University of Pune

Structure and Syllabus
SE (Petroleum, Petrochemical and Polymer Engineering)
University of Pune
(With effect from 2013-14)

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(With effect from 2013-14)

Subject code	Name of subject	Teaching Scheme, Hrs/Week			Examination Scheme					Marks
		L	T	Pr	Theory Online	TW	Pr	Or	Theory paper	Total
Term I										
212381	Engineering Chemistry I	4	-	2	50	-	50	-	50	150
212382	Engineering Materials	3	-	2	50	25	-	-	50	125
212383	Strength of Materials	4	-	2	50	25	-		50	125
212384	Momentum Transfer	4	-	2	50		-	50	50	150
212385	Elements of Social Sciences	3	-		50	-	-	-	50	100
212386	Introduction to Hydrocarbon Industry	-	-	2	--	-	-	50	-	50
212387	Machine Drawing and Workshop Practices	-	-	2	-	50	-	-	-	50
	Total	18	-	12	250	100	50	100	250	750
Term II										
Subject Code	**Name of subject**	**Teaching Scheme, Hrs/Week**			**Examination Scheme**					**Marks**
		L	**T**	**Pr**	**Online Theory**	**TW**	**Pr**	**Or**	**Theory paper**	**Total**
207007	Engineering Mathematics III	4	-	-	50	-	-	-	50	100
212388	Engineering Chemistry II	4	-	2	50	-	50	-	50	150
212389	Heat Transfer	3	-	2	50	-	-	50	50	150
212390	Process Calculations	3	-	2	50	25	-	-	50	125
212391	Particle Technology	3	-	2	50	50	-	-	50	150
212392	Technical Communication	-	-	2	-	-	50	-	-	50
212393	Electrical and Electronics Engineering	1	-	2	-	25	-	-	-	25
	Total	18	-	12	250	100	100	50	250	750

Note:

Subject of code 207004 is only for Chemical/Bio-tech./Printing.

This subject for petroleum/Petrochemical and Polymer code of this subject is 207007.

212381 Engineering Chemistry I

Teaching Scheme:
Lectures: 4 Hrs/week
Practical: 2 Hrs/Week

Examination Scheme:
Online: 50Marks
Paper: 50 Marks
Practical: 50 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1) Ability to correlate effect of structure with the reactivity.
2) Understanding of step by step electronic changes involved in reaction.
3) Understanding of basics of atomic structure and bonding and shapes of compounds.
4) Performance of an electrochemical cell including fuel cell.
5) Knowledge of synthesis of commercially important polymers.

Unit 1: Structural Effects and Reactivity: (8 L)

Bond cleavage: homolytic and heterolytic cleavages; attacking reagents – electrophiles and nucleophiles; reaction intermediates - carbonium, carbanion and free radical formation and stability; leaving group – explanation with example. Basic structural electronic effects – Inductive, resonance, hyperconjugation, steric, tautomerism. Types of reactions – Important organic reactions such as substitution, addition, elimination etc. Structure of benzene and concept of aromaticity (Huckel's rule)

Unit 2: Reaction Mechanism: (8 L)

Reactions Involving Carbonium Ion Intermediates: Nucleophilic substitution: SN^1, SN^2 reactions and their comparison. Aliphatic and aromatic nucleophilic substitution reactions. Electrophilic substitution in benzene and monosubstituted benzene with orientation effect. Nitration halogenation, sulfonation, Friedel Craft alkylation and acylation. Electrophilic addition to C = C. Addition of halogens, hydrogen, halide and water. Elimination: E_1 and E_2 reactions, Saytzeff and Hofmann elimination, comparison of elimination with substitution. Rearrangement: Beckman, pinacol. Reactions Involving Carbanion Intermediates: Addition of carbon nucleophile to cabonyl group such as Grignard reaction for preparation of alcohols and carboxylic acids. Nucleophilic substitution such as Wurtz and Condensation such as aldol, Claisen ester. Rearrangement such as Favorskii. Reactions Involving Free Radical Intermediate: Addition of hydrogen halide to C = C in presence of peroxide. Substitution such as halogenation of alkanes. Dimerization such as Kolbe synthesis.

Unit 3: Atomic Structure and Bonding: (8 L)

Atomoic structure, Electronic theory of valancy – electrovalency, covalency coordination valency, hydrogen bonding. electronic configuration, energy levels, orbitals, quantum numbers. Chemical bonding – Covalent bond, VBT, Hybridization, Hybridizational shapes of molecules with examples (upto C. N. 6), Molecular orbital theory, LCAO. M.O. diagrams for diatomic molecules like H_2, CO, O_2, N_2.

Unit 4:Electrochemistry and fuel cells: (8 L)

Electrochemical cell, conventions and standard states, cell diagram, Nernst equation, cell emf and Gibbs energy, reaction entropies, electrochemical series, standard electrode potentials, classification of electrochemical cells, Energy storage , batteries- primary (Zn-MnO_2 type), secondary (Lead acid, sodium sulfer, Fuel cells: features of fuel cell, classification and construction, anodic and cathodic reactions in fuel cells, limitations on power available from fuel cells.

Unit 5: Colloidal Chemistry: (8 L)

The colloidal state properties of lyophilic and lyophobic colloids – optical, Brownian movement, electrical, viscosity, methods of preparation, separation, determination of particle size, gels and emulsions. The ideal solution, Roult's law of ideal solutions, solutions of liquids in liquids, theory of dilute solution. Osmosis, osmotic pressure, measurement of osmotic pressure. Colligative properties of dilute solution – lowering of vapor pressure, elevation of boiling point with derivation, depression in freezing point with derivation. Abnormal behavior of solutions of electrolytes. Numerical based on all above.

Unit 6: Chemistry of Polymerization: (8 L)

Introduction, comparative study of free radical, ionic, step growth polymerization mechanism. Polymerization techniques: bulk, solution, suspension and emulsion. Average molecular weights (Mn, Mw, Mv and Mz) of polymers. Brief overview of chemical synthesis of various types of monomers viz olefins, vinyl chloride, styrene, diamine, diacids, diols, and phenols.

List of Practical: (any 8)

1. Volumetric estimation of amide from the given solution of amide.
2. Purification of organic compounds by using techniques such as distillation, sublimation.
3. Preparation of benzoic acid from benzamide.
4. Purification and drying of vinyl monomer
5. To determine molecular weight of non-volatile solute by depression in freezing point method.
6. To determine molecular weight of solid by elevation in boiling point method.
7. To determine purity of monomer.
8. Determination of molecular weight by end group analysis.
9. Determination of transport number of cation by moving boundry method / Hittorf's method.
10. Electroplating of copper on copper plate.

Books:

1. Morrison R. T. and Boyd R.N.; Organic Chemistry; Prentice Hall of India Private Ltd.; 7^{th} edition (2011).
2. Atkins P.W.; Physical Chemistry; Oxford; 7^{th} edition (2001).
3. March Jerry; Advanced Organic Chemistry; John Wiley and Sons; 6^{th} edition(2007).
4. Sykes Peter; A Guide Book to Mechanism in Organic Chemistry; Pearson;6^{th}edition(2003
5. Glasstone Samuel; Textbook of Physical chemistry; McMillan and Co. Ltd.; (1981).
6. Barrow G.M.; Physical Chemistry; McGraw Hill Publications; (1996).
7. V.R.Gowarikar, N.Viswanathan, JaydevSreedhar, Polymer Science, New Age International (2005) .
8. George Odian, Principals of Polymerisation, John Wiley and Sons (2004).

212382 Engineering Materials

Teaching Scheme:
Lectures: 3 Hrs/week
Practicals: 2 Hrs/week

Examination Scheme:
Paper: 50 Marks
Online: 50 Marks
Term Work: 25 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1. Understanding of the structure and properties of engineering materials.
2. Acquaintance with the changing trends in materials science and engineering.
3. Futuristic insight into materials.
4. Understanding of the applications according to change in the properties of materials.

Unit 1: Materials Science and Engineering (6 L)

Introduction, Developments in materials, engineering profession and materials, Classification of materials- Metals, Polymers, Ceramics, Composites, Semiconductors. Their Structure, properties & applications,

Macro, Micro, Nano, Submicroscopic observations of materials, structures of common polymers and crystal structure of Metals. Point, Linear, Planar and volume defects and their relationship with properties of materials, Crystalline, Noncrystalline and semicrystalline materials.

Criteria for selection of materials for special applications in Industries such as smart materials and biomedical materials.

Unit 2: Microstructural developments (6 L)

Components, Phases and phase equilibrium diagrams, Eutectic and Etectoid reactions.
Phase transformations and relationship with properties. Gibb's phase rule.
Microstructures of materials and their properties & applications.

Unit 3: Properties of materials (6 L)

Mechanical properties: Hardness, Strength, Toughness, Stiffness, Ductility, Malleability, Hardenability, Creep fatigue and Rheology

Electrical properties: Conductors, Semiconductors and insulators, dielectric materials.

Optical properties: Absorption, Reflection, Transmission and Refraction, optical fibers and lasers.

Magnetic properties: various types of magnetic materials, Diamagnetic, Paramagnetic, Ferromagnetic, Ant ferromagnetic and Ferromagnetic materials, Domain theory, Hard and soft magnetic materials.

Thermal Properties: Thermal expansion, Heat capacity, Thermal Conduction, Thermal Stresses.

Unit 4: Composite Materials (6 L)

Classification of composites, Reinforcing phase, Matrix phase, Fiber reinforced plastics, Metal matrix composites, Flake and Particulate composites, General and practical composite systems, stiffness evaluation of composite, Special composites such as nano particles dispersion polymer matrix composites.

Unit 5: Materials environment interactions (6 L)

Liquid solid reaction- Direct Dissolution Mechanisms, Kinetics of Corrosion Reactions, Corrosion Prevention

Gas solid reactions- Formation of gaseous reaction products, Protective and non protective solid oxides, oxidation prevention

Solid solid interactions- Wear mechanisms, designing to minimize friction and wear.

Radiation Damage and its prevention

Unit 6: Materials Processing (6 L)

Processing of metals, Ceramics, Polymers, Composites Semiconductors,
Nanostructured materials, Casting, Forming, Powder processing, Machining, Joining,
Surface coating treatments, Fiber Manufacturing,
Recent techniques in material processing.
Manufacturing techniques for metals, ceramics & engineering polymers

Term Work:

Term Work shall consist of the experiments listed below of which, at least eight should be performed in laboratory by the students. A record of the work performed should be presented in the form of a journal.

LIST OF PRACTICALS:

1. Microstructural observations of ferrous and non ferrous metals and alloys (Minimum five)
2. Annealing and normalizing of steel, observations.
3. Hardening and tempering of steel, observations.
4. Study of fractures of engineering materials.
5. Non destructive testing (Minimum two tests)
6. Macro observation of flow lines in forged products.
7. Macro etching Sulphur printing test of steel.
8. Cupping test of sheet materials
9. Hardness test any one out of the following
   (Rockwell, Brinell, durometer and Vickers)
10. Impact Test of Materials.

Books:

1. Schaeffer J.P.: Saxena A., Antolovich S.D., Sanders T.H.Jr., Warner S.B., The Science & Design of Engineering Materials, McGraw-Hill International.
2. Material Science & Engineering, William Smith, Ravi Prakash, McGraw Hill.
3. Callister William D. Jr. Material Science and Engineering an Introduction, John Wiley & Sons Inc.

212383 Strength of Materials

Teaching Scheme:
Lectures: 4 Hrs/week
Practicals: 2 Hrs/week

Examination Scheme:
Paper: 50 Marks
Online Exam: 50 marks
Term work: 25 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1. Understanding of the engineering fundamentals of stress, strain, phenomena of torsion, shear force and bending moment in various members of columns.
2. Knowledge of the laws and derivations governing design principles and strength of materials.

Unit 1: Simple Stresses and Strains: (6 L)

Concept of stress, strain, shear stress, shear strain, Hooke's Law, Elastic limit, Stress-strain curve for mild steel and important points on that curve. Deformations of axially loaded members (prismatic as well as tapering bars), deformation due to self-weight, axial force diagrams, relationship between various elastic constants of a material (E, G, K).

Stresses and Strains in determinate and indeterminate axially loaded members, bars of composite sections, stresses due to changes of temperature in simple and composite members.
Strain energy due to axial load (gradual and sudden) and impact.

Unit 2: (6L)

Torsion: Stresses and strains in determinate and indeterminate circular shafts subjected to tensional moment, torsional moment diagrams, power transmitted by shafts, flanged coupling.

Stresses on Inclined Sections: Normal and shear stresses on inclined sections due to bi-axial stress system. Principal stresses and strains (Analytical as well as Mohr's Circle Method)

Introduction to 3-D Mohr's Circle and numerical on same.

Unit 3: (6 L)

Thin Walled Pressure Vessels: Thin cylinders and spheres subjected to internal pressure. Hoop stress, longitudinal stress, principal stresses, strains in cylinder and sphere changes in dimensions, joints in pressure vessels.

Thick Walled Pressure Vessels: Lame's Formulae for thick cylinder (derivation expected), thick spherical vessels subjected to internal pressure (only application of formulae).

Unit 4: (6 L)

Shear Force and Bending Moment Diagrams: Shear force and bending moment in determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads and couples, relation between SF and BM, point of contra flexure for simple and compound beams.

Bending Stresses in Beams: Theory of simple bending, assumptions, derivation of flexure formula, Moment of inertia of common cross sections with respect to centroidal and parallel axes. Bending stress distribution diagrams, Moment of resistance and section modulus calculations.

Unit 5: (6 L)

Shear Stresses in Beams: Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common symmetrical sections. Maximum and average shear stress; shear connection between flange and web.

Columns: Concept of buckling of columns, Derivation of Euler's formula for buckling load for column with hinged ends, equivalent length of a column for various end conditions, limitations to Euler's formula, Rankine's formula.

Unit 6: (6 L)

Direct and Bending Stresses:

1. Middle third rule Core or Kernel of a section
2. Combined bending and torsion
3. Eccentrically loaded rivetted jointsand welded joints

Slope and Deflection of Beams:
Introduction and only Macaulay's Method.

Term Work:

Student should carry out 10 experiments out of the list given below and submit the journal. Practicals should be performed as per the Indian Standard Code of practice.

1. Tension test on mild steel, aluminum.
2. Izod and Charpy impact test on mild steel, copper, brass and aluminum, cast-iron.
3. Bending test on cast-iron and timber.
4. Shear Test: Single Shear and Double Shear Test on mild steel and aluminum.
5. Different types of Hardness tests on metals i.e. Rockwell Hardness Test, Brinell Hardness Test, Shore Scleroscope Test etc.
6. Torsion test on mild steel and cast-iron.
7. Fatigue test on metals.
8. Impact test on polymeric materials.
9. Tension test on polymeric materials.
10. Compression test on concrete.
11. Compression test on Cement Mortar Cube.
12. Measurement of shear force in beams.
13. Measurement of bending moment in beams.
14. Measurement of deflection of beams.

Books:

1) Timoshenko Stephen; Strength of Materials Part I; Elementary theory and problems; 3/e, CBS Publishers & Distributors; (1986).
2) Beer F. P. and Johnston E. R.; Mechanics of Materials; McGraw-Hill; (1981).
3) Singer F.L. and Pytel A.; Strength of Materials; Harper International, (1980).
4) Pytel and Singer; Strength of Materials; Harper and Row; New York; (1987).
5) Egar Popov Egar; Mechanics of Materials; Prentice Hall; (1983).

212384 Momentum Transfer

Teaching Scheme:
Lectures: 4 Hrs/week
Practicals: 2 Hrs/week

Examination Scheme:
Paper: 50 Marks
Online Exam: 50 Marks
Oral: 50 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1) an ability to write governing equations for a given flow systems based on fundamental principles
2) an ability to perform pressure drop calculations and line sizing for single phase and Multiphase flows
3) an ability to visualize and work on instrumentation and mechanical design aspects of a laboratory experiments
4) an understanding about the operational aspects, performance evaluation of the Fluid flow Machinery

Unit 1. Fluid Properties and Fluid Statics (8 L)

Definition of Fluid, Continuum concept of fluid, Fluid properties such as density, specific gravity, surface tension and capillarity effect, viscosity, Newtonian fluid and Non-Newtonian fluid classification, Type of flows.
Basic equation of fluid statics; pressure depth relationship, pressure forces on surfaces, pressure vessels and piping, buoyancy, pressure measurements

Unit 2: Fluid Kinematics and Dimensional Analysis (8 L)

Langrangian and Eulerian description, acceleration field, material derivative, Fluid flow visualization fundamentals**,** plots of fluid flow data**,** continuity equation, deformation of fluid elements
Dimensional analysis and similarity: Dimensional homogeneity, Methods of nondimensionalization of equations, dimensionless numbers in momentum transfer

Unit 3: Bernoulli's Equation and Momentum Equation (8 L)

The energy balance for a steady, incompressible flow, Bernoulli equation, Forms of Bernoulli equation, kinetic energy correction factor; B.E for gases, Applications for B.E for flow measurements, cavitation, unsteady state flows, non-uniform flows

Forces Acting on Control Volume, linear momentum equation, angular momentum equation, Applications of Momentum Equation

Unit 4: Single Phase flow **(8 L)**

Flow of incompressible fluid in circular pipe; Hagen-Poiseuille equation, head loss; friction factor-Fanning and Darcy equation, Moody diagram; major and minor losses; pipe fittings and equivalent diameter. Concepts of characteristics of turbulent flow in a pipe, Boundary Layer theory, Prandtl mixing length theory

Unit 5: Multiphase Flows **(8 L)**

Flow resistance of immersed bodies**,** concept of drag and lift; variation of drag coefficient with Reynolds number. Descriptions of Flow through porous media, packed bed and fluidized bed, Darcy's Law for flow through Porous Media, Kozeny-Carman Equation for Packed bed and Ergun Equation for Fluidized Bed, Gas-Liquid Flow Regimes, Lockhart Martinelli equation for gas –liquid multiphase flow systems

Unit 6: Fluid moving machines **(8 L)**

Classification fluid flow Machinery: Fans, Blowers, Pumps and Compressors. Types of Pumps used in Process Industry. Centrifugal Pumps: Operating characteristics, Performance curves, concepts of priming, Cavitation, NPSH, Specific speed, Head and Power calculations, series and parallel arrangements.
Positive Displacement Pumps: Types, working and its applications in Process Industry

Term Work:

Student should carry out 8 experiments out of the list given below and submit the journal.

Practicals for Momentum Transfer

1. Measurement of viscosity of a fluid
2. Reynolds experiment for Laminar, transitional and turbulent flow identification
3. Verification of Bernoulli's Equation
4. Determination of co efficient of Discharge for Orifice
5. Determination of co efficient of Discharge for Venturi
6. Estimation of frictional Pressure drop in Circular pipes of various MOC
7. Estimation of Frictional Pressure Drop across Pipe fittings in a flow loop
8. Verification of Darcy's Law
9. Demonstration of Gas-Liquid Multiphase flow regimes in horizontal and vertical flow through pipe and Numericals based on Lockhart Martinelli equation
10. To Study Construction, Working of Centrifugal, Reciprocating, Gear and Plunger Pumps
11. To Study Characteristics of Centrifugal Pumps

Oral Exam: Oral examination will be based on the above Practical work

Books:

1. Noel de Nevers; Fluid Mechanics for Chemical Engineers, Third Edition; McGraw Hill, 2005.
2. Yunus A Cengel , John M. Cimbala ; Fluid Mechanics; Tata-McGraw-Hill(2006)
3. W. L. McCabe, W. L. Smith, and P. Harriot, Unit Operations of Chemical Engineering, McGraw-Hill International Edition (Sixth edition) (2001).
4. Ron Darby, Chemical Engineering fluid Mechanics, Marcel Dekker Inc, NY (1996).

212385 Elements of Social Sciences

Teaching Scheme:
Lectures: 3 Hrs/week

Examination Scheme:
Paper: 50 Marks
Online Exam: 50 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1. Understanding of the concepts of macroeconomics.
2. Acquaintance with the contemporary economic perspectives in India.
3. Understanding of the nature of social structure and social change.
4. The perception of human values.

Unit 1: Basic Problems of Economic Organization (6 L)

What is Economics? The Scientific Approach, Pitfalls in Economic Reasoning, The Law of Scarcity, The Uses of Economics.

Basic Problems of Economic Organization

a. The key problems of economic organization. What, how, and for whom?.
   Inputs and Outputs, Market, Command and Mixed Economies.

b. Society's Technological Possibilities
   The Production Possibility Frontier, Efficiency, Opportunity cost, The Law of diminishing returns.

c. Features of a modern economy
   Specialization, and division of labor, Money; Factors of production (land, labour, capital). Capital and private property.

Unit 2: **Markets and Government in a Modern Economy (6 L)**

a. How markets solve the basic economic problems
   The market mechanism, Who governs the market? Prices as signals, market equilibrium, perfect and imperfect competition, Adam Smith's "Invisible Hand Doctrine".

b. The economic role of government.
   The three functions of government, Efficiency, Equity, and Stability, Macroeconomic Growth.

Basic Elements of Supply and Demand:

Analysis of supply and demand, the demand schedule, Supply schedule. Influences affecting supply and demand curves, Equilibrium of supply and demand, Effect on equilibrium of a shift in supply or demand. Rationing by prices.

Unit 3: Indian Economy: **(6 L)**

A historical perspective on the economic policies implemented in India during the post independence period to achieve the goals of planned economic development. Monitory and fiscal policies, industrial policy, foreign trade and exchange rate policies, price and wage policies.

Overview of economic reforms introduced after year 1990. Vision of India 2020.

Unit 4: **(6 L)**

A) Basic Sociology:

Civilization, Culture and Society, Cultural diversity and cultural change, Socialization, Individual freedom, Crime and punishment in modern society, Gender and Sexuality, Origins of Sex differences, Gender Socialization, Gender Relations, Feminism, Marriage and family in modern society, Features of modern urbanism, Globalization: its impact on third world in economic, Social and cultural areas, Human rights, Values and ethics in profession.

B) Indian Sociology:

Cultural diversity in India, Bases of secular polity, Problem of communalism, Casteism in India, Social reform and reformers, Census in India, Changing demographic picture.

Unit 5: Technology and Society **(6 L)**

Technology and social change, Ecological crisis, Concept of sustainable development, Science and technology policy in India, Nature and impact of IT revolution.

Unit 6: Religion and Philosophy: **(6 L)**

Nature of religion, Functions of religion, Problem of religious fundamentalism, Harmonious coexistence of different religious faiths, Vivekananda's views on religion and union of science and religion, Distinctive features of Indian philosophy.

Books

1. Broom Leonard, Selznic Philip and Dorothy Broom Darroch; Sociology; Harper and Row; (1981).
2. Haralambos Michael; Sociolocy themes and Perspectives; Oxford University Press; (1980).
3. Samuelson Paul A. and Nordhaus William D.; Economics; McGraw Hill International; (1992).
4. DattRuddar&Sundharam K. P. M.; Indian Economy; S. Chand and Company Ltd.;, (1991).
5. Kalam A. P. J.; India - 2020; Viking; (2002).
6. Giddens Anthony; Sociology; Polity Press; (1989).
7. Radhakrishnan S. and Moore C. A. (Eds); A Source Book in Indian Philosophy; Princeton Univ. Press; (1967).
8. Chatterjee S. and Datta D.; Introduction to Indian Philosophy; University of Calcutta 6th Edition; (1960).

212386 Introduction to Hydrocarbon Industry

Teaching Scheme:

Practical: 2 hours /W

Examination Scheme:

Oral: 50 marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1. Understanding of the vertical integration in Petroleum Industry
2. Learning on different areas of study in upstream, midstream and downstream industry

Minimum eight out of the following lists of list of experiments are to be carried out as a apart of syllabus for the course.

1. Worldwide distribution of oil and gas reserves. Introduction to Petroleum Exploration and Reservoir Description
2. Introduction to Reservoir Engineering Principles and practices, Well logging and log interpretation. Well testing and test analysis.
3. Drilling of oil and gas wells. Classification of wells. Drilling operating systems. Drilling fluids. Well completions. Gun perforating.
4. Hydrocarbon production techniques. Hydrocarbon recovery mechanisms.
5. Environmental aspects in Drilling, Production, Refining Operations and Petrochemicals
6. Overview of Chemical, Petrochemical and Polymer Industry
7. Introduction to Refining operations and separation processes
8. Petrochemicals derived
9. Measurement of Fluid Properties
10. Introduction to Polymerization Processes
11. Introduction to preliminary methods of identification of polymers
12. Introduction to basic composite manufacturing processes
13. Introduction to basic injection moulding process

The students will submit a journal based on the experiments performed as a part of this course. They will give an oral based on the sessions conducted.

212387 Machine Drawing and Workshop Practices

Teaching Scheme: **Examination scheme:**

Practical/Drawing/Week: 2 Hrs Term work: 50 Marks

Course Outcomes:

After completion of this course the students should be able to demonstrate:

1. Understanding of principles of machine drawing and its importance in machine shop operations.
2. Understanding of basics of detailed and assembly drawing for various equipment, machine elements and machine components.
3. Used the software for computer aided drawing of machine equipment and components.
4. Familiarity with the workshop tools, fundamental machine shop operations and to learn machining processes on different types of engineering materials.

Term Work:

Every student should carry out minimum four practicals / experiments from the list given below. Drawings are to be completed on A-1 size drawing sheet. A brief report of each workshop experiment is to be submitted in the form of journal. Drawing sheets, the jobs completed in the workshop and the journal report will be the basis for term work assessment.

List of Practicals:

Group I: Drawing

1. One drawing sheet of symbols and basic conventions of machine elements, materials and processes as per Indian and International Standards.
2. One drawing sheet of screw threads, screwed fastenings, cotter pin joints, pipe joints, knuckle joint, riveted and welded joints etc. (minimum two views of each component)
3. One drawing sheet on detail parts and their assembly of valves, couplings, clutches, brakes, pulleys, engine parts etc.
4. One drawing sheet based on AutoCAD with all three views for at least two machine elements / components mentioned above.

Group II: Workshop

5. Study of different types of machine tools like lathe, drilling, jig boring, shaper, milling and grinding.
6. One job on lathe with taper turning, thread cutting and drilling.
7. One job on lathe + milling machine – keyway cutting + grinding etc.
8. One job of welding and related processes.
9. One job of pattern making and foundry – one job of non- ferrous material.

Books:

1. S. K. Hajra Choudhary, A. K. Hajra Choudhary; Elements of Workshop Technology; Vol. I: Manufacturing Processes, Vol. II: Machine Tools; Media Promoters and Publisheres Pvt. Ltd.
2. N. D. Bhatt, V. M. Panchal; Machine Drawing; Charotor Publishing House, Anand, India.
3. Dr. K. L. Narayana, Dr. P. Kannaiah, K. Venkata Reddy; Machine Drawing; New Age International Limited.
4. Goutam Pohit, Goutam Ghosh; Machine Drawing with AutoCAD, PEARSON Education.
5. Faculty of Mechanical Engineering (Compiled by), PSG College of Technology, Coimbatore – 641004; Design Data, Data Book of Engineers, KalaikathirAchchagam, Coimbatore.

UNIVERSITY OF PUNE

For Petroleum/Petrochemical/Polymer Engineering (Sem II)

207007 ENGINEERING MATHEMATICS – III (2012 Course)

Teaching Scheme:
Lectures – 4 Hrs./Week

Examination Scheme:
Paper – 50 Marks (2 Hrs.)
Online – 50 Marks

Section I

Unit I: Linear Differential Equations (**LDE**) and Applications (09 Hours)

LDE of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous & Symmetric simultaneous DE. Applications of LDE to chemical engineering problems and mass spring system.

Unit II: Fourier Transform (**FT**) (09 Hours)

Fourier integral theorem. Sine & Cosine integrals. Fourier Transform, Fourier Cosine Transform, Fourier Sine Transforms and their inverses. Finite FT, Application of FT to problems on one and two dimensional heat flow problems.

Unit III: Laplace Transform (**LT**) and Applications: (09 Hours)

Definition of LT, Inverse LT, Properties & theorems, LT of standard functions, LT of some special functions viz. error, First order Bessel's, Periodic, Unit Step, Unit Impulse, ramp, jump, parabolic, Si(t) and Ei(t).
Applications of LT for solving ordinary differential equations, liquid level systems, consisting of single tank and two tanks in series (interacting and non-interacting systems), second order systems (damped vibrator).

Section II

Unit IV: Vector Differential Calculus (09 Hours)

Physical interpretation of Vector differentiation. Radial, Transverse, Tangential & Normal components of velocity and acceleration. Vector differential operator, Gradient, Divergence & Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit V: Vector Integral Calculus and Applications (09 Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem.
Applications of vectors to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.

Unit VI: Applications of Partial Differential Equations (**PDE**) (09 Hours)

Basic concepts, modeling of Vibrating string, Wave equation, one and two dimensional Heat flow equations, method of separation of variables, use of Fourier series. Applications of PDE to problems of Chemical and allied engineering.

Text Books:

1. Advanced Engineering Mathematics, 9e, by Erwin Kreyszig (Wiley India).
2. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).

Reference Books:

1. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
2. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
3. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
5. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

212388 Engineering Chemistry – II

Teaching Scheme:
Lectures: 4 Hrs/week
Practical: 2 Hrs/Week

Examination Scheme:
Paper: 50 Marks
Online 50 marks
Practical: 50 Marks

Course Outcomes:

After completion of the course, the students should be able to:

1) Demonstrate knowledge of common methods of functional group inter conversions.
2) Understand three dimensional shapes of organic compounds
3) Analyze kinetic data and to predict performance of batch reaction using rate law.
4) Demonstrate different analytical techniques of identification and separation.
5) Apply first law of thermodynamics to chemical reactions
6) Demonstrate knowledge of limitations imposed by second law of thermodynamics and its applications in energy sector.

Unit 1: Functional group conversions (8 L)

Definition of functional group, functional group inter conversions and common methods for synthesis of carboxylic acids and their derivatives, nitriles, aldehydes, ketones, amines, alcohols, phenols, alkyl halides, ethers, alkanes, alkenes and alkynes.

Unit 2: Stereochemistry (8 L)

Basic concepts of stereochemistry, Conformation isomerism of ethane, propane, butane, cyclohexane, mono substituted cyclohexane; monosaccharide (glucose and fructose) disaccharides (sucrose and maltose) polysaccharides (starch and cellulose). Optical isomerism with one and two chiral centers (AA and AB type), enantiomers, threo, erythro, meso, distereoisomers. Geometrical isomerism (cis, trans and E, Z). tacticity in polymers(mono)

Unit 3: Reaction Dynamics (8 L)

Order, molecularity, rate law, integral rate equation, method of determination of order of reaction (first, second, third and zero order reactions), half life, theories of reaction rates, numerical based on above.

Unit 4: Analytical Chemistry (8 L)

Chromatography – Paper, Column, T.L.C. and G.C. applications. Thermal analysis –Thermogravimetry (TGA), differential thermal analysis (DTA), and differential scanning calorimetry (DSC), principles, method, applications. **Spectroscopy** –A.A.S., Instrumentation and applications

Unit 5: First Law of Thermodynamics (8 L)

Heat, work, internal energy, enthalpy, isothermal and adiabatic processes, maximum work, first law of thermodynamics, mathematical statement – numerical. Applications.

Thermochemistry- Hess's law, Kirchhoff's equation heat of formation bond enthalpies – numerical based on above.

Unit 6: Second Law of Thermodynamics and free energy (8 L)

Second law of thermodynamics, entropy, calculation of entropy change: in phase transformation, in chemical reaction, in mixing process. Variation of entropy with temperature, pressure and volume for an ideal gas. Concept of free energy, criteria for spontaneity of a reaction. Gibbs Helmholtz equation, chemical potential, standard free energy of formation, variation of free energy with temperature and pressure – numerical based on above.

Term Work:

Term Work shall consist of the performance of experiments listed below. A record of the work performed should be presented in the form of a journal.

List of Practical:

Any three experiments from following list:

1. To determine of rate constant of hydrolysis of methyl acetate by dilute HCl and to show that it is a first order reaction.
2. To determine the rate constant of hydrolysis of ethyl acetate by NaOH (saponification) and to show that it is a second order reaction.
3. Identification of metal ions by paper chromatography
4. Heat of neutralization
5. Heat of solution for potassium nitrate

Any six organic compounds from following list:

Organic qualitative analysis - Preliminary tests, type, elements, functional group and physical constants – atleast one compound from each type:

1 Acids – benzoic acid, salicylic acid, phthalic acid, oxalic acid, acetic acid cinnamic acid p-nitrobenzoic acid.
2 Phenols - α naphthol, β naphthol, resorcinol, o- nitrophenol, p-nitrophenol, p-cresol, phenol.
3 Bases – Aniline, p-toludine, diphenylamine
4 Neutral – Benzaldehyde, glucose, acetone, ethyl methyl ketone, benzophenone, methyl acetate, ethyl acetate, naphthalene, nitrobenzene, urea, thiourea, m-dinitrobenzene.

Demonstration experiments:

1. Joule Thomson expansion
2. Refrigeration cycle

Books:

1. Morrison R.T. and Boyd R.N.; Organic Chemistry; Prentice Hall of India Ltd.7th edition, (2011)
2. Sykes Peter; A Guide Book to Mechanism in Organic Chemistry; Pearson;6thedition (2003)
3. Glasstone Samuel; Textbook of Physical chemistry; McMillan and Co. Ltd.; (1981)
4. Barrow G.M.; Physical Chemistry; McGraw Hill Publications; (1996)

5. Hoffman Robert V.; Organic Chemistry – An Intermediate Text; Oxford University Press (1997).
6. Thomas Engel and Philip Reid; Physical Chemistry, Pearson, 1st edition, (2006).
7. Vogel's Text Book of Quantitative Chemical Analysis , Longman, 5th edition.(1989)

212389 Heat Transfer

Teaching Scheme:
Lecture/Week: 3 Hrs
Practical/Week: 2 Hrs

Examination Scheme:
Online Theory: 50 Marks
Theory Paper: 50 Marks
Oral: 50 Marks

Course Outcomes:

Students successfully completing this course will be able to demonstrate:

1. Knowledge of basic physics and mathematics involved in three modes of heat transfer and their applications.
2. An ability to identify, formulate and solve engineering problems related to heat transfer
3. An ability to identify heat exchange equipment appropriate for a given duty and to design the same
4. An ability to carry out self-learning in advanced topics related to heat transfer

Unit 1: Conduction (6 L)

Heat transfer modes, laws; General Differential equation; Steady state problems in plane and composite systems; Thermal resistance; Insulation and critical radius; Unsteady state heat conduction; Extended surfaces as Fins

Unit 2: Convection (6 L)

Principles, Dimensional analysis of Heat Transfer by Natural Convection:
Principle Heat balance Equation in laminar flow; Natural convection heat transfer from plate and cylinder

Principles, Dimensional analysis of Heat Transfer by Forced Convection:
Laminar and Turbulent Boundary layers; Laminar and turbulent flow heat transfer in a circular pipe. Dimensional groups in Heat Transfer

Unit 3: Radiation (6 L)

Basic concepts; Emission characteristics and laws of black body radiation; Radiation incident on a surface; Solid angle and radiation intensity; Heat exchange by radiation between two black surface elements; Heat exchange by radiation between two finite black surfaces; The shape factor; Radiation shields.

Unit 4: Heat Exchangers **(6 L)**

Basic types of heat exchangers; Flow arrangements; Overall heat transfer coefficient and fouling factor calculations; Analysis of Heat Exchangers; Mean temperature difference; Effectiveness – NTU Method; Concept ofHeat Exchange Networks

Unit 5: Condensation and Boiling **(6 L)**

Types of condensation; Drop and Film condensation on a vertical plate, vertical tube and horizontal tubes; Effect of superheated vapor and non-condensable gases; Types of boiling; Pool and Forced Convection boiling; boiling curves; Simplified relations for boiling heat transfer with water; Critical Flux; The concept of heat pipe.

Unit 6: Heat Transfer Equipment: Process Design **(6 L)**

TEMA Designations, Heat exchanger design considerations; Types of evaporators; Design of Single and multiple effect evaporators.

Term work:

Every student should carry out minimum 08 experiments from the following list and submit the laboratory record which will form the term work.

List of Practical:

1. To determine thermal conductivity of a metal bar.
2. To determine thermal conductivity of a liquid.
3. To determine critical radius of an insulating material.
4. To determine heat transfer coefficient in an unsteady-state.
5. To determine efficiency of a Pin Fin.
6. To determine the emissivity of a test plate.
7. To determine heat transfer coefficient in forced convection.
8. To determine heat transfer coefficient in natural convection.
9. To determine heat transfer coefficient in Double Pipe Heat Exchanger.
10. To determine overall heat transfer coefficient (U) for Shell and Tube Heat Exchanger.
11. To determine overall heat transfer coefficient and effectiveness of a plate type heat exchanger.
12. To study heat transfer in a heat pipe.
13. To determine heat transfer coefficient of two phase heat transfer.
14. To study evaporators.
15. Simulation studies and design of a Shell and Tube Heat Exchanger using HTRI software
16. Symbols of various Heat Exchange Equipment

Oral:

The oral examination will be based on the practical performance during the term.

Books:

1. Sukhatme S. P.; Heat Transfer, 4th Edition; University Press (India) Private Limited, 2005.
2. Eduardo Cao, Heat Transfer in Process Engineering, McGraw-Hill, 2010
3. Kern D. Q.; Process Heat Transfer; McGraw Hill, 2001.
4. Holman J. P.; Heat Transfer, 9th Edition; Tata McGraw-Hill, 2002.
5. McCabe W. L., J. C. Smith and P. Herriot; Unit Operations of Chemical Engineering, 7th Edition; McGraw Hill, 2005.

212390 Process Calculations

Teaching Scheme:
Lectures: 3 hrs/week
Practical/Week: 2 Hrs

Examination Scheme:
Online Theory: 50 Marks
Theory Paper: 50 Marks
Termwork: 25 Marks

Course Outcomes:

Students successfully completing this course will be able to:

1. Perform material and energy balances for a given process
2. Use modern software tools to solve material and energy balance problems

Unit 1: Units, Conversions and Balances (6 L)

Introduction to unit operations and unit processes. Units and Dimensions. Conversion of units. Basic process variables: Mass. Volume. Flow rate. Chemical composition. Volume, Mass and mol fractions. Wet basis and dry basis, Average molecular weight, specific gravity, API gravity, Behavior of gases: ideal and Van der Waal Gases. Specific volume of gas mixtures

Unit 2: Material Balance on Non reacting Systems (6 L)

Overall and Component balances. Steady state and unsteady state Processes. Degrees of Freedom analysis for given process unit. Material balance on non-reacting systems. Recycle, Bypass and Purge calculations. Calculations for Absorber- Stripper, Extraction- Distillation.
Unsteady state process calculations for a mixer

Unit 3: **Material Balance on Reacting Systems (6 L)**

Introduction to Stoichiometry, molar table for converter, Balances on reacting systems. Limiting and excess reactants. Fractional conversion. Extent of reaction. Multiple reactions. Yield and selectivity. Recycle and Purge calculations involving chemical reactions.

Unit 4: Energy Balance on Non reactive Systems (6 L)

General energy balance equation for open systems, Reduced version in terms of enthalpy for process application, enthalpy calculations, heat capacities of solid, liquid and gases, sensible and latent heats, problems involving enthalpy change for gaseous and liquid streams, energy balance for phase change processes such as condensation and boiling, Balances on dissolution and heat of mixing processes, Acid Mixing. Unsteady state heating or cooling of a mixed liquid.

Unit 5: Energy balance on reactive systems (6 L)

Heat effects accompanying chemical reactions**,** Hess's Law, Standard Heat of Reaction, combustion and formation, Effect of temperature on standard heat of reaction, Adiabatic Reaction Temperature, Heat Load and utility Calculations for non adiabatic operations

Unit 6: Combustion (6 L)

Solid, liquid and gaseous fuels, Coal gasification and combustion, Net Calorific Value and Gross Calorific Value, Ultimate and Proximate analysis of coal, theoretical and excess air, flue gases, combustion calculations for boilers, furnaces and gasifies

Term Work:

Term work shall consist of six assignments and a Mini Project consisting of inputs received in the six submitted assignments. Assignments shall include manual calculations, spreadsheet and a process simulation in Aspen HYSYS for the following units;

1. Specific volume of a hydrocarbon gas mixture
2. Acid mixing
3. Molar Table for a converter
4. Single phase stream heating / cooling duty calculation
5. Heating duty for a phase change equipment
6. Non-adiabatic Reactor calculations
7. Adiabatic Reaction Temperature Calculations
8. Recycle purge Calculations with and without reaction. Ammonia Manufacture
9. Single stage separation calculations

Books:

1. Bhat B. I. and Vora; Stoichiometry; 2/e, Tata McGraw Hill; (2000).
2. Felder R. M. and R. W. Rousseau; Elementary Principles of Chemical Processes; 3/e, John Wiley and Sons; (2000).
3. Himmelblau D. M.; Basic Principles and Calculations in Chemical Engineering; 6/e, Prentice-Hall, India, (1996).
4. Hougen O. A., K. M. Waston& R. A. Ragatz; Chemical Process Principles Part-I, Material and Energy Balances; Asia Publishing House, Mumbai; (1995).
5. Narayanan K.V.and.Lakshmikutty B; Stoichiometry and Process Calculations; 1/e, Prentice-Hall, India, (2006).

212391 Particle Technology

Teaching Scheme:
Lecture/Week: 3 Hrs
Practical/Week: 2 Hrs

Examination Scheme:
Paper: 50 Marks
Online Exam: 50 Marks
Term work: 50 Marks

Course Outcomes:

Students successfully completing this course will be able to:

1. Gain basic understanding of properties and behavior of systems containing particulate solids.
2. Acquaint with major equipments used for solid handling in Petroleum Industry.

Unit 1: (6 L)

Particle Characterization and Solid Flow : Single Particles. Measurement of particle size. Screening, Particle size distribution. Mean particle size. Efficiency of separation and grade efficiency.

Particulate Solids in Bulk: General Characterizations. Agglomeration. Resistance to shear and tensile forces. Angles of repose and of friction. Flow of solids in hoppers. Flow of solids through orifices. Measurement and control of solids flowrate. Overview ofsolid conveyers.

Unit 2: Size Reduction and Enlargements (6 L)

Mechanism of size reduction. Energy for size reduction. Methods of operating crushers. Nature of the material to be crushed. Type of crushing equipment. Coarse crushers. Intermediate crushers. Fine crushers. Specialized applications.
Brief outline of particle size enlargement

Unit 3: Settling and Sedimentation in Particle- Fluid Separation (6 L)

Theory of motion of particles through fluids, motion under gravitational and centrifugal fields, Terminal settling velocity of particles in a fluid (Stoke's law and Newton's law region and K-criteria for settling), Free settling and hindered settling.

Gravity settling, centrifugal separation (cyclone separator) and sedimentation: Principles of sedimentation. Kynch theory of sedimentation. Flocculation. Thickener design using Badger Bencheromethod.

Unit 4: Agitation & Mixing (6 L)

Agitation and mixing of fluids and solids, types of mixers, Standard design of mixing vessel,Types of agitators: axial flow impellers and radial flow impellers, Power number and Reynolds number for mixing,Power consumption of agitated vessels, Suspension of solids,the degree of mixing, The rate of mixing

Unit 5: Liquid Filtration: **(6 L)**

Filtration Theory. Relation between thickness of cake and volume of filtrate. Flow of liquid through the cloth. Flow of filtrate through the cloth and cake combined. Compressible filter cakes. Filtration Practice. The filter medium. Blocking filtration. Effect of particle sedimentation on filtration. Delayed cake filtration. Preliminary treatment of slurries before filtration. Washing of the filter cake.

Filtration Equipment:

Filter selection. Bed filters. Bag filters. The filter press. Pressure leaf filters. Vacuum filters. The tube press.

Centrifugal Separations:

Basic concepts of centrifugal separator methods.

Unit 6: Fluidization: **(6 L)**

Fundamentals of fluidization, types of fluidization. Particulate, bubbling and turbulent fluidization. Minimum fluidizing velocity. Minimum fluidizing velocity in terms of terminal falling velocity. The centrifugal fluidized bed. The spouted bed. Applications of the fluidized solids technique.
Pneumatic conveying

Term Work:

Term work shall consist of a journal based on the reports of at least 12 experiments performed from the list given below:

1. To determine particle size distribution for a given sample. Using standard sieve series.
2. To determine angles of repose and of friction for a given particulate mass.
3. To validate the equation (for example Brown's equation) for flow of solids through an orifice.
4. Experiment on blending of solid particles using a simple drum mixer.
5. Experiment on the working of gas-solid cyclone separator.
6. Experiment on particle size reduction in Ball Mill.
7. Experiment on settling of solid particles in stagnant fluid. (Stroke's Regime).
8. Experiment on characteristics of fluidized beds.
9. Experiment on Cake filtration.
10. Experiment on agitation and mixing
11. Experiment on batch Sedimentation.
12. Experiment on leaf filter.
13. Experiment on Jaw Crusher.
14. To work out material balance calculations over a continuous screening equipment using electronic spreadsheet.

Books:

1. Richardson J. F. & J. H. Harker; Coulson and Richardson's Chemical Engineering, Vol.2 Particle Technology & Separation Processes; 5/e, Butterworth – Heineman (2002).
2. McCabe W. L., J. C. Smith & P. Harriott; Unit Operations of Chemical Engineering; 5/e, McGraw-Hill Inc. (1993).
3. Badger W. L. & J. T. Banchero; Introduction to Chemical Engineering; Tata McGraw – Hill Edition (1997).
4. Geankoplis C.J.; Transport Processes and Separation Process Principles, Fourth edition, Eastern Economy Edition (2003)

212392 Technical Communications

Teaching Scheme:
Practical: 2 Hr/week

Examination Scheme:
PR: 50 Marks

Course Outcomes:

At the end of this course the student will be able to

1. Develop the ability to communicate effectively using suitable styles and techniques
2. Present technical material orally and using audio-visual way with confidence and poise
3. Perform well during GDs, Presentations, and Interviews
4. Communicate technical material to a variety of audiences
5. Work well in teams and understand lifelong learning concepts

Term Work:

Term work and theory are considered as an integral part of the course. Term work shall consist of a journal containing regular assignments and presentations completed in the practical class and at home. As far as possible, submission should be word processed on computer using standard package by the student himself. For the purpose of assignments, extensive use of research papers published in technical journals and articles published in magazines and newspapers may be made so that there is no repetition by individuals. Oral presentation exercises and group discussions should be conducted batch wise so that there is a closer interaction.

The total number of assignments should not be less than twelve, generally covering the topics mentioned below. All students should submit a journal as a part of Term work and oral examination will be based on assignment performed in the journal.

List of Assignments:

1. Formal speech on following topics;
    a. About myself
    b. The problems I face while communicating
    c. Topics on current affairs
2. Analyze Technical Communication Skills in Job Ads from a large newspaper, Web site, and/or professional journal
3. Résumé/Cover Letter or Statement Writing
4. Policy Memo Writing
5. Writing a Memo explaining Project idea
6. Technical writing on question involving a scientific or technological controversy such as Wiki Article
7. A letter each on different types of professional correspondence
8. Precise writing exercises – Exercises of summarizing English Articles & News
9. Reading and critics on Technical/ scientific article in News paper
10. Games on team building, communication and public speaking
11. Group discussions on current topics
12. Report writing – At least one report on each types should be practiced

13. Power Point Presentation of Report
14. Technical proposal writing
15. Writing Instructional Manual/ Operational Guides, Training Manual
16. Development of advertisement for any product / services for news paper/pamphlet
17. Notice writing for any one organization
18. Writing Literature review and abstract for technical article
19. Development of Flyer/Broacher for a technical event
20. Ethical and Power Issues in Technical communication

Books:

1. Aspi Doctor, “Principles and Practice of Business Communication”, Rhoda Doctor, Sheth Publications, Mumbai, 1998
2. Pravil S. R. Bhatia, “Professional Communication Skills”, S. Chand and Co., New Delhi, 2000
3. R. K. Chaddha, “Communication Techniques and skills”, DhanpatRai Publication, New Delhi, 2002
4. Sunita Mishra, C. Muralikrishna, “Communication Skills for Engineers”, Pearson Education, 2003

212393 Electrical and Electronics Engineering

Teaching Scheme:
Lecture: 1 hr/week
Practical: 2 hrs/week

Examination Scheme:
Term Work: 25 Marks

Course Outcomes

At the end of this course the student will be able to demonstrate

1. Familiarity with Electrical and Electronics systems.
2. Knowledge about motor characteristics.
3. Knowledge about electrical and electronic starters for ac and dc motors.
4. knowledge about generation of power.

3-Phase Circuits: (2 L)

Measurement of power in 3-phase circuits using 2-wattmeter method for balanced star and delta loads; Measurement of reactive power using one-wattmeter method.

D. C. Motors: (2 L)

Principle of working, construction, types, characteristics, starters, Methods of speed control, applications.

Induction Motors: (2 L)

a) 3-phase: Rotating Magnetic Field, Slip, and Torque slip, Characteristics, Starters and Applications.

b) Single phase: Types, Starting methods, Applications.

Alternators: (4 L)

Principles of operation, definition of regulation and efficiency. Converters and Invertors.

Industrial Electronics Devices and Applications: (4 L)

SCR, Triac, Power MOSFET, IGBT, Characteristics and Simple applications like Controlled Rectifiers, Study of UPS, Light Dimmers, Fan Regulators (Only Block Diagram).

Controllers, Transducers and Sensors: (4 L)

AC / DC / Stepper Motor Controllers.

Transducers for Temperature, Pressure, Displacement, Level, Photo Sensors, Actuators.

Note: The term work shall consist of a record of the following experiments performed.

List of Practicals:

1. Measurement of power in three-phase circuit by two wattmeter methods.
2. Measurement of reactive power in three phase circuit using one wattmeter method.
3. Brake Test on D.C. shunt motor.
4. Load test on D.C. series Motor.
5. Speed variation of D.C. shunt motor using armature voltage and field current control.
6. Load Test on three phase Induction Motor.
7. Study of single-phase induction motors.
8. Study of starters for (a) D.C.Motors (b) 3-phase Induction Motors

Books:

1. Hughes Edward; Electrical Technology, 5th Edition; English Language Book Society; (1982.)
2. Taylor E. O.; Utilisation of Electric Energy; Orient Longman Pvt. Ltd.; (1983.)
3. Cotton H.; Electrical Technology; CBS; (1999.)
4. Liptak -Instrument Engineers Hand Book Vol-I &Vol-II
5. Krishna Kant PHI -Computer Based Industrial Control