

**Course Name : CHEMISTRY**

**Course Code No : CH-201**

**Credits: 4 L T P : 4 0 0**

**Lecture wise breakup**

**No. of Lectures**

**1. TREATMENT AND ITS ANALYSIS**

Boiler feed water and its problems, Water Softening techniques- Internal and external treatment, Domestic Water treatment, Chemical Analysis- Hardness, Alkalinity, Dissolved Oxygen, BOD, COD, Free Chlorine, Sulphates, Chloride ions, Dissolved CO<sub>2</sub>, TDS, TSS, SS and related numerical problems [12]

**2. CHEMICAL TOXICOLOGY**

Biochemical effects of As, Pb, Cd, Hg, CN. [4]

**3. POLYMER CHEMISTRY**

Classification and stereo chemistry of polymers, Mechanism and methods of polymerisation, Structure-property relationship, Engineering Polymers- silicones, Epoxy resins and conducting Polymers, [7]

**4. ALIPHATIC AROMATIC SUBSTITUTION REACTIONS**

Electrophilic aromatic substitutions, Nucleophilic aromatic substitution- Diazonium ions, addition-elimination: Elimination viz benzyne formation. [7]

**5. PHASE RULE**

Introduction, Gibbs phase rule and its related terms, One component system- Water system, Carbondioxide and Sulphur system. Two component system-Lead- Silver system and their thermal analysis. [6]

**6. TRANSITION METAL COMPLEXES**

Crystal field theory and Crystal field splitting in Octahedral, tetrahedral and Square planar complexes. [5]

**7. LUBRICANTS**

Functions of lubricant, mechanism, classification, properties and analysis of Lubricants and related numerical problems. [5]

**8. MOLECULAR SPECTROSCOPY**

IR, UV and NMR Spectroscopy- Principle, instrumentation and applications. [9]

**Text Books:**

1. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co.Pvt. Ltd.

**Reference Books:**

1. Organic Chemistry by Robert Thornton Morrison and Robert Neilson Boyd, 6<sup>th</sup> Edition 1992, Prentice Hall of India Pvt. Ltd.
2. Concise Inorganic Chemistry Vth Edition J D Lee 2003 (Chapman & Hall).
3. Introductory Polymer Chemistry by G.S.Mishra, John Wiley & Sons, New York, 1993.
4. Environmental Chemistry by A.K.De; New Age International(P) Limited, 2006
5. Modern Approach to Organic Chemistry B.Sc. Part- III Modern Publishers,2005

**CH 201H ADDITIONAL TOPICS FOR HONOURS**

Effluent treatment methods, Biochemical effects of cyanide and pesticides, Plastics,rubbers,fibers moulding methods for M.Wt Determination, Applications of

Substitution reactions in Industrially important compounds, Organometallic compounds and their applications, Structure determination by I.R., U.V. AND NMR Spectroscopy.

**Course Name : CHEMISTRY LAB.**  
**Course Code No : CH-202 Credits : 2 L T P : 0 0 3**

### **COURSE CONTENTS:**

Volumetric analysis- Permanganometric titrations, Acid-Base titrations, Iodometric titrations, Complexometric titrations and Dichrometric titrations, Analysis of lubricants- Viscosity, Flash Point, , Instrumental techniques for chemical analysis – Conductometric and potentiometric titrations, Atomic Absorption Spectrophotometer, UV-Visible Spectrophotometric, Construction of phase diagram, Preparation of few inorganic complexes, organic compounds and polymers.

### **REFERENCE BOOKS**

1. Vogel's Textbook of Quantitative Chemical Analysis, 6<sup>th</sup> Edition by J Mendham, R.C.Denny, J.D.Barnes and MJK Thomas, Pearson Education.
2. Vogel's Qualitative Inorganic Analysis, 7<sup>th</sup> Edition by G.Svehla, Pearson Education.
3. Essentials of Experimental Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co. (PVT.) LTD. New Delhi.
4. Applied Chemistry Theory and Practice by O.P.Vermani and A.K.Narula, New Age International (P) Limited Publishers, New Delhi.

**Course Name : SOLID MECHANICS**  
**Course Code : ENN 201 Credit : 4 L T P : 4 0 0**

### **Prerequisites:**

**Lecture wise breakup No. of Lectures**  
**PROPERTIES OF MATERIAL: (03)**

Introduction, uni-axial tension test, idealized stress- strain diagrams, isotropic linear elastic, visco-elastic and plastic materials, compression test, impact test, fatigue test, torsion and bending test.

**SIMPLE STRESSES & STRAINS: (08)**

Concept of stresses and strains, relationship between elastic constants, extension of uniform bar & tapered bar under its own weight and due to load applied, stresses produced in compound bars due to axial loads, thermal stresses, resultant stress and strain circle, principal stresses determined from principal strain.

**SHEAR FORCE AND BENDING MOMENT IN BEAMS (07)**

Shear force, bending moment, Relation between W.F and SF and B.M. diagram of various beams under various types of loading.

**BENDING AND SHEAR STRESSES IN BEAMS (08)**

Pure bending, bending stresses, eccentric loading combined bending and direct stresses, Middle Third and middle quarter rule, composite beams, Variation of shear stresses in various cross-sectional beams.

**ANALYSIS OF PLANE FRAMES (06)**

Analysis of simple plane frames, frames of different types, force analysis of plane frames by method of joints and section.

**TORSION (05)**

Torsion equation for circular shaft, shafts under action of varying torque, determination of principal stresses and maximum shear stresses in circular shaft due to combined bending and torsion, torsion of composite shafts.

**COLUMNS & STRUTS (06)**

Definitions and examples of instability; criteria for stability of equilibrium, Euler's theory of buckling of columns, Euler's equation for various end restraints, Rankine formula, eccentrically loaded struts, struts with initial curvature, lateral stability of beams; struts with lateral loading.

**DEFLECTION OF BEAMS (07)**

Deflection by calculus, Macaulay's methods, Moment area method, method of deflection coefficient, deflection due to shear of various beams under the action of various loading conditions; built in and propped beams.

**BOOKS:**

1. An introduction to the Mechanics of Solids-Crandall & Dahi (McGraw Hill)

**REFERENCES;**

1. Strength of Materials-GH Ryder (MacMillan)
2. Mechanics of Solids-E.P. Popov (Pearson Education)
3. Mechanics of Materials by E.J. Hearn



Buckingham's Theorem, non-dimensional groups, Geometric, Kinematics and Dynamic similarity, Applications.

**FLOW MEASUREMENT**

**(8)**

Venturimeter, orifice meter, Pitot tube, Orifices, mouth pieces, notches, weirs, Current meter.

**BOOKS:-**

1. Gupta and Gupta, : “ Fluid Mechanics and its Applications” , Wiley- Eastern , 1982.
2. R.J. Grade and A.G. Mirajgaonkar, Engineering Fluid Mechanics' Nem Chand and Bros. Roorkee , 1980.

**REFERENCES:**

1. Frank M. White,” Fluid Mechanics” , McGraw Hill.
2. Modi and Seth “Hydraulic & Fluid Mechanics, Standard book house, New Delhi 1980.
3. Streeter, V. L., “Fluid Mechanics” MacGraw Hill Co.
4. Lewitt, E.H., “Hydraulics and the Mechanics of Fluids” Pitman.

**Course Name :** MANUFACTURING PROCESS - I

**Course Code :** PE 201

**Credits :** 4

**L T P :** 4 0 0

**Pre-Req. :** TA-105

**Lecture wise breakup**

**No. of Lectures**

**INTRODUCTION**

**(6)**

Classification of manufacturing processes, materials properties, Selection Criteria for Manufacturing Processes,

**CASTING**

**(20)**

Introduction to casting processes & applications & basic elements. Types of casting & Selection of materials for pattern materials used, Allowances & Color codes. Sand-casting, types of sand & moulds, desirable materials of molding sand. Testing of sand & Introduction to Cores. Type of Core, Core making process, Core-prints & applications. Melting, Pouring, Feeding, Equipments used, Construction & Operations of Cupola Furnace. Design of Gates & Risers, Aspiration effect, Cleaning & Finishing of Castings: Casting Defects, Causes & remedies. Special Casting Processes such as Centrifugal, Die, Investment, Shell molding & Continuous castings

**METAL FORMING**

**(8)**

Introduction, Classification of Forming processes , Effect of forming parameters, Hot & Cold working processes, true stress-strain curves, determination of flow stress, Tresca and Von-Mises criteria, metal forming lubrication, lubrication mechanisms: boundary, mixed and hydrodynamics lubrication

**ROLLING** (6)

Classification of Rolling Processes, Rolling Mills & Products. Variables, rolling Defects & Controls.

**DRAWING** (6)

Drawing of rods, wires, tubes, Variables in Drawing & Operations., analysis of drawing forces.

**FORGING** (6)

Open & Closed Die forging, Open, hammer forging, Press & Drop forging, analysis of forging forces, sticking and sliding friction.

**EXTRUSION** (6)

Classification of Extrusion processes, Equipments & Variables used in Extrusion.

**POWDER METALLURGY**

Characteristics of metal powders & production methods. Mixing & Blending , Advantage & Limitations of Powder Metallurgy, Industrial Applications

**BOOKS:**

1. Manufacturing Technology, Foundry, Forming & Welding by P N Rao.

**REFERENCES:**

1. Principle of Manufacturing Material & Processes by J S Campbell
2. Industrial Forming by ROWE.

**PE 201H: MANUFACTURING PROCESS - I**

In addition to the contents of PE 201 the additional topics are:

1. Design of gating systems and risers
2. Powder Metallurgy
3. Determination of flow stress

**Course Name :** KINEMATICS AND DYNAMICS OF MACHINES

**Course Code :** PE 202

**Credits :** 4

**L T P :** 4 0 0

**Pre-Req :** --

**Lecture wise breakup**

**No. of Lectures**

**VELOCITY AND ACCELERATION:** (10)

Basic concept of machines, link, kinematics pair, kinematics chain, mechanism inversions for kinematics chains, slider crank chains and its inversions. quick return motion(Crank and Slotted lever type and whitworth type), Instantaneous center of rotation of body, velocity of rubbing in pin joints, coriolis component of acceleration and

advanced problems on velocity and acceleration.

**FRICITION:** (4)

Types of laws of friction inclined plane, efficiency of inclined plane square and V threads screw jack. Disc & cone clutch. Friction circle. Friction axis of link.

**BELTS, ROPES AND CHAINS:** (6)

Materials, types of drives, idle pulley, intermediate or counter shaft pulley, angle and right angle drive, quarter turn drive, velocity ratio, laws of velocity ratio, crowning of pulleys, loose and fast pulleys, belt length, stepped con pulley belts, ratio of tension on tight and slack side of belt, HP transmitted, angle of contact, centrifugal tension, initial tension, rope guide, chain guide, type of chain, length of chain with problems.

**TOOTHED GEARING:** (8)

Condition for smooth transmission of motion, nomenclature of involute teeth, involute rack, path of contact and arc of contact, interference minimum number of teeth, method of removing interference, helical and spiral gears, bevel gears, worm and worm wheel, their speed ratio, numerical problems.

**GEAR TRAINS** (8)

Simple compound and epicyclic gear trains, estimation of their velocity ratio, numerical problems.

**FLYWHEEL AND TURNING MOMENT DIAGRAM:** (4)

Fluctuation of speed and energy, coefficient of Fluctuation of speed and energy, simple problem on flywheel of a shearing machine.

**CAMS** (4)

Displacement, velocity and acceleration Diagrams, profile of cams, determination of maximum velocity and acceleration of follower, the types of Cams advance problems of cams with reciprocating and oscillating followers.

**BALANCING** (4)

Balancing of rotating masses, primary secondary balancing of reciprocating masses, balancing machines.

**GOVERNORS** (8)

Types of governors, terms used, watt, porter, proell & hartnell governor, effort & power of governor, stability. Sensitiveness, hunting & isochronous, controlling force curve

**BOOKS:**

1. Theory of Machines by Shigley.

**REFERENCES:**

1. Theory of Machines by P L Ballaney
2. Theory of Machines by S S Rattan
3. Theory of Machines by V P Singh

**PE 202H: KINEMATICS AND DYNAMICS OF MACHINES**

In addition to the contents of PE 202 the additional topics are:

1. Gyroscope
2. Vibrations

**Course Name :** INDUSTRIAL METROLOGY  
**Course Code :** PE 203  
**Credits :** 4

**L T P :** 4 0 0

**Pre-Req. :** --

**Lecture wise breakup**

**No. of Lectures**

**STANDARDS OF MEASUREMENT**

(6)

Need of standards, classification: primary, secondary and tertiary standards, traceability of standards, length standards: line and end standards, derivation of end standard from line standards. Slip gauges and their calibration, wavelength standards. Angle standards: angle slip gauges, precision polygons and divided circles.

**LIMITS, FITS AND TOLERANCES**

(6)

Concept of interchangeability, types of interchangeability, need for standard systems of limits, fits and tolerances, BIS; 919; 1963 standard system, selection of limits and fits exercises on limits, fits and tolerances, design principles for limit gauges. Taylor's principle, types of limit gauges, tolerances on limit gauges.

**MEASURING AND GAUGING INSTRUMENTS**

(8)

Design principles of measuring instruments; kinematics design, principle of alignment. pivots and bearings, sources of error in measurement, calibration of measuring instruments: mechanical linear and angle measuring instruments. vernier calipers, micro - meters, dial gauges, bevel protectors, sine bar spirit level, optical instruments; autocollimator, tool room microscope, length measuring machines, comparators; magnification principles, types of comparators, mechanical, optical, pneumatic, electrical and electronic comparators.

**GEOMETRICAL METROLOGY**

(10)

Concept of form errors, straightness, flatness, roundness, squareness and concentricity errors and their measurements.

**SCREW THREAD AND GEAR METROLOGY**

(10)

Elements of screw thread metrology, measurement of major, minor and effective diameters of external and internal screw threads, measurement of pitch and screw thread angle, effect of pitch error, elements of gear metrology, measurement of gear tooth thickness, gear profile, gear concentricity, pitch and run-out for involute gears, gear rolling test.

**MEASUREMENT OF SURFACE FINISH**

(10)

Concept of macro and micro errors, scales; surface roughness measures, datum for surface roughness measurement; M and E system, measurement of surface roughness, stylus methods using mechanical, optical and electrical (Talysurf) magnification (Tomlinson testers)(Forster)

**BOOKS:**

Engineering Metrology by I C Gupta

**REFERENCES:**

Handbook of Industrial Metrology – A S T M E

**PE 203H: INDUSTRIAL METROLOGY**

In addition to PE-203, the following topics are included:

- 1 Alignment tests of lathe
- 2 Alignment tests of drilling and milling machine