English and it also aims at confidence building for interviews and competitive examinations. The Lab is to cover following syllabus.

1. Communication lab.
2. Listening skills.
3. Speaking skills. (A) Phonetic symbols, pronunciation.  
(B). conversation: telephonic, face to face, formal and informal situations
4. Oral presentation.

### Course Contents

Category of Course	Course Title	Course Code	Credits- 6C			Theory Papers (ES)
			L	T	P	
Departmental Interdisciplinary DID-1	Basic Electrical Engineering	BE104	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs
			3	1	2	

**Branch:** Common Semester

**Course:** IT 1601/BE104 Basic Electrical Engineering

#### Unit I

##### Electrical Circuit Analysis

Voltage & current sources, dependent & independent sources, source conversion, analysis of D.C. circuits, KLC & KVL, Mesh & loop analysis, concept of dummy node & dummy mesh, Thevenin's & Superposition theorem, star-delta circuits.

#### Unit II

##### AC Circuits

Review of 1-phase AC circuits under sinusoidal steady state, active, reactive and apparent power, power factor. 3-Phase AC circuits, star and delta connections. 3-phase source and load, analysis of balanced and unbalanced systems, power in 3-phase circuits and their measurements.

#### Unit III

##### 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 IV

##### Transformers

Single-phase transformer, Basic concepts and construction features. Types of transformers. Voltage, current and impedance transformation. Equivalent circuits. Per unit system, voltage regulation, losses and efficiency. Testing of transformers. Auto transformers.

#### Unit V

##### Rotating Electric Machines

Basic concepts, working principle & general construction of DC machines (motor and generator) 3-phase and 1-phase induction motors and synchronous machines ( motor and generator).

#### Reference Books:-

1. Mittle and Mittal- "Basic Electrical Engineering" 2/e TMH
2. HUGHES Electrical Technology – Pearson
3. A.E. Fitzgerald, C. Kingsley and Umans, "Electrical Machinery", McGraw Hill, 5<sup>th</sup> Edition, 1992.
4. Vincent Del Toro, "Principles of Electrical Engineering ", Prentice Hall, 1987.
5. Kothari and I.J. Nagrath, "Basic Electrical Engineering", 2/e Tata McGraw Hill.
6. Kothari and I.J. Nagrath, "Electric Machines", 3/e Tata McGraw Hill.
7. Mittle and Mittal- "Basic Electrical Engineering" 2/e TMH
8. Cathey- Basic Electrical Engineering, Schaum Series, TMH

**List of suggestive core experiments:**

1. Verification of KCL & KVL.
2. Verification of Thevenin's Superposition theorem.
3. Measurement of active and reactive power in 1-phase and 3-phase.
4. Study of transformer, name plate rating, determination of ratio and polarity.
5. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
6. Study of constructional features of dc machines.
7. Separation of resistance and inductance of choke coil.
8. Measurement of various line & phase quantities for a 3- phase circuit.

### Course Contents

Category of Course	Course Title	Course Code	Credits – 6C			Theory Papers (ES)
			L	T	P	
Engineering Sciences ES-1	Engineering Graphics	BE105	2	1	3	Max.Marks-80
						Min.Marks-28
						Duration-3hrs

**Branch:** Common

**Course:** BE105 Engineering Graphics.

Note: To cover above syllabus, each Institute must have a computer lab (6 to 12 hrs/month) and CAD software.

**Practical (30 MaxM):** Marks to be allotted on sketching (10), exercise on CAD s/w (10) and viva (10).

**Term work (30 MM):** A min. of 30 hand drawn sketches on size A4 (graphic sketch Book) or 10 sheets of size A2 or 6 sheets of size A1, plus 5 CAD-printouts on size A4 sheets ( 15 marks to be allotted for this record + 8 marks for attendance + 7 marks for Teachers Assessment-Ref. Internal assmt guidelines)

#### Unit I

**Scales:** Representative factor, plain scales, diagonal scales, scale of chords.

**Conic sections:** Construction of ellipse, parabola, hyperbola by different methods. Normal and Tangent

**Special Curves:** Cycloid, Epee-cycloid, Hypo-cycloid, Involutives, Archimedean and logarithmic spirals.

#### Unit II

**Projection:** types of projection, orthographic projection, first angle and third angle projection, **Projection of points and lines**, True inclinations and true length of straight lines, Traces of straight lines, Auxiliary planes.

#### Unit III

**Projection of planes and solids:** Projection of circle, triangle and polygons, Projection of polyhedrons, Pyramids, Cylinders, Cones and Spheres in different positions.

#### Unit IV

**Section of Solids:** Section of right solids by normal and inclined planes.

**Intersection** of cylinders.

**Development of Surfaces:** Parallel line and radial - line method for right solids.

**Isometric Projections;** Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.

#### Unit V

**Introduction to Computer Aided Drafting (CAD).** Basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders. Transformations and editing commands like move, rotate, mirror, array, scale etc. Surfaces and solids of revolution. Defining drawing size and printing/ plotting. **Solution of projection problems on CAD**

#### Reference Books

A Premier on Computer Aided Engg drawing-Visvesvaraya Technological University (VTU), Belgaum.

Engineering Drawing - By N.D. Bhatt.

Engineering Drawing and graphics - By Venugopal.

Engineering Drawing – By T. Jeyopooan.

Engineering Graphics – Agrawal and Agrawal, TMH.

## Course Contents

Category of Course	Course Title	Course Code	Credits – 6C			Theory Papers (ES)
			L	T	P	
Departmental Interdisciplinary DID-4	Basic Electronics	BE 107	3	1	2	Max.Marks-100 Min.Marks-35 Duration-3hrs.

**Branch:** Common Semester

**Course:** BE107 Basic Electronics

### Unit-1

**Electronic components:** Introduction to Resistors, Inductors, Capacitors and their color codes, semi-conductors, diodes, V-I-characteristics, various types of diodes, bipolar junction transistors and their working, introduction to CC, CB & CE transistor configurations.

### Unit-2

**Basic Electronic circuit:** Half wave & full wave diode rectifiers, introduction to BJT amplifiers, filters, low pass & high pass filters, band pass & band stop filters. Filter implementation: RC-filters, LC-filters.

### Unit-3

**Measuring Instruments:** Cathode ray oscilloscope, block diagram of CRO & its basic application, multi-meter & its application, LCR-Q meter & its application.

### Unit-4

**Digital Electronics:** Number systems used in digital electronics: decimal, binary, octal, hexadecimal, their complements, operations and conversion, floating point and signed numbers. DeMorgan's theorem, AND, OR, NOT, NOR, NAND, EX-NOR, EX-OR gates & their representation & truth table, half and full adder circuits, R-S flip flop, J-K flip flop

### Unit-5

**Integrated Circuits:** Advantages of IC's over analogue circuits, classification of IC's based on density levels, introduction to monolithic and hybrid ICs, OPAMP, Basic applications of OPAMP like inverting & non-inverting amplifiers, integrator and differentiator. Introduction to 555-Timer and its application.

### ReferenceBooks:

1. Millmann & Halkias, Integrated Electronics, Tata Mc Graw Hills New Delhi.
2. Shultz- Grobbs Basic Electronics, TMH
3. Millman- Electronic devices and circuits, Tata Mc Graw Hills New Delhi
4. Electronic Devices & Circuits by Devid A. Bell, Princeten Hall, India
5. Hughes, Electrical and electronic technology, Pearson Education.
6. Basic Electronic Engg. By J.S. Katre, Max Publication, Pune.
7. Salivahanan- Electronic devices and Circuits, TMH
8. Zbar- Basic electronics: A Text Lab Manual, TMH.

### List of suggestive core experiments:

1. Identification of different Electronics components.
2. Observing input and output waveforms of rectifiers.
3. Transistor application as amplifier and switch.
4. Working of different measuring instruments.
5. Verification of truth table for various gates.

### Course Contents

Category of Course	Course Title	Course Code	Credits – 6C			Theory Papers (ES)
			L	T	P	
Basic Sciences BS-3	Engineering Physics	BE201	3	1	2	Max.Marks-100 Min.Marks-35 Duration-3hrs.

**Branch:** Common Semester

**Course:** BE201 Engineering Physics

#### Unit I Quantum Physics

Origin of Quantum hypothesis, DeBroglie's hypothesis of matter wave & its experimental verification. Group and particle velocities & their relations. Uncertainty principle with elementary proof & its application to Electron microscope, Compton effect. Wave function and its physical significance, general idea and application of time dependent and time independent Schrodinger wave equation.

#### Unit II Wave Optics

Interference: Fresnel's biprism, Interference in thin films, Newton's rings and Michelson's interferometer experiments. Diffraction at single slit, double slit and n-slit. Diffraction grating. Rayleigh criterion, resolving power of a telescope, grating and prism. Concept of polarized light, Brewster's laws, Double refraction, Nicol prism, quarter & half wave plate. Idea about circularly & elliptically polarized light.

#### Unit III Nuclear Physics

Nuclear Structure & Nuclear properties, Quantitative treatment of nuclear models: liquid drop and shell models, Linear Particle accelerator, Cyclotron, Synchrotron, Synchrocyclotron, and Betatron, Nuclear cross section, chain reaction, critical size. Application of  $E = mc^2$ , Q-Value, Nuclear fusion & fission, Nuclear reactors, Geiger- Muller Counter, Bainbridge and Auston mass Spectrograph.

#### Unit IV Semiconductors & Nano-Physics

Free Electron model of solids, Qualitative Analysis of Kronig Penny model, Effective mass, Fermi level for Intrinsic and Extrinsic Semiconductors: p-n junctions, Zener break down, photodiode, solar-cells, Hall effect.

Elementary idea about Nano structures and Nano materials

#### UNIT V Laser and Fiber Optics

Laser: Stimulated and spontaneous emission, Einstein's A & B Coefficients, transition probabilities, active medium, population inversion, pumping, Optical resonators, characteristics of laser beam. Coherence, directionality and divergence. Principles and working of Ruby, Nd:YAG, He-Ne & Carbon dioxide Lasers with energy level diagram.. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses & various uses.

Engineering uses & applications of laser and Optical Fiber

#### Reference Books: -

1. Engineering Physics- V. S. Yadava, TMH
2. A T.B. of Optics by Brijlal and Subhraminayan.
3. Optics By Ghatak, TMH
4. Engineering physics by M.N. Avadhanulu and P.G. Kshirsagar. S. Chand & Co.
5. Fundamentals of engineering physics by P. Swarup, Laxmi Publications.
6. Atomic and Nuclear physics by Brijlal and Subraminiyan.
7. Introduction to atomic and nuclear physics- Harvey E. White- East-West Press, New Delhi.
8. Concepts of Modern Physics- Beiser, TMH
9. Laser Electronics – Verdryan, Eastern-Wiley and Sons.

**List of suggestive core experiments: -**

1. Biprism, Newton's Rings, Michelson's Interferometer.
2. Resolving Powers –Telescope, Microscope, and Grating.
3. G.M. Counter
4. Spectrometers-R.I., Wavelength, using prism and grating
5. Optical polarization based experiments: Brewster's angle, polarimeter etc.
6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.
7. Uses of Potentiometers and Bridges (Electrical)..
8. Experiments connected with diodes and transistor.
9. Measurement of energy band gap of semiconductor.
10. Other conceptual experiments related to theory syllabus.

### Course Contents

Category of Course	Course Title	Course Code	Credits– 4C			Theory Papers (ES)
			L	T	P	
Basic Sciences BS-4	Engineering Mathematics-II	BE202	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

**Branch:** Common

**Course:** BE202 Engineering Mathematics-II

#### Unit I

Fourier series and half range series. Laplace transforms & Inverse Laplace transforms of simple functions, their elementary properties and applications in solution of ordinary differential equations.

#### Unit II

Second order differential equation with variable Coefficients (Only by method: One solution is known & variation of parameters); Solution by series method with emphasis on Legendre's and Bessel's equation only and their elementary properties.

#### Unit III

Linear and Non-Linear Partial differential equation of first and second order with constant coefficients, Separation of variable method, Application in solution of wave and heat conduction equation.

#### Unit IV

Vector calculus, Vector Differentiation, Velocity and acceleration, Gradient, Divergence and Curl. Line and Surface integral, Stoke's and Gauss divergence theorem.

#### Unit V

Binomial, Normal and Poisson's distribution, Curve fitting (Method of Least Square) elementary concept of reliability, forecasting and decision theory.

#### Reference Books :-

1. Higher Engineering Mathematics- Ramana, TMH
2. Laplace Transform – by M. R. Spiegel (Schaum's Series).
3. Adv. Engineering Maths by Erwin Kreszig, Wiley India IIT student ed. 8<sup>th</sup>
4. Higher Engg. Maths - by B.S. Grewal.
5. Mathematical Statistics- by Ray & Sharma
6. Advanced Engineering Mathematics- Wylie and Barrett, TMH
7. Introduction to theory of statistics-Mood, TMH
8. Partial differential equation- Duchateau, Schaum Series, TMH

## Course Contents

Category of Course	Course Title	Course Code	Credits – 6C			Theory Papers (ES)
			L	T	P	
Engineering Sciences-ES-3	Engineering Mechanics	BE203	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**Branch:** Common

**Course:** BE203 Engineering Mechanics

### Unit I

#### Static of force systems

Composition and resolution of forces, concurrent, non-concurrent and parallel forces in a plane, free body diagrams, Moment of a force and Varignon's theorem, conditions of equilibrium, polygon of forces and Funicular Polygon, equivalent force system, Bodies in equilibrium, structures under equilibrium, couple, moment of a couple, equivalent couple, addition of couples, illustrative exercises.

### Unit II

#### Centroid & Moment of Inertia, Friction

Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems, Product of Inertia, Principal Axes and Principal Moment of solid bodies. Coloumb's law of friction, Friction on inclined plane. Screw and Nut friction, Ladder and wedge friction, Friction in journal collar bearings, Uniform pressure and uniform wear.

### Unit III

#### Transmission of Power:

Transmission of power through Belt, Rope and Gears, Ratio and tension on tight side and slack sides, Centrifugal tension, Lifting machines; Spur, Bevel, Worm gearing, Rack and Pinion gear, Gear Trains, Simple and compound pulleys.

### Unit IV

#### Shear Force and Bending Moment:

Shear Force and Bending moment Diagram for Cantilever and Simply supported beam with concentrated, distributed load, and couple. Overhanging beams. Point of Inflexion/Contra-flexure. Relationship between bending moment and shear for pure bending.

### Unit V

#### Virtual work and trusses:

Concept and principle of virtual work, degree of freedom of system, use and application of virtual work for problems on beams, ladders, frames, virtual work done by moment/ torque. Perfect and imperfect truss, analysis of trusses, method of joints, method of sections, graphical method for perfect trusses, illustrative exercises.

#### Text Books:

1. Beer & Johnson, Vector Mechanics for Engineers - Statics, Tata Mc Graw Hills New Delhi.
2. Timoshenko-Engineering Mechanics, TMH
3. R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
4. A. Boresi & Schmidt- Engineering Mechanics: Statics & Dynamics, Thomson' Books
5. Shames- Engineering Mechanics-statics dynamics, Pearson Education.
6. Dr. K.L. Kumar, Engineering Mechanics, Tata Mc Graw Hills New Delhi
7. Shelley- 800 Solved Problems in Vector Mech. for engineers Vol-1 Statics, Schaum Series, TMH
8. R.K. Rajput, Engineering Mechanics S. Chand & Co.
9. G. L.Meriam- Engineering Mechanics-Statics, Wielly India.

### List of suggestive core Experiments:

Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting minimum one experiment from each unit of syllabus.

#### S.No Title

1. To verify the law of Triangle of Forces and Lami's theorem.
2. To verify the law of parallelogram of forces.
3. To verify law of polygon of forces
4. To find the forces in members of a simple jib crane and to compare them with theoretical values.
5. To find the support reactions of a given truss and verify analytically.
6. To verify the law of moments by rotating disc apparatus.
7. To verify the law of moments using a bell crank lever.
8. To determine the velocity ratio, mechanical advantage, and efficiency of a given single purchase crab winch.
9. To determine for the given wheel and axle. (i) the velocity ratio (ii) mechanical advantage and (iii) efficiency, and to plot the curves of load against mechanical advantage, efficiency, actual effort and ideal effort.
10. To determine for the given worm and worm wheel the velocity ratio, mechanical advantage and efficiency and to plot the curves of load against mechanical advantage, efficiency and actual effort.
11. To determine for the given Screw Jack the velocity ratio, mechanical advantage, efficiency, and to plot the curves of load against mechanical advantage efficiency, actual effort and ideal effort.
12. To determine the coefficient of friction between two given materials by inclined plane method.
13. To find the coefficient of friction between belt and pulley and rope and pulley.
14. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.
15. To find out the centroid of plane areas graphically and verify it analytically.
16. To determine the centroid of plane areas graphically and verify it analytically.
17. To determine the moment of inertia of fly wheel by falling weight method.

### Course Contents

Category of Course	Course Title	Course Code	Credits – 6C			Theory Papers (ES)
			L	T	P	
Interdisciplinary DID-2	Basic Mechanical Engineering	<b>BE204</b>	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

**Branch:** Common Semester

**Course:** **BE204** Basic Mechanical Engineering

#### Unit I

**Materials:** Classification of engineering material, Composition of cast iron and carbon steels on Iron-Carbon diagram and their mechanical properties. Alloy steels and their application. Stress-strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials

#### Unit II

**Measurement:** Temperature, pressure, velocity, flow strain, force and torque measurements, concept of measurement error & uncertainty analysis, Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set. Introduction to lath, drilling, milling and shaping machines.

#### Unit III

**Fluids:** Fluid properties pressure, density and viscosity. Pressure variation with depth, static and kinetic energy, **Bernauli's** equation for incompressible fluids, Viscous and turbulent flow, working principle of fluid coupling, pumps, compressors turbines, positive displacement machines and pneumatic machines. Hydraulic power & pumped storage plants for peak load management as compared to base load plants.

#### Unit IV

**Thermodynamic:** First and second law of thermodynamic; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, classification and working of boilers, efficiency & performance analysis, natural and artificial draught, calculation of chimney height. Refrigeration, vapor absorption & compression cycles, coefficient of perform (COP), refrigerant properties & eco friendly refrigerants.

#### UNIT V

**Reciprocating Machines:** Steam engines, hypothetical and actual indicator diagram, Carnot cycle and ideal efficiency, Otto and diesel cycles, working of two stroke & four stroke petrol & diesel IC engines.

#### Reference Books: -

1. Material Science- Narula TMH.
2. Fluid Mechanics and Machinery- Agrawal, TMH
3. Instrumentation and Measurements by Nakra and Chaudhary.TMH
4. Engineering Thermodynamic by P.K. Nag, Tata McGraw Hill
5. Internal Combustion Engines- Ganesan, TMH.

#### List of suggestive core Experiments:

Theory related eight to ten experiments including core experiments as follows:

1. Tensile testing of standard mild steel specimen.
2. Experiment on Bernoulli's theorem.
3. Linear and angular measurements using, Vernier, micrometer, slip gauge, dial gauge and sine-bar.
4. Study of different types of boilers and mountings.
5. To find COP of a refrigeration unit.
6. Study of different IC engines.

## Course Contents

Category of Course	Course Title	Course Code	Credits - 6			Theory Papers (ES)
			L	T	P	
Departmental Interdisciplinary DID-3	Basic Civil Engineering	BE205	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35 Duration-3hrs

**Branch:** Common semester

**Course:** BE205 Basic Civil Engineering

### Unit I

#### **CIVIL ENGINEERING MATERIALS:**

Stones, bricks, cement, lime, timber-types, properties, tests & uses; mortars - cement, lime & mud mortars, concrete-proportioning, mixing, curing, properties, tests and uses, RCC, RBC, PSC; FRC; cellular concrete, Ferro cement - properties and uses. Steel, aluminum, copper, glass, plastics, bitumen, asbestos, paints, distempers, varnishes, solid and hollow concrete blocks, pre-cast stone masonry blocks, roofing and flooring tiles.

### Unit II

#### **BUILDING CONSTRUCTION:**

Elements of Building Construction, Planning with respect to orientation. Utility of space, energy efficiency, etc. Foundations, conventional spread footings, raft, RCC footings, grillage and arch foundations, pipe foundations etc. Super structure-stone and brick masonry walls, partition walls, bonds, plastering and pointing, floors, roofs. Doors, windows, lintels, staircases - types and their suitability, Dampness and its prevention, cost effective construction techniques in mass housing schemes.

### Unit III

#### **SURVEYING & POSITIONING:**

Introduction to surveying, Instruments - levels, theodolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances - conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

### Unit IV

#### **MAPPING & SENSING:**

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, applications of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.

### Unit V

#### **DISASTER RESISTANT BUILDING:**

Earthquake, cyclone and Fire resistant buildings, Disaster Management and Planning, Disaster Mitigation and Protection, Disaster Preparedness, Response and Recovery, Disaster rescue and Relief, Disaster resettlements, rehabilitation and reconstruction. Introduction to various IS codes for Building design & construction.

### Reference Books:

1. Basic Civil Engineering- Palanichamy, TMH
2. Basic Civil Engineering by S. Ramamrutam & R. Narayanan - Dhanpat Rai Pub., New Delhi.
3. Surveying by Duggal – Tata McGraw Hill New Delhi.
4. Building Construction by S. C. Rangwala - Charotar Publications House, Anand.
5. Building Construction by Gurucharan Singh - Standard Book House, New Delhi
6. Global Positioning System Principles and applications – Gopi , TMH

**List of suggestive core Experiments:**

Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

**S.No Title**

1. To perform chain survey of a given area for locating existing ground features.
2. To draw the profile of a building by chain surveying method.
3. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
4. To perform leveling exercise by Height of instrument of Rise and Fall method.
5. To find out of the Reduced Level(R.L.) of the top of the building using Theodolite.
6. To measure horizontal and vertical angles in the field by using Theodolite.
7. To perform plane table leveling exercises by Radiation/Intersection/ Traversing etc. method.
8. To determine(a) normal consistency(b) Initial and Final Setting time of a cement sample.
9. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
10. To determine the Compressive strength of concrete of given proportions.
11. To determine the Compressive strength of bricks.
12. To test the efflorescence of bricks.
13. To determine particle size distribution and fineness modulus of coarse and fine aggregate.
14. Determine bulk modulus for bulking of fine aggregate sand.

## COURSE CONTENTS

Category of Course	Course Title	Course Code	Credits - 3		
			L	T	P
Information Technology IT - 1	Basic Computer Programming	BE206			
			1	0	3

**Course: BE206** Computer Programming

### Unit I

Introduction to MS-Windows and MS-Office  
 Principles of Object-Oriented Programming  
 Procedure-Oriented Programming vs. Object-Oriented Programming, Basic concepts of OOPs, Advantages of OOPs, Object Oriented Languages.  
 Beginning with C++  
 What is C++, Structure of C++ program, Creating, Compiling, Linking, and Executing a C++ program.

### Unit II

Token, Expressions and Control Structures  
 Tokens, Keywords, Identifiers, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Variable Declaration, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Memory Management Operators, Manipulators, Type Cast Operators, Operator Overloading, Operator Precedence, Control Structures.

### Unit III

Functions in C++  
 Main Function, Function Prototyping, Call by reference vs. Call by 'Value, Inline Functions, Default Arguments, *const* Arguments, Function Overloading, Friend and Virtual Functions.

### Unit IV

Classes and Objects  
 Specifying a Class, Defining Member Functions, Making a Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Returning Objects, Pointers to Members.

### Unit V

Constructors and Destructors  
 Constructors, Parametric Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor, Destructors.  
 Operator Overloading and Type Conversions  
 Definition, Overloading Unary Operators, Binary Operators, Binary Operators using Friends, Rules for Overloading Operators.

### Unit VI

Inheritance  
 Defining Derived Classes, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Member Class : Nesting of Class.

## **Unit VII**

Pointers, Virtual Functions and Polymorphism Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

## **Unit VIII**

Managing Console I/O Operations

C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators. Working with Files  
Classes for File Stream Operations, Opening and Closing a File, Detecting EOF, File Pointers, Updating a File, Error Handling During File Operations.

### **Suggested List of Experiments:**

C++ programs based on course contents.  
(At least two program from each unit.)

### **Reference Books:-**

1. Object Oriented Programming with C++ By E.Balagurusamy, TMH.
2. Programming in C++ By Robert Lafore.
3. ISRD-Object Oriented Programming with C++ , TMH
4. C++ the complete reference By Herbert Schildt, TMH
5. Mastering C++, Venugopal, TMH
6. Programming with C++ Hubbert, Schaum Series, TMH

### Course Contents

Category of Course	Course Title	Course Code	Credits – 4C		
			L	T	P
Engineering Sciences ES-2	Workshop Practice	BE207	0	0	3

**Branch:** Common to all branches.

**Course:** BE207 Workshop Practice

#### Unit I

**Introduction:** Manufacturing Processes and its Classification, Casting, Machining, Plastic deformation and metal forming, Joining Processes, Heat treatment process, Assembly process. Powder Metallurgy, introduction to computers in manufacturing.

#### **Black Smithy Shop**

Use of various smithy tools. Forging operations: Upsetting, Drawing down, Fullering, Swaging, Cutting down, Forge welding, Punching and drafting.

**Suggested Jobs :** Forging of chisel., forging of Screw Driver

#### Unit II

#### **Carpentry Shop:**

**Timber :** Type, Qualities of timber disease, Timber grains, Structure of timber, Timber, Timber seasoning, Timber preservation .Wood Working tools: Wood working machinery, joints & joinery. Various operations of planning using various carpentry planes sawing & marking of various carpentry joints.

**Suggested Jobs :** Name Plate ,Any of the Carpentry joint like mortise or tennon joint

#### Unit III

#### **Fitting Shop:**

Study and use of Measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, micro meter. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting operations: Chipping filling, Drilling and tapping.**Suggested Jobs :**Preparation of job piece by making use of filling, sawing and chipping , drilling and tapping operations.

#### Unit IV

#### **Foundry:**

**Pattern Making:** Study of Pattern materials, pattern allowances and types of patterns. Core box and core print, .Use and care of tools used for making wooden patterns.

#### **Moulding:**

Properties of good mould & Core sand, Composition of Green , Dry and Loam sand. Methods used to prepare simple green and bench and pit mould dry sand bench mould using single piece and split patterns.

#### Unit V

**Welding:** Study and use of tools used for Brazing, Soldering, Gas & Arc welding.

Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes . Safety precautions.

**Reference Books:** 1. Bawa Workshop Practice, TMH

2. Manufacturing Technology- P.N. Rao, Vol.1&2, TMH

3. Workshop Practices - Hazara Choudhary, Vol. I & II.

4. Production Technology - R.K. Jain.