GURU KASHI UNIVERSITY

Diploma in Petro Chemicals and Petro Refinery Engineering
(DPE)

Session: 2022-23

Department of Petroleum Engineering

				(Hours Per Week)			
Sr. No	New Subject Code	Subject Name	Type of Subject T/P	L	T	P	No. of Credits
			Semester: 1st				
1	DPE101	Applied Chemistry – I	T	4	0	0	4
2	DPE102	Applied Mathematics - I	T	5	0	0	5
3	DPE103	Applied Physics – I	T	4	0	0	4
4	DPE104	English and Communication Skills – I	T	3	0	0	3
5	DPE105	Engineering Drawing – I	T	2	0	6	5
6	DPE106	Applied Chemistry – I (Practical)	P	0	0	2	1
7	DPE107	Applied Physics – I (Practical)	P	0	0	2	1
8	DPE108	English and Communication Skills – I (Practical)	P	0	0	2	1
9	DPE109	General Workshop Practice – I	P	0	0	6	3
		Total		18	0	18	27

				(Hours Per Week)			
Sr.	New Subject Code	Subject Name	Type of Subject T/P	L	T	P	No. of Credits
			Semester: 2nd				
1	DPE201	Applied Mathematics - II	T	5	0	0	5
2	DPE202	Applied Physics-II	T	4	0	0	4
3	DPE203	Chemical Engineering Materials	T	4	0	0	4
4	DPE204	Basics of Electrical and Electronics Engineering	T	5	0	0	5
5	DPE205	Engineering Drawing-II	T	2	0	6	5

6	DPE206	Applied Physics-II (Practical)	P	0	0	2	1
7	DPE207	General Workshop Practice – II (Practical)	P	0	0	6	3
8	DPE208	Basics of Information Technology (Practical)	P	0	0	4	2
9	DPE209	Basics of Electrical and Electronics Engineering (Practical)	P	0	0	2	1
		Total		20	0	20	30

Semester: 3rd							
Sr.	New Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	DPE301	Mechanical Operations	T	4	0	0	4
2	DPE302	Engineering Mechanics-I	T	4	0	0	4
3	DPE303	General Chemical Technology	T	4	0	0	4
4	DPE304	Organic Chemistry	T	4	0	0	4
5	DPE305	Industrial Chemical Calculations	T	4	0	0	4
6	DPE306	Introduction to Petrochemical Technology	T	4	0	0	4
7	DPE307	Mechanical Operations (Practical)	P	0	0	2	1
8	DPE308	Organic Chemistry (Practical)	P	0	0	2	1
9	DPE309	Testing Laboratory-I	P	0	0	4	2
		Total		24	0	8	28

Semester: 4th

Sr.	New Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	DPE401	Fluid Flow	T	5	0	0	5
2	DPE402	Engineering Mechanics-II	T	5	0	0	5
3	DPE403	Petroleum Refining	T	5	0	0	5
4	DPE404	Physical & Analytical Chemistry	T	4	0	0	4
5	DPE405	Chemical Engineering Thermodynamics	T	5	0	0	5
6	DPE406	Fluid Flow (Practical)	P	0	0	2	1
7	DPE407	Engineering Mechanics-II (Practical)	P	0	0	2	1
8	DPE408	Physical & Analytical Chemistry (Practical)	P	0	0	2	1
9	DPE409	Testing Laboratory-II	P	0	0	4	2
Total				24	0	10	29

Semester: 5th							
Sr.	New Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	DPE501	Mass Transfer-I	T	5	0	0	5
2	DPE502	Heat Transfer	T	4	0	0	4
3	DPE503	Chemical Reaction Engineering	T	4	0	0	4
4	DPE504	Petrochemicals Technology	T	4	0	0	4
5	DPE505	Plant Utilities	T	4	0	0	4
6	DPE506	Plant Operation	T	4	0	0	4

7	DPE507	Heat Transfer (Practical)	P	0	0	2	1
8	DPE508	Chemical Reaction Engineering (Practical)	P	0	0	2	1
9	DPE509	Project Work-I	P	0	0	4	2
Total				25	0	8	29

Semester: 6th							
Sr.	New Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	DPE601	Basics of Management	T	4	0	0	4
2	DPE602	Mass Transfer-II	T	3	0	0	3
3	DPE603	Industrial Hazards & Safety	T	3	0	0	3
4	DPE604	Polymer Technology & Processing.	T	4	0	0	4
5	DPE605	Process Instrumentation & Control	T	4	0	0	4
6	DPE606	Environmental Studies	T	3	0	0	3
7	DPE607	Mass Transfer-II (Practical)	P	0	0	2	1
8	DPE608	Industrial Hazards & Safety (Practical)	P	0	0	2	1
9	DPE609	Process Instrumentation & Control (Practical)	P	0	0	2	1
10	DPE610	Project Work-II	P	0	0	8	4
Total				21	0	14	28

Note: This study scheme (less semester 1 & semester 2) is also applicable to Diploma PCPRE LEET.

1ST SEMESTER SYLLABUS

APPLIED CHEMISTRY-I (DPE101)

Credits: 04   **L T P**
                                                                  4 0 0

Detailed Contents

Chapter 1: Basic Concepts of Chemistry (10 hrs)

1.1 Units and Dimensions, dimensional formulas- dimensional analysis principle of homogeneity of dimensions and their limitations, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity, thermodynamic parameters-significance and applications)

1.2 Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotones   (recapitulation only)

1.3 Mole concept, solution, standard solution, methods to express concentration of solution Molar mass, molar volume of gases, strength of solutions in grams per liter, morality (M), molality (m), mass and volume percentages and mole fraction

1.4. Chemical equations, thermo-chemical equations, balancing of chemical equations and simple stoichiometric calculations.

1.5 Numerical problems based on mole concept and molarity.

Chapter 2: Atomic Structure, Periodic Table and Chemical Bonding (12 hrs)

2.1 Fundamental particles- electrons, protons and neutrons

2.2 Bohr's model of atom and its limitations (qualitative treatment only).

2.3 Wave particle duality and Heisenberg's uncertainty principle (elementary idea only)

2.4 Modern concept of atom, definition of orbit and orbital's, shapes of s and p orbital's only, quantum numbers (significance only), electronic configuration of elements up to atomic number 30 on the basis of Aufbau Principle, Pauli's Principle and Hund's Rule

2.5 Modern periodic law and periodic table, groups and periods.

2.6 Classification of elements into s, p, d, and f blocks (periodicity in properties are excluded)

2.7 Chemical bond and cause of bonding.

2.8 Ionic bond, valence bond approach of covalent bond, hybridization (sp^3, sp^2 and sp) sigma (σ) and pi (π) bonds.

2.9 Metallic bonding – electric, magnetic and dielectric properties based on Band model

Chapter 3: Water (10 hrs)

3.1 Sources of water, impurities in water (dissolved –gases, salts and suspended),

3.2 Hardness of water, types of hardness, degree of hardness, units of hardness-ppm, $^{\circ}Cl$, $^{\circ}Fr$ – numerical problems

3.3 Disadvantages of using hard water in domestic and in industries: Laundry work (action of soap on water), paper, textile and beverage industries.

3.4 Boiler feed water and its quality - causes and prevention of   Scale and sludge formation, Priming and foaming, Boiler corrosion, Caustic embitterment

3.5 Softening of hard water by
Ion exchange process- dematerialized water advantages and limitations of this method
Desalting of sea water by reverse osmosis (RO) method
Calgon process

3.6 Characteristics of drinking water and ICMR, ISI –quality criteria

3.7 Water analysis: Quantitative analysis of hardness by EDTA method, alkalinity, and estimation of total dissolved solids (TDS)-numerical problems

3.8 Enlist applications of various kinds of water in engineering and chemical industry.

Chapter 4: Gas laws, Terminology of Thermodynamics and Equilibrium (14 hrs)

4.1 Definition of gas and perfect gas, gas laws- Boyle's Law, Charles law & Avogadro's law, Gas constant (R).

4.2 Terminology of Thermodynamics- thermodynamic system, surroundings, types of systems, extensive and intensive properties, state of a system, state functions, isothermal, adiabatic reversible, irreversible spontaneous and non spontaneous processes, meaning of ΔE, ΔH, ΔS and ΔG, free energy of spontaneous and non spontaneous processes (mathematical derivations are excluded)

4.3 Elementary idea of zeroth, 1st, 2nd, and 3rd laws of thermodynamics (without mathematical derivation)

4.4 Applications of free energy change (ΔG) criteria (in metallurgy and electric work without any mathematical derivation)

4.5 Equilibrium state and its significance statement of Le-Chatelier's principle, equilibrium constant (K) and its applications.

4.6 Electrolytes, non electrolytes, ionization in aqueous solutions, degree of ionization, ionic product of water (K_w)

4.7 Concept of pH, pH- scale and industrial applications of pH

4.8 Definitions - acids, bases, neutralization and acid base titrations, indicators and choice of indicators for acid base titration.

4.9 Buffer (acidic, basic and neutral) solutions, enlist applications of buffer solution

4.10 Simple numerical problems (only on 4.1, 4.5. 4.6 and 4.7 sections)

Chapter 5: Electrochemistry (10 hrs)

5.1 Electronic concept of oxidation and reduction, redox reactions

5.2 Electrolytes, non-electrolytes and electrolysis,

5.3 Faraday's Laws of electrolysis and applications in electrometallurgy and electroplating in automobile

5.4 Standard reduction potential (SRP), activity series, electrochemical cell and their e.m.f

5.5 Chemistry of commercial electrochemical cells

5.6 Primary cells - Daniel cell and dry cell
Secondary cell - lead acid storage cell, Wetson-cadmium cell, Ni-cad battery, Li battery, Hg – button cell and Ag- button cell
Fuel cells

Chapter 6: Organic Chemistry (06 hrs)

6.1 Tetra covalence of carbon in carbon compounds, catenation (definition only)

6.2 Classification of organic compounds on the bases of functional group

6.3 IUPAC nomenclature of simple organic compounds (containing one functional group only) and their common names (if any)

Books:

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan, Jalandhar
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.
6. Applied Chemistry-I by Dr.P.K. Vij & Shiksha Vij, Lords Publications, Jalandhar
7. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)

8. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
9. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
10. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)

APPLIED MATHEMATICS – I (DPE102)

Credits: 05   **L   T   P**
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Detailed Contents:

Chapter 1: Algebra   (30 hrs)

1.1   Complex Numbers: Complex number, representation, modulus and amplitude. De-movier's theorem, its application in solving algebraic equation.
1.2   Basics and properties of logarithms and its applications in solving problems related to basic logarithmic formulas.
1.3   Geometrical progression, its nth term and sum of n terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem such as maximum possible output of the machine, vibration of the spring, finding out capacity of tank etc.
1.4   Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)
1.5   Permutations and Combinations: Value of ^np_r ^nc_r. Simple problems of formulation of words from given alphabets (with and without repetition), circular permutations etc.
1.6   Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

Chapter 2: Trigonometry   (25 hrs)

2.1   Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Applications of angles such as angle subtended by an arc, diameter of moon etc.
2.2   T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).
2.3   Graphs of Sin x, Cos x, Tan x and e^x
2.4   Applications of Trigonometric terms in engineering problems such as to find an angle   of elevation, height, distance etc.

Chapter 3: Co-ordinate Geometry   (25 hrs)

3.1   Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae
3.2   Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple problems on locus.
3.3   Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula

3.4   General equation of a circle and its characteristics. To find the equation of a circle, given: -
         Centre and radius
         - Three points lying on it
         - Coordinates of end points of a diameter
3.5   Equation(s) of a straight line, circle, and conics (ellipse, parabola and hyperbola)   and   their
         application in solving engineering problems..

Books:
1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Luxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd.,
    New Delhi
9. Engineering Mathematics by S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi
12. Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar
13. Advanced Engineering Mathematics by Peter V.Oneil, University of Albama, 2007 edition,
    Cengage Learning India Pvt. Ltd. Patparganj, New Delhi

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APPLIED PHYSICS – I (DPE103)

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Credits: 04

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Detailed Contents:

Chapter 1: Units and Dimensions (8 hrs)

1.1   Physical quantities

1.2   Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)

1.3   Dimensions and dimensional formulae of physical quantities

1.4   Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis

1.5   Error in measurement, random and systematic errors

1.6   Application of units and dimensions in measuring length, diameter, Circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

Chapter 2: Force and Motion (10 hrs)

2.1   Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors

2.2   Force, resolution and composition of forces: resultant, parallelogram law of forces, equilibrium of forces

2.3   Newton's Laws of motion: concept of momentum, Newton's laws of motion and their engineering applications, derivation of force equation from Newton's second law of motion; conservation of momentum, impulse. Simple numerical problems

2.4   Circular motion: angular displacement, angular velocity and angular acceleration

2.5   Relation between linear and angular variables (velocity and acceleration)

2.6   Centripetal force (derivation) and centrifugal force with its application such as banking of roads, bending of cyclist, motion in vertical circle etc

2.7   Application of various forces in lifts, cranes, large steam engines and turbines.

Chapter 3: Waves and Vibrations (10 hrs)

3.1   Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship $v = n\lambda$) and their applications

3.2   Wave equation, $y = r\ sine\ \omega t$, phase, phase difference, superposition of waves and their applications.

3.3   Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.

3.4   Free, forced and resonant vibrations with examples

3.5   Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications

3.6   Ultrasonic – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

Chapter 4: Rotational Motion (6 hrs)

4.1   Concept of translator and rotating motion with examples

4.2   Definitions of torque, angular momentum and their relationship

4.3   Conservation of angular momentum (qualitative) and its examples

4.4   Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).

4.5　Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

Chapter 5: Work, Power and Energy (10 hrs)

5.1　Work: definition and its SI units

5.2　Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application

5.3　Power: definition and its SI units, calculation of power with numerical problems

5.4　Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation

5.5　Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application

5.6　Friction: concept, types and its engineering applications.

5.7　Application of Friction in brake system of moving vehicles, trains, aero planes and other objects.

Chapter 6: Properties of Matter (10 hrs)

6.1　Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications

6.2　Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, U-tube, manometers and barometer gauges and their applications

6.3　Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension

6.4　Fluid motion, stream line and turbulent flow, Equation of Continuity, Bernoulli's Theorem and their applications.

6.5　Viscosity and coefficient of viscosity: Buoyant force, buoyancy, Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity and its application in hydraulic systems.

Chapter 7: Thermometry (10 hrs)

7.1　Difference between heat and temperature on the basis of K.E. of molecules

7.2　Principles of measurement of temperature and different scales of temperature and their relationship

7.3　Resistance thermometers and Pyrometers with their field applications such as Thermocouple, Bi-metallic thermometer.

7.4　Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them

7.5　Modes of transfer of heat (Conduction, convection and radiation with examples)

7.6　Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method)

7.7　Application of various systems of thermometry in refrigeration and air-conditioning etc.

Books:

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi 11
5. Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi.
6. Berkeley Physics Course, Vol. I, II &III, Tata McGraw Hill, Delhi
7. The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi
8. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers

9. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
10. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
11. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar City
12. Physics by Nelcon and Parker Publishers UK
13. Engineering Physics by Vanchna Singh and Sheeetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

ENGLISH AND COMMUNICATION SKILLS – I (DPE104)

Credits: 03

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Detailed Contents:

Chapter 1: Facets of Literature (14 hrs)

1.1   Short Stories:
          Homecoming – R.N. Tagore
          The Selfish Giant - Oscar Wilde
          The Diamond Necklace- Guy- De Maupassantt
          The Stick – Justice Surinder Singh

1.2   Prose**:**
          I Have A Dream – Martin Luther King
          On Habits – A. G. Gardiner
          My struggle for An Education- Booker T Washington
          Seeing People Off – Max Beerbohm

1.3   Poems:
          Ozymandias – P.B. Shelley
          Daffodils – William Wordsworth
          Stopping by Woods on a Snowy Evening – Robert Frost
          Forefathers- Edmund Blunden

Chapter 2: Grammar and Usage (10 hrs)

2.1   Parts of speech:
          Nouns
          Pronouns
          Adjectives
          Articles
          Verbs
          Adverbs
          Prepositions
          Conjunction
          Interjection
          Identifying parts of speech
          Structures: Verb patterns, Question tags,
          Subject – Verb agreement (concord)

2.2   Pair of words (Words commonly confused and misused)
          Tenses
          Correction of incorrect sentences
          One word substitution

Chapter 3: Translation (04 hrs)

      3.1   Glossary of Administrative Terms (English and Hindi)

     3.2   Translation from Hindi into English

Chapter 4: Paragraph of 100-150 words from outlines (08 hrs)

Chapter 5: Comprehension (04 hrs)
     Unseen passages of literature, scientific data/graph based for comprehension exercises

Chapter 6: Communication (08 hrs)
     6.1   Definition, Introduction and Process of Communication
     6.2   Objectives of Communication
     6.3   Notices

Books:

1. English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh, 6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

ENGINEERING DRAWING – I (DPE105)

Credits: 05
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Note:
1. First angle projection is to be followed
2. Minimum of 16 sheets to be prepared
3. Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

Detailed Contents:
Chapter 1: Introduction to Engineering Drawing
1.1   Introduction to drawing instruments, materials and layout of drawing sheets.
Chapter 2: Free Hand Sketching and Lettering (03 sheets)
2.1   Different types of lines in engineering drawing as per BIS specifications
2.2   Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
2.3.   Free hand lettering (Alphabet and numerals) – lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3,5,8 and 12 mm heights in the ratio of 7:4
Chapter 3: Dimensioning Technique (01 sheet)
3.1   Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
3.2   Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches
Chapter 4: Scales (02 sheets)
4.1   Scales - their need and importance (Theoretical instructions).
4.2   Drawing of plain and diagonal scales
Chapter 5: Projection (05 sheets)
5.1   Theory of projections (Elaborate theoretical instructions)
5.2   Projection of Points
        Production of a point in the first quadrant.
        Projection of a point in the third quadrant.
5.3   Projection of Straight Line
        Line parallel to both the planes
        Line perpendicular to any one of the reference plane
        Line inclined to any one of the reference plane.
5.4   Drawing 3 views of given objects (Non-symmetrical objects may be selected for this exercise)
5.5.   Drawing 6 views of given objects (Non-symmetrical objects may be selected for this exercise)
5.6.   Identification of surfaces on drawn views and objects drawn
5.7.   Exercises on missing lines and views
Note: At least one sheet in third angle projection
Chapter 6: Sections (02 sheets)

6.1   Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning
6.2   Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
6.3   Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
6.4   Exercises on sectional views of different objects.

Chapter 7: Isometric Views (03 sheets)
7.1   Fundamentals of isometric projections (Theoretical instructions)
7.2   Isometric views of combination of regular solids like cylinder, cone, cube and prism.

Books:
1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House.
4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar

APPLIED CHEMISTRY-I (PRACTICAL) (DPE106)

Credits: 01

L T P
0 0 2

List of Practical

1. Introduction to volumetric analysis, apparatus used in volumetric analysis and molarity based calculations.
2. Preparation of standard solution of oxalic acid $\{(COOH)_2.2H_2O\}$ or potassium permanganate $(KMnO_4)$ or potassium dichromate $(K_2Cr_2O_7)$
3. To verify the physical (state, color, odour solubility, boiling and melting points) properties and few chemical properties of ionic (e.g. NaCl) and covalent (kerosene oil or any other such compound may be given) compounds.
4. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
5. To determine total acid number of given oil volumetrically
6. To prepare cuprammonium $\{Cu(NH_3)_4SO_4\}$ and estimate cupric ion in the given solution of copper sulphate solution by spectrophotometer method..
7. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)
8. To verify the first law of electrolysis. (Electrolysis of copper sulphate solution using copper electrode).
9. To prepare iodoform from ethanol or acetone
10. To prepare Bakelite
11. To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.
12. Estimation of hardness of water by EDTA method.
13. Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid
14. Determination of pH of given solution using pH meter.

APPLIED PHYSICS – I (PRACTICAL) (DPE107)

Credits: 01

L T P
0 0 2

List of Practicals (to perform minimum ten experiments)
1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
3. To determine the thickness of glass strip and radius of curvature using a spherometer
4. To verify parallelogram law of forces
5. To find the time period of a simple pendulum and determine the length of second's pendulum.
6. To find the frequency of a tuning fork by a sonometer
7. To find the velocity of sound by using resonance apparatus at room temperature.
8. To find the Moment of Inertia of a flywheel about its axis of rotation
9. To find the surface tension of a liquid by capillary rise method
10. To determine the atmospheric pressure at a place using Fortin's Barometer
11. To determine the viscosity of glycerin by Stoke's method
12. To determine the coefficient of linear expansion of a metal rod
13. To find the coefficient of thermal conductivity of Bakelite sheet (bad conductor) by Lee's Disc Method
14. To determine the coefficient of thermal conductivity of a copper strip using Searle's Thermal Conductivity apparatus.

ENGLISH AND COMMUNICATION SKILLS – I (PRACTICAL) (DPE108)
Credits: 01

L T P
0 0 2

List of Practicals
1. (Locating a Book in Library
2. To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
3. To seek information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a good speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

GENERAL WORKSHOP PRACTICE – I (DPE109)

Credits: 03   **L T P**
                                                                      0 0 6

Detailed Contents (Practicals)
The following shops are included in the syllabus:
1. Carpentry and Painting Shop
2. Fitting Shop
3. Electric Shop

Note: The contents of various shops prescribed under workshop Practice –I are same as that of General Workshop Practice-I which is common for most of engineering diploma programmes except for Computer Engineering and Information Technology.

The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1.   Carpentry and Painting Shop
1.1   Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
1.2   Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed. Job I Marking, sawing, planning and chiseling & their practice
1.3   Introduction to various types of wooden joints, their relative advantages and uses.
       Job II   Preparation of half lap joint
       Job III Preparation of Mortise and Tenon Joint
1.4   Demonstration of various methods of painting wooden items.
       Job IV Preparation of surface before painting including primer coat
       Job V Painting Practice by brush/roller/spray
2.   Fitting Shop
2.1   Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.). Identification of various sections of steel viz. Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
2.2   Description and demonstration of various types of work benches. Holding devices and files. Precautions while doing filing work.
       Job I   Marking of job, use of marking tools and measuring instruments.
       Job II Filing a dimensioned rectangular or square piece of an accuracy of ± 0.25mm
       Job III Filing practice (Production of flat surfaces) Checking by straight edge.
2.3   Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.
       Job IV   Making a cutout from a square piece of MS Flat using Hand hacksaw.
3.   Electric Shop
3.1   Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
3.2   Study of electrical safety measures and demonstration about use of protective devices.
       Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.

       Job II Preparation of a house wiring circuit using fuse, switches, socket, holder, ceiling rose etc. by batten wiring and PVC casing and capping

3.3   Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, desert cooler etc.

3.4   Introduction to the construction of a Lead-acid battery and its working.

       Job III Installation of a battery and to connect two or more batteries in series and in parallel.

Books:

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

2ND SEMESTER SYLLABUS

APPLIED MATHEMATICS-II (DPE201)

Credits: 05   **L   T   P**
                                                                                5   0   0

Detailed Contents:

Chapter 1: Algebra (10 hrs)
1.1   Determinants: Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule.
1.2   Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.
1.3   Application of Matrix in computer programming

Chapter 2: Differential Calculus (24 hrs)
2.1   Definition of function; Concept of limits.

$$\text{Four standard limits} \quad \underset{x \to a}{Lt} \quad \frac{x^n - a^n}{x - a},$$

$$\underset{x \to 0}{Lt} \ \frac{Sin\ x}{x}, \quad \underset{x \to 0}{Lt} \ \frac{a^x - 1}{x}, \quad \underset{x \to 0}{Lt} \ (1+x)^{1/x}$$

2.2   Differentiation of x^n, sin x, cos x, tan x, e^x, $\log_a x$ (Please take one example of differentiation by definition)
2.3   Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
2.4   Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation, Successive differentiation (excluding nth order).
2.5   Application of differential calculus in::
         (a) Rate Measures
          (b) Errors and increments
         (c) Maxima and minima
          (d) Equation of tangent and normal to a curve (for explicit functions only)

Chapter 3: Integral (26 hrs)
3.1   Integration as inverse operation of differentiation with simple examples.
3.2   Simple integration by substitution, by parts and by partial fractions (for linear factors only)
3.3   Evaluation of definite integrals (simple problems)-

$$\text{Evaluation of} \ \int_{0}^{\pi/2} Sin^n x. \, dx, \quad \int_{0}^{\pi/2} Cos^n x \, dx, \quad \int_{0}^{\pi/2} Sin^m x \ Cos^n x \, dx$$

         using formulae without proof (m and n being positive integers only)
3.4   Applications of integration for :
         (a) Simple problem on evaluation of area bounded by a curve and axes.
         (b) Calculation of volume of a solid formed by revolution of an area about axes.
             (Simple problems).
         (c)To calculate average and root mean square value of a function and
         (d) Area by Trapezoidal Rule and Simpson's Rule

Chapter 4: Statistics and Probability (12 hrs)
4.1   Measures of Central Tendency: Mean, Median, Mode with example of daily life.

4.2. Measures of Dispersion: Mean deviation, Standard deviation

4.3 Probability definition and addition law of probability, theorem and simple numerical problems, General view of normal probability curve (No numericals)

4.4 Explanation of different sampling techniques (No numericals)

Chapter 5: Differential Equations (08 hrs)

5.1 Solution of first order and first degree differential equation by variable separation method (simple problems)

 5.2. Differential equations of homogeneous equation

Books:

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.

2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar

3. Applied Mathematics by Dr. RD Sharma

4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar

5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications

6. Engineering Mathematics by Dass Gupta

7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi

8. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi

9. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi

10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,

11. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi

12. Applied Mathematics-II, Archana Sharma, Lords Publications, Jalandhar

13. Advanced Engineering Mathematics by Peter V.O,neil, University of Albama 2007 edition, Cengage Learning India Pvt. Ltd. Patparganl, New Delhi.

APPLIED PHYSICS – II (DPE202)

Credits: 04   **L   T   P**
                                                                              4   0   0

Detailed Contents:

Chapter 1: Optics (12 hrs)
1.1   Review of basic optics laws: Reflection and Refraction
1.2   Refractive index and magnification, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection and their applications
1.3   Simple concepts of interference, diffraction , Polarization and their applications like Commercial equipment, optic glasses and its manufacturing and use of Polarimeter in sugarcane industry and distilleries (No explanation required).
1.4   Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case) and their applications

Chapter 2: Electrostatics (10 hrs)
2.1   Coulombs law, unit charge and electric lines of force
2.2   Electric flux and Gauss's Law, Electric field intensity and electric potential
2.3   Electric field due to point charge, straight charged conductor, plane charged sheet and charged sphere (Inside and outside the sphere)
2.4   Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down
2.5   Pollution, different types of pollution and polluting agents, Use of Electronics in reducing Air and Water pollution e.g. precipitation of microbes and moisture reparation from air and gases in industry (small explanation only)

Chapter 3: DC Circuits (15 hrs)
3.1   Concept of electricity, various applications of electricity
3.2   Current, voltage, resistance, potential difference and e.m.f, power, electrical energy and their units, advantages of electrical energy over other forms of energy and Alternating Current and Direct Current
3.3   Ohm's law and its applications, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors an Resistance, Definitions of Conductance and Super Conducter's
3.4   Kirchhoff's laws, Wheatstone bridge principle and its applications
3.5   Heating effect of current and concept of electric power, energy and their units, related numerical problems and their applications
3.6   Examples of DC Circuits e.g. Various electrical and electronic equipment CRO, T.V., Audio system, Computers (Only examples, no explanations)

Chapter 4: Electromagnetism (10 hrs)
4.1   Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units
4.2   Permeability and susceptibility and their applications. Electromagnetic Induction, Lanz's law and its uses like dynomo, Right hand and left hand rules, Magnetic lines of force due to straight conductor, Solenoid and Circular coil. Force on a current carrying rectangular coil placed in magnetic field and its uses in moving coil galvanometer, electric motor (Concept only). Lorentz force, Force on a current carrying conductor (straight and rectangular)
4.3   Moving coil galvanometer its principle, construction and working.

Chapter 5: Semiconductor physics (07 hrs)

5.1   Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics

5.2   Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)

Chapter 6: Modern Physics (10 hrs)

6.1   Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers their engineering and medical applications.

6.2   Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

Books:

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New Delhi
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheeetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

CHEMICAL ENGINEERING MATERIALS (DPE203)

Credits: 04

L T P
4 0 0

Detailed Contents:

Chapter 1.   Introduction (4 hrs)
Scope of engineering materials, classification of engineering materials, fundamental nature & structure of material, selection of materials

Chapter 2.   Engineering properties of materials (6 hrs)
MP, BP, Heat capacity, thermal conductivity, Expansion co efficient, thermal insulation, stress, strain, Factors affecting properties of materials

Chapter 3.   Metals & Alloys (8 hrs)
Heat treatment of Steels Mechanical properties of steel, wrought Iron. The analysis of simple Iron Carbon system, Important furnaces for purification of metal. Alloys: Objectives of alloying, properties of alloys, Classification of alloys, approximate compositions. Applications of Nickel steel, chrome steel, Chrome nickel steel, Bronze, brass, Bell metal, Gun metal Monel metal, German silver Duralumin, Bearing metal Hastelloy (i.e. Non ferrous alloys, Copper alloys Aluminium alloys, Nickel base Alloys Lead base alloys) Working pressure for Metal, soldering of metal welding of metal.

Chapter 4.   Corrosion & its prevention (6 hrs)
Definition, Types of corrosion Electrochemical Corrosion Galvanic corrosion high temp. Corrosion Factors influencing corrosion methods for protection against corrosion, Laboratory & Plant corrosion test selection of materials.

Chapter 5.   Ceramic materials (8 hrs)
Definition properties & application of clay, Fire clay bentonite, Glass, raw material of Glass, mfg. of glass types of glasses their properties & uses Porcelain general properties, Composition and uses, Cement – properties & application.

Chapter 6.   Polymer materials (8 hrs)
Polymer & their structure Addition & Condensation Polymerisation plastics Definition properties of plastics, classification of plastics, Rubbers – Definition classification, sources, properties & uses of natural & synthetic, rubber, vulcanizing wood, properties, general idea about seasoning its advantage & Limitation.

Chapter 7.   Lubricants (5 hrs)
Importance and classification of lubricants, properties and application of synthetic & semisolid lubricants method of applying lubricants

Chapter 8.   Special application materials (5 hrs)
Insulation materials properties & application of various electric, thermal, sound, Insulation materials. Adhesives- definition, classification of Adhesives, advantages & limitation of Adhesives.

Chapter 9.   Packing materials (4 hrs)
Objectives of packaging, requirement of Packaging materials, properties and uses of paper, aluminium foil & card board

Books:
1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.

3. Engineering Chemistry by Shashi Chawla.

4. Progressive Applied Chemistry – II by Dr. G.H. Hugar, Eagle Prakashan Jalandhar.

5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer - Narosa Publishing House New Delhi.

6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)

7. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)

8. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)

9. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (DPE204)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Application and Advantage of Electricity (03 hrs)
Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (06 hrs)
Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. AC Fundamentals (08 hrs)
Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current
relationship (no derivation)

4. Transformers (06 hrs)
Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

5. Electric Motor (10 hrs)
Description and applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor. Motors used for driving pumps, compressors, centrifuge, dyers etc. Totally enclosed submersible and flame proof motors

6. Basic Electronics (15 hrs)
Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, their characteristics and uses. Characteristics and applications of a thyristor, characteristics and applications of stepper motors and servo motors in process control. Logic Gates i.e. ANS gate, OR Gate, NOT gate, NOR gate, NAND gate, XOR gate and their truth tables.

Books:
1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic electronics and Linear circuits by NN Bhargava and Kulshreshta, Tata McGraw Hill New Delhi.
9. Electronic principles by SK Sachdev, Dhanpat Rai and Sons, New Delhi.

10. Electronic Devices and circuits by Rama Raddy Narora Publishing House Pvt.Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi
12. Digital Electronics by Malvino

ENGINEERING DRAWING – II (DPE205)

Credits: 05

L T P
2 0 6

Detailed Contents:

1. Detail and Assembly Drawing (01 sheets)
1.1. Principle and utility of detail and assembly drawings
1.2. Introduction to CAD Software
1.3. Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example with CAD Software
2. Threads (Min.02 sheets)
2.1. Nomenclature of threads, types of threads (metric). Single and multiple start threads
2.2. Forms of various external thread sections such as V, Square, Acme, Knuckle, Metric, Seller and Buttress thread
2.3. Simplified conventions of left hand and right hand threads, both external and internal threads
2.4. Draw at least one sheet using CAD Software
3. Nuts and Bolts (Min.02 sheets)
3.1. Different views of hexagonal and square headed bolts and nuts
3.2. Assembly of nuts and bolts with washers
3.3. Draw at least one sheet using CAD Softwa
4. Locking Devices (01 sheet)
4.1. Lock nuts, Castle nuts, Sawn nuts, Split pin lock nut
4.2. Spring washers, Locking plates.
4.3. Draw different locking devices using CAD Software
5. Screws, Studs and Washers (01 sheet)
5.1. Drawing various types of machine screws
5.2. Drawing various types of studs
5.3. Drawing various types of washers
5.4. Redraw the above sheet using CAD Software
6. Keys and Cotters (Min.03 sheets)
6.1. Various types of keys and their application. Preparation of drawings of various keys and cotters
6.2. Various types of joints (a) Sleeve and Cotter joint (b) Kunckle joint (c) Spigot and Socket joint
6.3. Draw any one joint using CAD Software
7. Rivets and Rivetted Joints (02 sheets)
7.1. Types of general purpose rivet heads
7.2. Types of rivetted joints -lap, butt (single cover plate and double cover plate), chain and zig-zag riveting.
7.3. Caulking and fullering of rivetted joints.
7.4. Draw any one type of rivetted joint using CAD Software

Books:
1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., New Delhi
2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House

4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar

5. AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo & D. Sarvanan, Wiley India Pvt. Ltd., Delhi

6. CATIA for Beginners by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delh

7. CATIA for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delh

8. Pro/Engineer Wildfire 5.0 for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd.,Delhi.

9. NX 6: For Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi.

10. Solidworks 2009: The Basics by David C. Planchard, Schroof Development Corporation, Post Box 1334, Mission KS 66222, USA.

11. Solidworks 2010 for Engineers and Designers, Prof. Sham Tickoo, Wiley India Pvt. Ltd, Delhi.

APPLIED PHYSICS- II (PRACTICAL) (DPE206)

Credits: 01
        L T P
        0 0 2

List of Practicals (To perform minimum eight experiments)
1. To find the focal length of convex lens by displacement method.
2. To determine the magnifying power of an astronomical telescope
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To find resistance of galvanometer by half deflection method
6. To measure very low resistance and very high resistance using Wheat Stone bridge
7. To determine the capacity of a parallel plate capacitor by discharging through a voltmeter and also find out the tine constant of the given capacitor.
8. To draw characteristics of a pn junction diode and determine knee and break down voltages
9. To find wave length of He Ne semiconductor LASER.
10. Use of CRO in plotting AC/DC

GENERAL WORKSHOP PRACTICE – II (DPE207)

Credits: 03   **L T P**
                                                                                   0 0 6

Detailed Contents (Practicals)
The following shops are included in the syllabus:
1. Welding Shop
2. Electronic Shop
3. Sheet Metal Shop

Note:
The contents of various shops prescribed under workshop Practice –I are same as that of General Workshop Practice-I which is common for most of engineering diploma programmes except for Computer Engineering and Information Technology.

The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1. Welding Shop
- 1.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 1.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.

  Job I   Practice of striking arc while using electric arc welding set.

  Job II Welding practice on electric arc welding for making uniform and straight weld beads
- 1.3 Various types of joints and end preparation.

  Job III   Preparation of butt joint by electric arc welding.

  Job IV   Preparation of lap joint by electric arc welding.

  Job V   Preparation of corner joint by using electric arc welding.

  Job VI   Preparation of Tee joint by electric arc welding.

2.   Electronic Shop
- 2.1   Identification and familiarization with the following tools used in electronic shop: Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron and their demonstration and uses.
- 2.2   Identification and familiarization with the following electronic instruments:

  a) Multimeter analog and digital (Three and half digit)

  b) Single beam simple CRO, Signal Generator and Function Generator; function of every knob on the front panel

  c) Audio-oscillator having sine and square wave output

  d) Regulated Power supply -- fixed voltage and variable voltage, single output as well as dual output.

  Job I Practice in the use of above-mentioned equipment. For this small experimental as set up may be done
- 2.3   Various types of protective devices such as: Wire fuse, cartridge fuse etc.
- 2.4   Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors
- 2.5   Safety precautions to be observed in the electronic shop

NOTE: Demonstration Boards for the above components should be made.

Job II Cut, strip, join and insulate two lengths of wires/ cables (repeat with different types of cables/wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD Players, VCD/DVD Players, Cassette Recorder and Players, Hi-Fi equipment, Hand- set, microphone

Job IV Cut, bend, tin component, Leeds, inserts and solder components (resistor, capacitor, diodes, transistors, FETs, IFT coils, ICs etc) on a PCB

3. **Sheet Metal Shop**

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

3.1 Introduction and demonstration of hand tools used in sheet metal shop.

3.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

3.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

3.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.

Job I Shearing practice on a sheet using hand shears.
   a) Practice on making Single riveted lap joint/Double riveted lap Joint.
   b) Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint

Books:

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

BASIC OF INFORMATION TECHNOLOGY (PRACTICAL) (DPE208)

Credits: 02

L T P
0 0 4

List of Practicals

1. Given a PC, name its various components and peripherals. List their functions
2. Practice in installing a computer system by giving connection and loading the system software and application software
3. Exercises on entering text and data (Typing Practice)
4. Installation of operating System viz. Windows XP, Windows 2007 etc..
   Features of Windows as an operating system
   - Start
   - Shutdown and restore
   - Creating and operating on the icons
   - Opening closing and sizing the windows
   - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
   - Creating and operating on a folder
   - Changing setting like, date, time, colour (back ground and fore ground)
   - Using short cuts
   - Using on line help
5. MS-Word
   - File Management:
   - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
   - Page Set up:
   - Setting margins, tab setting, ruler, indenting
   - Editing a document:
   - Entering text, Cut, copy, paste using tool- bars
   - Formatting a document:
   - Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
   - Aligning of text in a document, justification of document ,Inserting bullets and numbering
   - Formatting paragraph, inserting page breaks and column breaks, line spacing
   - Use of headers, footers: Inserting footnote, end note, use of comments
   - Inserting date, time, special symbols, importing graphic images, drawing tools
   - Tables and Borders:
   - Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
   - Print preview, zoom, page set up, printing options
   - Using Find, Replace options
   - Using Tools like:
   - Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables
   - Using shapes and drawing toolbar,
   - Working with more than one window in MS Word,
   - How to change the version of the document from one window OS to another

- Conversion between different text editors, software and MS word

6. MS-Excel
   - Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
   - Menu commands:
     - Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
   - Work books:
     - Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
   - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
   - Creating a chart:
     - Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
   - Using a list to organize data, sorting and filtering data in list
   - Retrieve data with query: Create a pivot table, customising a pivot table. Statistical analysis of data
   - Exchange data with other application: embedding objects, linking to other applications, import, export document.

7. MS PowerPoint
   Introduction to PowerPoint
   - How to start PowerPoint
   - Working environment: concept of toolbars, slide layout, templates etc.
   - Opening a new/existing presentation
   - Different views for viewing slides in a presentation: normal, slide sorter etc.

   Addition, deletion and saving of slides
   Insertion of multimedia elements
   - Adding text boxes
   - Adding/importing pictures
   - Adding movies and sound
   - Adding tables and charts etc.
   - Adding organizational chart

   Formatting slides
   - Using slide master
   - Text formatting
   - Changing slide layout
   - Changing slide colour scheme
   - Changing background
   - Applying design template

   How to view the slide show?
   - Viewing the presentation using slide navigator
   - Slide transition
   - Animation effects etc.

8. Working with MS Access
   Understanding different data types

       Creation of table
       Entering data in a table and modify it.
       Creating simple Queries

9.   Internet and its Applications
       Log-in to internet
       Navigation for information seeking on internet
       Browsing and down loading of information from internet
       Sending and receiving e-mail

- Creating a message
- Creating an address book
- Attaching a file with e-mail message
- Receiving a message
- Deleting a message

Books:

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, 7th edition, Tata Mc Graw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
5. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
6. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
8. Mastering Windows 95, BPB Publication, New Delhi
9. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
10. Fundamentals of Information Technology by Leon and Leon;Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
11. On Your Marks - Net…Set…Go… Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
12. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
13. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEEIRNG (PRACTICAL) (DPE209)

Credits: 01

L T P
0 0 2

List of Practicals:
1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation
2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation
3. Connection and reading of an electric energy meter
4. Use of ammeter, voltmeter, wattmeter, and multi-meter
5. Measurement of power and power factor in a given single phase ac circuit
6. Study of different types of fuses, MCBs and ELCBs
7. Study of zener as a constant voltage source and to draw its V-I characteristics
8. To draw V-I characteristics of a (i) NPN transistor (ii) thyristor (SCR)
9. Study of construction and working of a (i) stepper motor and (ii) servo motor

3RD SEMESTER SYLLABUS

MECHANICAL OPERATION (DPE301)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Introduction - Definition of unit operation & unit process Difference of unit operation & unit process with examples. (5 hrs)

2. a) Characterisation of solid particles – Particle shape sphericty (shape factor) particle size, calculation of equivalent particle diameter, specific surface area, volume surface mean diameter, mass mean diameter, simple calculation of properties. (3 hrs)

2. b) Screening – standard screen series, cumulative analysis, differential analysis, Sieve shaker, Definition of ideal & actual screen capacity and effectiveness of screen. Types of screens- Grizzlies, Trommels, Gyratory screen, Vibrating screens. Simple calculation on capacity and effectiveness of screen. (3 hrs)

3. Size reduction (Comminution):
a) Criteria for size reduction characteristics of comminuted products, particle size distribution, energy and power requirement in crushing, work index, laws of crushing, Rittinger's law, Bond's law, Kick's law, Simple calculation of power for size reduction. (4 hrs)
b) Size reduction equipment - Crushers, Jaw crushers, Roll crushers, Angle of nip, Ribbon factor, capacity of Roll crusher, Gyratory crusher, Grinder, Hammer Mill, Ball mill, Attrition mill, Critical speed of Ball mill. Ultrafine grinders - Fluid energy mill cutting machines - Knife cutters, Open and close circuit grinding, Introduction to size enlargement. (3 hrs)

4. Agitation and Mixing of liquids: Definition of agitation & mixing and their Applications. Equipment for agitation, Purposes of agitation, Types of impellers, Propeller, paddle, Turbine Anchor, equation for power consumption in agitation, flow Patterns in agitated tanks, Baffles, Vortex prevention, flow number, Factors affecting agitation. Simple problems on calculation of power in Agitated vessels. (5 hrs)

5. Mixing of solids: Purposes of mixing solids & pastes factors affecting selection of equipment, rate of Mixing, mixing index for pastes & powder Principle construction & working of change Can mixer, Kneaders, ribbon blender, Pug mill, Banbury mixer, Muller mixer, Double Cone mixer. (4 hrs)

6. Filtration: Definition & application of filtration, factors affecting selection of equipment, Filtration equipment – plate & frame filter   press, shell & leaf filter, vacuum filter, rotary drum filter (pre coat), centrifugal Filtration, centrifuge, cartridge filter, filter media & its characteristics, filter aids and methods of application, precoating Principles of cake filtration, constant pressure & constant rate filtration. Filter medium resistance specific cake resistance simple calculation of α and Rm principles, of centrifugal filtration. (5 hrs)

7. Sedimentation: Definition – Batch sedimentation rate of Sedimentation height of inter phase & time curve. Flolculation Thickners, Gravity Setting processes. Sink & float method. Differential settling methods, Free & Hindered Settling, definition of Stoke's law, Newton's Law for terminal settling velocity. (5 hrs)

8. Separation based on property (solid particles) Definition & application of solid separation, Factors affecting selection of equipment, Froth Floatation, Jigging, Magnetic separation, Electro static precipitator, Cyclone separator, Hydro cyclone, Centrifugal classifier, Bag filter. (4 hrs)

9. Conveying of solids (Conveyers): Vertical & horizontal transport, Belt Chain, screw, pneumatic conveyor Bucket elevator Industrial application of conveying. (4 hrs)

Books:

1. Mechanical Operations by Swain, Tata McGraw Hill Publication
2. Mechanical Operations by Kiran D. Patil, Nirali Publication
3. Chemical Engineering, Vol. I and II by Coulson and Richardson, Pergamon Press Publication
4. Unit Operation of Chemical Engineering by McCabe and Smith; McGraw Hill Publication
5. Introduction to Chemical Technology by Badger and Banchero, McGraw Hill Publication
6. Fluid Mechanics and Its Applications by Gupta and Gupta, Wiley Eastern Publication
7. Principles of Unit Operations by Alen Foust, John Wiley Publication

ENGINEERING MECHANICS – I (DPE302)

Credits: 04
L T P
4 0 0

Detailed Contents:

1. Fundamental of Applied Mechanics: Fundamental unit, Derived units, system of Units, scalar & vector quantities, introduction to applied mechanics. (4 hrs)

2. Force: Force characteristics of force, system of forces, fundamental principles of transmissibility effect of force. (5 hrs)

3. Coupling concurrent force system: Resultant & equilibrant force, Equilibrium of a Coplanar concurrent force system, Analytical Method, parallelogram & Lami's theorems Composition and resolution of forces. Bow's Notation Graphical method laws of parallelogram Triangle & polygon of force. (6 hrs)

4. Moment & couple: Moment, Types of moment, couple & characteristic of couple Varignon's theorem of moment. Conditions of equilibrium for coplanar non-concurrent forces. (5 hrs)

5. Coplanar non-concurrent forces: Parallel force system, resultant of parallel force System by Graphical & analytical method, Resultant of coplanar non concurrent & non Parallel forces by analytical method & graphical Method. (6 hrs)

6. Support reaction: Types of supports, types of loads, support reaction by graphical and analytical method for simply Supported beam, over hanging beam and roller and hinged beams Reaction of perfect frame. (5 hrs)

7. Centroid: Centre of gravity & moment of inertia Centre of gravity, centroid of composite geometrical Figures, centre of gravity of solid body, modules of selection, moment of inertia radius of gyration, theorem of parallel axis, moment of inertia radius of gyration, theorem of parallel axis, moment of inertia of rectangle, triangle, circle, symmetrical I section & II sections. (5 hrs)

8. Friction: Static, dynamic, & limiting friction Rolling & sliding friction, normal reaction, coefficient of friction, angle of friction and angle of repose laws of friction. Friction along various plane ladder friction wedge friction & screw jack friction. (5 hrs)

Books:
1. Applied Mechanics by Birender Singh, Kataria Publications
2. Engineering Mechanics by Khurmi, Tata McGraw Hill
3. Applied Mechanics by IB Prasad, Khanna Publications
4. Engineering Mechanics by lrving H. Shames; Prentice Hall of India Ltd.

GENERAL CHEMICAL TECHNOLOGY (DPE303)

Credits: 04   **L T P**
                                                                                                            4 0 0

Detailed Contents:

1. Oils and Fats (08 hrs)
Introduction, Extraction of oils, Hydrogenation of oils.
2. Sugar (08 hrs)
Introduction, Juice extraction, defacation, concentration, refining
3. Paper & Pulp (06 hrs)
Introduction, Criteria for getting good quality paper, Types of pulp and Manufacture of paper by fourdrinier machine
4. Sulphuric Acid (06 hrs)
Introduction, Grades of sulphuric acid, Manufacture of sulphuric acid by contact process.
5. Soda Ash Industry (06 hrs)
Manufacture of Soda ash by Solvay process and Modified Solvay process.
6. Glass (04 hrs)
Introduction, Different types of glasses, raw materials required by glass industry, Manufacture of glass.
7. Cement Industry (04 hrs)
Types of Portland cement, Manufacture of Portland cement.
8. Fertilizer Industry (08 hrs)
Introduction, NPK, Manufacture of ammonia and urea, superphosphate and triple superphospate, mixed fertilizers, complex and compound fertilizers.
9. Polymer Industry (08 hrs)
Definition of polymerisation, Types of polymerization, Manufacture of polyethylene, polyvinylchloride, semi-synthetic polymers and synthetic polymers.
10. Industrial Gases (06 hrs)
Manufacture of Carbon-dioxide, Nitrogen and Oxygen.

Books:
1. Chemical process Technology by Shreeve, Mc Graw Hill Publication.
2. Outlines of Chemical Technology by Dryden, East west press publication.
3. Fertilizer Industry in India, part I and II by Pritam Singh and VS Awasthi, 1992.
4. A text book of Chemical Technology, Vol I & II by G.N. Pandey, Vikas Publication.

ORGANIC CHEMISTRY (DPE304)

Credits: 04   **L T P**
                                                                                                4 0 0

Detailed Contents:

1. Stereo chemistry: Isomerism: geometrical & Optical. (5 hrs)
2. Grignard's reagent - Organometalic compounds properties & uses. Girgnard reagent as an important tool for organic synthesis. (6 hrs)
3. Aliphatic compounds- Chemical reactions involved in methods of preparation, Properties & uses of Ketones, Aldehydes, Halogens carboxylic acids, esters, Aminocompounds. (6 hrs)
4. Aromatic Compounds.
Difference between Aliphatic & Aromatic, Chemical reaction involved in preparation of aromatic compounds, properties & uses, Benzene & its homologous, Halogen derivatives of aromatic compounds, e.g. chlorobenzene , sulphonic acid e.g. Benzene sulphonic acid, Aromatic nitro compounds e.g. Nitrobenzene, amino compounds e.g. aniline, Aromatic carboxylic acids e.g. Benzoic acid, Aromatic Aldehydes & Ketones e.g., Benzaldehyde, Polycylic & Heterocyclic aromatic compounds. (10 hrs)
5. Aromaticity of Benzene: Stability of benzene ring, Nomenclature of Benzene derivatives, reaction, mechanism of aromatic, Substitution electrophilic substitution, Nucleopholic addition Explain- Nitration, Sulphonation, Oxidation Reduction, Halogenation, Amination giving examples. (7 hrs)
6. Cycloparaffins, Stability of cyclic compounds. (4 hrs)

Books:
1. Textbook of organic chemistry by P L Kalsi, Macmillan India Ltd.
2. A textbook of organic chemistry by Raj K Bansal, New Age International Limited, 2003.

INDUSTRIAL CHEMICAL CALCULATIONS (DPE305)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Introduction (12 hrs)
Dimensions, Units, Physical Quantities like density, pressure, volume, force, power, energy, temperature, heat in SI, CGS, FPS and MKS. Numerical problems related to interconversion in different system of units. Definition of mole, mole fraction, mass, mass fraction, molality, normality, molarity. and simple numerical problems.

2. Behaviour of Ideal Gases (16 hrs)
PVT relationships, standard Conditions, partial pressure and pure Component Volume. Gas laws, Boyles law, Charles law, Dalton's and Amagat's law, Ideal Gas equation, Equation for real gases i.e. Vanderwall's equation, simple numerical problems, relation calculation of composition, average. Molecular weight and density.

3. Material Balance (20 hrs)
Concept of material balance, types of material balance, material balance for unit operation with bypass, recycle and purge, simple numericals based on material balance without chemical reactions and with chemical reactions.

4. Energy Balance (20 hrs)
Concept of energy balance, Forms of energy, Definition of:
- Exothermic and Endothermic Reactions
- Standard Heat of Reaction.
- Heat of Combustion
- Heat of Formation.
- Heat Capacity
- C_p and C_v
Calculation of:
- Standard heat of reaction from heat of formation and combustion data.
- Heat of reaction at Constant pressure or constant column.
- Heat of Reaction at a temperature from standard conditions i.e. 25^0C.

5. Combustion processes (12 hrs)
Simple definition of
- Excess Air
- % Excess Air
- Air fuel ratio
- Theoretical O_2 required
Analysis of products of combustion of proximate and ultimate analysis.

Books:
1. Solved Example in Chemical Engineering by G.K. Roy, Khanna publication.
2. Chemical Process Principles by Hougen and Watson, Wiley International Edition.
3. Stoichiometry by Bhatt and Vohra, Tata MC Gran Hill publication
4. Basic Principles and Calculations in Chemical Engineering y Himmelblaw, prentice Hall publication.
5. Stoichiometry by K.A. Gavhane, Nirali Publishers

INTRODUCTION TO PETROCHEMICAL TECHNOLOGY (DPE306)

Credits: 04

L T P
4 0 0

Detailed Contents:

Chapter 1: Introduction to Petrochemical Refining (5 hrs)
- Indian Refineries, Their location and capacity
- Global crude oil producers,
- Characteristics of crude, Composition, constituents of crude oil

Chapter 2: Refining (10 hrs)
- Process of Refining of crude oil to obtain various fractions
- Unit operations used in separation processes - Fractionation, Vacuum Distillation
- List of Hydrocarbons/fractions obtained, their Boiling Ranges and Their uses

Chapter 3: Unit Processess in Refineries: Flow charts, reactions, Description (10 hrs)
- Hydrogeneration, cracking, Alkylation, Polymerisation
- Hydrocracking. Isomerisatiopn, Reforming, Esterifiaction & Hydrationsss
- Waste Treatment

Chapter 4: Types of Hydrocarbon Fuels (10 hrs)
- Types & its chacteristics, ASTM methods of product testing
- Specification for various fuels
- Detailed study of naphtha, LPG, gasoline, kerosene, diesel, fuel oils, bitumen and bitumen emulsion

Chapter 5: Hazard & Safety (10 hrs)
- Hazard in Petrochemical Industry
- Safety in Petrochemical Industry

Books:
1) B.K. Bhaskara Rao "Modern Petroleum Refining Process" 4th Edition, OXFORD & IBH Publishing Co. Pvt. Ltd.,
2) Dr. B.K. BhaskaraRao "A Text on Petro Chemicals" 1st Edition, Khanna Publishers.
3) Dryden's Outlines of Chemical Technology Edited and Reprinted by M. Gopala Rao Marshall Sittig, 2nd Edition
4) Austin, G.T., Shreve's Chemical Process Industries, 5th Edition, McGraw Hill.
5) Kirk-Othmer, Encyclopedia of Chemical Technology, 4th Edition, 1993, Wiley –Inter Science Publication, John Wiley & Sons, New York.
6) W.L Nelson "Petroleum Refinery Engineering", 4th Edition, McGraw Hill.
7) G.D.Hobson and W.Rohl, Modern Petroleum Technology, Applied Science.

MECHANICAL OPERATION (PRACTICAL) (DPE307)

Credits: 01

L T P
0 0 2

List of Practicals:
1. Sieve shaker – cumulative analysis – Differential analysis
2. Roll crusher – calculation of theoretical capacity, Ribbon factor, Angle of nip, Reduction ratio, Power calculation.
3. Ball Mill – calculation of critical speed, operating speed, Application of Rittinger's law in ball mill.
4. Settling rate calculation by sedimentation.
5. Calculation of α and Rm in vacuum filtration.
6. Study of plate & frame filter press, filtration and washing in filter press
7. Rate of filtration by gravity filtration.
8. Efficiency of separation in froth floatation.
9. Calculation of power consumption in agitated vessel.
10. Efficiency of separation in cyclone separator
11. Calculation of viscosity by stokes law using terminal velocity equation.
12. Test kick's law in Jaw crusher.
Student should perform minimum 10 experiments.

ORGANIC CHEMISTRY (PRACTICAL) (DPE308)

Credits: 01

L T P
0 0 2

List of Practicals:
1. Determination of melting point of an organic compound
2. Determination of boiling point of an organic compound
3. Distinguish between aldehydes & ketones by tollen's reagent
4. Crystallisation of impure organic sample i.e., bezoic acid
5. Determination of nitrogen, sulphur, chlorine, bromine & iodine in an organic compound
6. Preparetion of iodoform from ethanol or acetone
7. Detection of functional groups (esters, phenolic, amines, carboxylic, nitro, aniline) in simple organic compound
8. Separation of two compound mixtures benzoic acid + benzophenone
9. Distinguish between aliphatic & aromatic compound
10. To Prepare a pure sample of dibenzalacetone from benzaldehyde & acatone

TESTING LABORATORY- I (DPE309)

Credits: 02

L T P
0 0 4

List of Practicals:
1. Determination of density of light oil
2. Determination of surface tension of given oil
3. Determination of viscosity and viscosity index of given petroleum fraction using saybolt viscometer.
4. Determination of cloud, pour and drop point of given petroleum fraction.
5. Determination of vapour pressure of gasoline using Reid Vapour pressure apparatus
6. Determination of flash point of given petroleum fraction by Abel method
7. Determination of fire point of given petroleum fraction by Abel method
8. Determination of Carbon Residue of given petroleum fraction using Rams Bottom Carbon Residue apparatus
9. Determination of Calorific value of given petroleum fraction using Bomb Calorimeter

4TH SEMESTER SYLLABUS

FLUID FLOW (DPE401)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Introduction: Dimensional analysis – Dimensional equation, Dimensionally Homogeneous equation, Dimensionless groups & their significance. (4 hrs)

2. Fluid static & its applications: Introduction to statics & dynamics Nature of Fluid, pressure concept, Hydrostatic equilibrium, Barometric equation, Types of fluids Compressible, Incompressible, Manometers, 'U' tube Inclined tube, differential, Continuous gravity Decanter centrifugal decanter simple Calculation of pressure drop in manometer. (5 hrs)

3. Fluid flow phenomena: Potential flow Laminar & Turbulent flow, Reynolds experiment velocity gradient & Viscosity, Momentum flux, kinematic viscosity Newtonian and non Newtonian fluids their Examples, Boundary layer separation & Wake formation. (5 hrs)

4. Basic equations of fluid flow: Continuity equation of mass balance; Define; Mass velocity, Average velocity Bernoulli's equation correction factor in Bernoulli's equation, Kinetic energy correction, correction for fluid friction, pump work in Bernoulli's equation. (5 hrs)

5. Flow of incompressible fluids in pipes (friction in flowing fluid): Flow of Incompressible fluid in pipes, Hagen poiseuille equation friction factor, relation between skin friction parameters, relation between maximum average velocity. Velocity distribution in pipe, effect of roughness in friction, friction loss from sudden expansion, sudden contraction friction loss in fittings & valves, equivalent, diameter, Hydraulic radius equivalent length, fully developed flow. (10 hrs)

6. Flow measurement Orifice meter: Venturimeter, Pitot tube, Rotameter, Weirs and notches, Flow nozzle. Principle, construction, working installation, Merits & Demerits calculation of flow in meters (simple calculation no derivation of equation). (5 hrs)

7. Transportation of fluids: Pipes, tubes, pipe fittings, specification of Pipes & tubes (schedule number BWG) Joining of pipes & tubes. Valves- Gate valve, Globe valve, plug cock, Ball valve, check Valve, safety valve, Butterfly valve, steam Traps devices for leakage prevention around Moving parts, stuffing box Mechanical seal. (8 hrs)

8. Fluid moving machinery (6 hrs)

a) Pumps capacity of pumps, Head developed efficiency of pump work done by pump BHP, FHP suction lift, Cavitation & NPSH, simple calculation of power in C.F. pump, performance, Characteristics of C.F. pump, losses in C.F.pump, Principle construction & working of C.F. pump, Installation of C.F.pump, uses of C.F. pump

b) Positive displacement Pumps- (Description & uses), reciprocating pump, Gear pump, plunger pump, vacuum pumps, steam jet ejectors, Acid egg, Air lift pump.

c) Fans Blowers & Compressors – Description & uses

9. Fluidisation: Introduction, Concept of fluidisation, types of fluidisation, Application of fluidisation, Minimum porosity, pressure drop in bed, simple problems on fluidisation. (4 hrs)

Books:
1. Unit Operations of Chemical Engg.by Mc Cabe W.L. & Smith J.C., Mc Graw-Hill
2. Chemical Engg, Hand Book by Perry & Chilton
3. Chemical Engineering Vol. I and II by Coulson and Richardson; Pergamon Press Publication
4. Introduction to Chemical Engineering by Badger and Banchero; McGraw Hill Publication
5. Principles of Unit Operation by Alen Foust, John Willey Publication
6 Chemical Engineering Fluid Mechanics by A.P..Kulkarni, Nirali Publications

ENGINEERING MECHANICS – II (DPE402)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Linear and angular motion: Mechanics, Dynamics, Kinetics and Kinematics Rectilinear motion displacement, speed velocity, acceleration, equation of Linear action with uniform acceleration, Velocity time diagram angular motion, Rotation, angular displacement angular velocity, angular acceleration, relation between linear and angular motion, equation of angular motion with uniform acceleration. (4 hrs)

2. Force Mass Acceleration and work power energy, types of energy, Newton's laws of motion, Relation between force, mass acceleration. Definition of work power, energy, types of energy, conservation of energy. (5 hrs)

3. Lifting machines and power transmission: Law, definitions, Mechanical advantage, velocity ratio, efficiency, Law of machine, friction in the machine, Maximum efficiency and reversibility machine, some types of lifting machine such as inclined plane, simple wheel and axle, wheel and differential axle, worm and worm wheel and screw jack and their velocity ratio, power transmission, individual drive an drop group drive belt and pulley drive, driver, follower and idler, cross and belt, transmission belt, slips and its consideration, centrifugal tensile gear transmission various types of gear used, gear transmission. (10 hrs)

4. Stress and strain: Simple stress and strain and elastic constants, elasticity stress, strain, types of stress, working stress, Factor of safety. Young's Modulus of elasticity. Deformation of body due to forces acting on it. Principles of superposition stress in bars of varying action and bars of composite section stress due to change in temperature. Linear and lateral strain, Poission's ratio volumetric strain, Bulk modulus. Modulus of rigidity Relation between E.G.K. (10 hrs)

5. Bending Moment, shear force and bending stress: Definition of bending moment and shear force. S.F. & B.M. diagram cantilever and simply supported beams loaded with point load and U.D.L. point of contraflexure theory of simple bending, assumptions in the theory of simple bending. Bending stress equation.

Equation

$$\frac{M}{I} = \frac{F}{Y} = \frac{E}{R}$$

Neutral axis moment of resistance, Distribution of bending stresses in symmetrical and unsymmetrical section. (8 hrs)

6. Thin cylindrical and spherical shells: Thin cylindrical and spherical shells, stress in cylindrical stress, design of cylindrical shell change in dimension of cylindrical shell due to internal pressure, thin spherical shell, change in the diameter and volume of thin spherical shell due to internal pressure. (6 hrs)

7. Torsion: shafts subjected to Torsion – Design of simple couplings. (4 hrs)

Books:
1. Applied Mechanics by Birender Singh, Kataria Publications
2. Engineering Mechanics by Khurmi, Tata McGraw Hill
3. Applied Mechanics by IB Prasad, Khanna Publications
4. Engineering Mechanics by lrving H. Shames; Prentice Hall of India Ltd.

PETROLEUM REFINING (DPE403)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Introduction: Significance – effect of blending and illustration of the following: pour point, cloud point, cetane number, pour point depressents, octane number, octane boosters, distillation, viscosity and its reducers, flash point, copper corrosion, calorific value, reid vapour pressure, aniline point, detailed study of Abel and Pinc method, Doctor solution and its uses, API gravity, existant gum and potential gum. (10 hrs)

2. Evaluation of bitumen: Elastic recovery, ductility, softening point, penetration test. (4 hrs)

3. Aviation fuels: Different types of aviation fuels and analysis, silver corrosion, WSIM, JEFTOT, anti oxidants, static electricity reducers, final boiling point, total sulphur, mercaptains, lubricity, smoke point, freezing point, calorific value. (8 hrs)

4. Manufacture of gasoline: By cracking, anti knock performance, research octane number, motor octane number and road octane number. (4 hrs)

5. Treatment techniques: Treatment of LPG, LNG, sweetening operation for gases, treatment of gasoline, kerosene and lube oil, and purification of wax. (10 hrs)

6. Cracking operations: Different types of cracking. Thermal cracking of petroleum products and vaccum gas oil, types of thermal cracking, mixed phase cracking, vapour phase cracking, selective cracking, visbreaking, catalytic cracking and its feedstock, commercial processes, process variables of cracking, catalyst for cracking, hydrocracking, hydroprocessing, comparision og hydro cracking and hydrotreating, hydroforming, platforming, uniforming, ultraforming, reforming, thermal reforming, catalytic reforming, fixed bed reforming, hyper forming, penex process of alkylation. (15 hrs)

Books:

1) B.K. Bhaskara Rao "Modern Petroleum Refining Process" 4th Edition, OXFORD & IBH Publishing Co. Pvt. Ltd.,

2) Dr. B.K. BhaskaraRao "A Text on Petro Chemicals" 1st Edition, Khanna Publishers.

3) Dryden's Outlines of Chemical Technology Edited and Reprinted by M. Gopala Rao Marshall Sittig, 2nd Edition

4) Austin, G.T., Shreve's Chemical Process Industries, 5th Edition, McGraw Hill.

5) Kirk-Othmer, Encyclopedia of Chemical Technology, 4th Edition, 1993, Wiley –Inter Science Publication, John Wiley & Sons, New York.

6) W.L Nelson "Petroleum Refinery Engineering", 4th Edition, McGraw Hill.

7) G.D.Hobson and W.Rohl, Modern Petroleum Technology, Applied Science.

PHYSICAL & ANALYTICAL CHEMISTRY (DPE404)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. State of matter – Solid Liquid & Gas their properties – Physical properties of liquids types of physical properties & characteristics of each properly. Definition of surface tension, refractive Index, Molar refraction, specific refraction viscosity, Molecular viscosity, surface tension & Viscosity measurement methods, Ostwald Viscosity, stalagmometer. (4 hrs)

2. General Gas Laws & Atomic Theory: Kinetic theory of gases. Deviation from gas Law, Reduced Vander waal's equation of state, Critical properties, Phenomenon of liquefaction of gases. (4 hrs)

3. Ionic equilibria: Introduction sparingly soluble salts, Acids & Bases Hydrolysis, Hydrolysis constant, Buffer Solution, Acid base titrations. (3 hrs)

4. Colloids & Emulsion: Colloids & its various aspects, characteristics of true solutions, suspension & colloidal solution. Classification of colloids difference between Lyophobic, Lyophillic solutions methods, preparation of colloidal solutions, condensation & dispersion methods, purification of colloidal solution, Dialysis ultra filtration, properties of colloidal solution, scattering of light colour charge, Electro osmosis protection, Brownian movement, electrophoresis co-agitation. Phenomenon of emulsion. Definition of Emulsion, types of cleansing action of soap, Advantages of synthetic detergent over alkali Soap, properties & utility of gels. (7 hrs)

5. Adsorption : Langmuir's adsorption theorem Gibbs adsorption equation, solid liquid, Liquid – liquid interfaces. (4 hrs)

6. Chemical Thermodynamics: Systems, State & state functions, work & heat, First law of thermodynamics, Thermo chemistry, Entropy & free energy, Gibbs-Helmholtz, Clapeyron Equation, Isotherm & Isochore, standard free Energy & its utility Free energy, Temp. Dependence of equilibria. (7 hrs)

7. Chemical Kinetics: Classification of reactions. Reaction mechanisms Concentration effect temperature effect, reaction Velocity order of reaction, expression & determination. (5 hrs)

8. Electrometric– methods of analysis: Electrode, types of electrode, distinguish between inert electrode, reference electrode, various electrometric methods. pH analysis, definition of pH, pOH & their relationship, standard oxidation potential functions of hydrogen electrode calomel electrode, glass Electrode Ag/AgCl/KCl electrode quinhydrone, Electrode. Problems of pH & pOH calculation, Methods of determining pH by pH meter, by pH indicator, By potentiometer methods. Conductometery; definition of conductivity, Galvanic cell, concentration cell, specific, Conductance, cell constant, equivalent Conductance, molecular conductance, Conductivity of water. Conductometry titrations , acid base titration, Precipitation titration replacement titrations. (10 hrs)

9. Chromatography: Thin–layer Chromatography, Ion exchange,column chromatography, Paper chromatography. (3 hrs)

10. Qualitative & quantitative analysis: Common ion effect, Ionic product, solubility, solubility product, use of H_2 & NH_4Cl in qualitative inorganic analysis. (4 hrs)

Books:
1. A Textbook of Physical Chemistry by A. S. Negi, New Age International Ltd.
2. Basic Concepts Of Analytical Chemistry by S M Khopkar, New Age International Ltd.

CHEMICAL ENGINEERING THERMODYNAMICS (DPE405)

Credits: 05

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Detailed Contents:

Chapter 1: Introduction and Basic Concepts (12 hrs)
Systems, processes and surroundings, homogenous and heterogeneous systems, closed, open and isolated, extensive, and extensive properties, state and path functions. Concept of internal energy, enthalpy, entropy, free energy and equilibrium equation of state, ideal gas law, Vander Waals equation. Amagat's law, Dalton's law, Henry's law, Raoult's law, zeroth law of thermodynamics.

Chapter 2: First Law of Thermodynamics for Open and Closed Systems (12 hrs)
Statement of first law of thermodynamics, use of steam tables, calculation of internal energy, enthalpy, heat and work for ideal gas undergoing reversible, isothermal, adiabatic and polytrophic processes. Isobaric T-V, P-V and P-T diagrams

Chapter 3: Second law of Thermodynamics (18 hrs)
- Statement of second law of thermodynamics: Kelvin plank statement and carnot statement, carnot cycle and its efficiency, concept of entropy and entropy change for closed and open system.
- Heat pump and heat engine (coefficient of performance and efficiency).
- Reversible and irreversible process. Thermodynamic temperature scale.

Chapter 4: Third law of Thermodynamics, Statement only (02 hrs)

Chapter 5: Application of Second law of thermodynamics (12 hrs)
Refrigeration, vapor compression and absorption refrigeration, types of compressors, reciprocating air compressors, single stage compressor, isentropic efficiency of compressor.

Chapter 6: Phase Equilibrium (08 hrs)
Raoult's law, Gibb's phase rule, vapor liquid equilibrium, dew point and bubble point, calculations for two component systems.

Books:
1. Introduction to Chemical Engineering Thermodynamics by Smith and Vanness, Mc Graw Hill.
2. Chemical Engineering thermodynamics by K.V. Narayanan, Prentice Hall India.
3. Chemical Engineering Thermodynamics by Dodge, Mc Graw Hill.
4. Chemical Engineering Thermodynamics by YVC Rao
5. Engineering Thermodynamics by PK Nag
6. Thermal Engineering by Balleny
7. Chemical Engineering Thermodynamics by K.A. Gavhane, Nirali Publication

FLUID FLOW (PRACTICAL) (DPE406)

Credits: 01

L T P
0 0 2

List of Practicals:
1) Calibration of Orifice meter
2) Calibration of Venturimeter
3) Calibration of Rotameter
4) Verification of Bernoulli's equation
5) Reynolds experiment
6) Friction in straight circular pipe
7) Friction in fittings
8) Velocity measurement in pilot tube
9) Performance characteristics of C.F. pump
10) Demonstration of pipe fittings, pipe, tubes, valves
11) Flow in packed column
12) Study of C.F. pump & reciprocating pump, construction/parts
Students should perform minimum 10 experiments.

ENGINEERING MECHANICS – II (PRACTICAL) (DPE407)

Credits: 01

L T P
0 0 2

List of Practicals:
1. To find mechanical advantage, velocity ratio & efficiency of an inclined plane
2. To find mechanical advantage, velocity ratio of single purchase crab
3. Tensile test on bars of mild steel & aluminium
4. Bending test on a steel bar
5. Torsion test on specimen of different metals for determining modules of rigidity
6. Impact test on metals
      (a) Izod test
      (b) Charpy test
7. To find Mechanical advantage, velocity ratio & efficiency of screw jack
8. To find Mechanical advantage, velocity ratio & efficiency of worm & worm wheel
9. To determine the stiffness of helical spring & to plot graph b/w load & extension
10. Study of various types of belts

PHYSICAL & ANALYTICAL CHEMISTRY (PRACTICAL) (DPE408)
Credits: 01

L T P
0 0 2

List of Practicals:
1. Determination of viscosity – By Ostwald viscometer
2. Determination of surface tension stalagmometer
3. Partition co-efficient
4. pH meter, pH paper
5. Conductometry titration, HCl, NaOH
6. Conductometry titration NaCl, $AgNO_3$
7. Study of first order and second order kinetics
8. Refractometer

TESTING LABORATORY- II (DPE409)
Credits: 02

L T P
0 0 4

List of Practicals:
1. Determination of softening point
2. Determination of penetration of bitumen
3. Ductility of bitumen
4. Determination of aniline point of given petroleum fraction
5. Determination of diesel index
6. Distillation of petrol, kerosene, diesel
7. Determination of smoke point
8. Determination of flash point of given petroleum fraction by Pensky Martine's apparatus
9. Determination of fire point of given petroleum fraction by Pensky Martine's apparatus

5TH SEMESTER SYLLABUS

MASS TRANSFER – I (DPE501)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Introduction (4 hrs)

Introduction to Mass transfer Operation. Classification of mass transfer operation, selection of separation method, Methods of conducting the Mass transfer operation, Factors affecting diffusional operation.

2. Molecular diffusion in fluids (7 hrs)

Definition, Fick's Law, Fick's second law, Steady State Molecular diffusion in fluids at rest and in laminar flow. Molecular diffusion in gases Steady State diffusion of A through non diffusing B steady state equimolal Counter diffusion, diffusivity of gases effect of Temp. On diffusivity, Molecular diffusion in Liquid: Steady State diffusion of A through non diffusing B steady equimolal counter diffusion Diffusivity of liquids Steady State diffusion of solids. (Note- No derivation of equation use of equation with simple calculation), Uses of molecular diffusion.

3. Mass transfer co-efficients (6 hrs)

Definition of Flux, Mass transfer co-efficient, Brief idea of Mass transfer co-efficient in laminar flow, and turbulent flow Thermal diffusivity. Mass diffusivity, molecular diffusivity, conclusion of penetration theory, film theory, surface renewal theory. Corresponding dimensionless group of Mass Transfer & Heat transfer.

4. Inter Phase Mass Transfer (6 hrs)

Equilibrium & Equilibrium distribution in curve, Brief idea about diffusion between phases definition of local mass transfer coefficient, relation between local & overall M.T. coefficient, material balance Steady state co-current process, Steady State counter current process define: stage, ideal stage, theoretical stage, Stage efficiency, cascade.

5. Equipment for gas liquid operation (10 hrs)

(a) Gas dispersed equipments. Agitated vessels, tray tower, definition of flooding, loading, priming, tray spacing, tower diameter, down spouts weirs sketch of bubble cap tray Tray tower, Tray arrangements, sieve tray, entrainment, weeping, tray efficiency.

b) Liquid dispersed equipment. Venturi scrubbers, wetted wall towers spray tower & Spray chambers, packed towers, types of packing, Characteristics of packing, sketch of packed tower, Packing arrangement: Random & Regular packing Support, liquid distribution, flooding & loading Characteristics outline of diameter & pressure drop Calculation for packed tower.

6. Humidification Operation (10 hrs)

Definition of various terms, uses of Clausis clapeyron Equation to calculate vapour pressure, vapour pressure curve 0 Define – saturated liquid, super heated liquid Triple point, critical point, critical pressure, critical Temperature, normal boiling point LHV, sensible heat. Vapour – gas mixtures Define – vapour & gas – partial pressure, absolute humidity, Molal absolute humidity, difference between saturated Vapour gas mixtures unsaturated Vapour gas mixture, Dry bulb temperature. Relative saturation, Dew point, Humid volume. Humid heat, Enthalpy, Importance of psychrometric chart for Air water system, adiabatic saturation curves, wet bulb temperature, Purposes of gas liquid contact operation, water Cooling tower, types, operation, performance, spray Ponds, spray chambers.

7. Absorption & Stripping (8 hrs)

Definition of absorption & desorption, use of Solubility and equilibrium solubility curves, two Component system only, effect of temp. & Pressure on solubility, characteristics of ideal solution, Raoults Law, Non ideal solution, Henry's law, Selection of solvent for absorption, material balance on counter current & cocurrent absorber & Stripper. Equilibrium and operating lines for Absorber & stripper. Minimum liquid/gas Ratio for absorption. Continuous contact equipment.
Define – HETP, HTU, NTU Absorption factor, stripping factor Real trays, Simple calculation of MB & Number of stages in absorption, height of tower.

Books:
1. Mass Transfer Operations by Trey bal, Kogakusha Publication
2. Introduction to Chemical Engineering by Badger and Banc hero, McGraw Hill Publication
3. Unit Operation of Chemical Engineering by Mc Cab and Smith; McGraw Hill Publication
4. Mass Transfer by Sherwood Pigford and Wilke, McGraw Hill Publication
5. Chemical Engineers Handbook by Perry and Chilton, McGraw Hill Publication
6. Mass Transfer Operations by Kiran D. Patil, Nirali Publication

HEAT TRANSFER (DPE502)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Modes of Heat transfer (4 hrs)
Introduction, nature of heat flow conduction Convection, radiation, Fourier law of conduction, Newton's law of convection, Stefan Boltzman law of Radiation.

2. **Heat transfer by conduction** (4 hrs)
Definition – Flux temperature gradient, Fourier's law Thermal conductivity & its valuation with temp. , Thermal conductivity in solids, liquids & gases Thermal diffusivity, S.S. heat conduction through Single & composite wall, cylinder, sphere, thermal diffusivity.

3. Heat transfer by convection (4 hrs)
Introduction- Rate of heat transfer Heat flux Average temp. Newton's law of convection, Definition of overall H.T.coefficient, individual H.T. coefficient, Concept of Prandtl number, Nusselt number, Grashoff numbers, free, Convection, forced convection, Laminar & Turbulent flow in pipes & tubes – Sider & Tate Equation, Dittus Bolter equation.

4. Heat transfer for condensing vapours (phase change) (7 hrs)
a) Boiling – Saturated boiling, pool boiling, Nucleate boiling, Heat flux Vs temperature Drop curve study, factors influencing the rate of heat transfer in boiling, subcooled boiling.
b) Condensation – Film type condensation. Dropwise condensation, correlation for heat Transfer coefficient, condensing of super heated vapours, effect of non condensable Gases on rate & condensation

5. Heat transfer by radiation (6 hrs)
Stefan-Boltzmann's law for total emissive Power, Heat transfer between bodies, concept of Absorption of emission, Black body, Grey Body, White body, Opaque body, Absorption, Transmission, reflection, emissive power of Black body, Planck's law, emissivity, Kirchoff's Law, radiation shield, calculation of heat loss in atmosphere.

6. Heat transfer equipments (8 hrs)
Heat transfer to fluid, concept of cocurrent & counter current flow, temperature range, and Log mean temperature difference, relation between, Individual & overall HT coefficient, define the terms Heat exchanger, cooler, Heater, Condenser, Evaporator, Reboiler, Vaporiser, double pipe heat exchanger (Hair pin), shell & tube heat exchanger, Types of shell & tube heat exchanger 1-1, 1-2, 2-4. Exchanger, concept of correction Factor of LMTD, condensers Horizontal, vertical, Reboiler, extended surface heat exchanger, plate Type heat exchanger, heat transfer in agitated Vessel, simple calculation of overall H.T. coefficient in heat exchangers & heat transfer area.

7. Evaporation (7 hrs)
Introduction- Liquid characteristics, factors affecting selection of evaporator boiling point elevation, heat capacity & economy of an Evaporator, single effect evaporator, multi-effect Evaporator, Types of feed, forward feed, backward feed, effect of heat economy by recompression of vapour, equipment: Short tube evaporator, long tube evaporator, agitated Film evaporator, forced circulation evaporator, Climbing film evaporator, falling film evaporator, Simple problems on single effect evaporator, Calculations (Direct formula).

8. Types of insulation (4 hrs)
Insulating material, methods of insulation, lagging of steam pipe, critical insulation, thickness, optimum Insulation thickness, simple calculation of Insulation thickness.

9. Turbulence furnaces (3 hrs)

Application classification & types of tubular furnaces.

10. Different methods of heating & cooling (5 hrs)

Chilled water, brine water, cooling water, refrigeration, hot water, steam water heating, oil heating with (with/without phase change), process stream exchanger, molten salt heaters, air heater, electric heating, furnace heating.

Books:

1. Heat Transfer by Chapman, MacMillan Publication
2. Principles of Heat Transfer by Kreith, Harper and Row Publication
3. Process Heat Transfer by Kern, McGraw Hill Publication
4. Heat Transfer by McAdams, McGraw Hill Publication
5. Heat and Mass Transfer by D.S. Kumar
6. Solved examples in chemical Engineering by G.K. Roy.
7 Heat Transfer by K.A. Gavahne, Nirali Publications

CHEMICAL REACTION ENGINEERING (DPE503)

Credits: 04

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Detailed Contents:

Chapter 1. Kinetics of Homogeneous Reactions (08 hrs)
Introduction to chemical reaction and different types of reactions like single reaction, multiple reactions-parallel reaction, series reaction, series-parallel reaction, irreversible and reversible reactions, exothermic and endothermic reactions.

Chapter 2. Basics (12 hrs)
- Order of reaction- zero, first, second and fractional order
- Molecularity of reaction and difference between order and molecularity
- Elementary and non-elementary reactions, introduction to kinetic models for non-elementary reactions

Chapter 3. Rate of reaction, special rate of reaction (12 hrs)
Threshold energy, Energy barrier, Activation energy and temperature dependence of specific reaction rate. Various factors affecting rate of reaction.

Chapter 4. Reversible Reactions (08 hrs)
Concept of chemical reaction equilibrium, equilibrium constant, effect of T and P on equilibrium constant, equilibrium conversion

Chapter 5. Reactions Vessels for homogenous reactions (24 hrs)
- Concept of residence time, space time and space velocity.
- Different types of reactors for homogenous reactions - batch, semi-batch, ideal reactors – CSTR, PFR
- Steady state CSTR/MFR and PFR, their space time and residence time, simple numericals
- Factors influencing the selection of reactors.

Books:
1. Chemical Reaction Engineering by Levenspeil, John Wiley Publication
2. Chemical Engineering Kinetics by Smith, McGraw Hill Publication
3. Elements of Chemical Reaction Engineering by Fogler, Prentice Hall of India
4. Reaction Kinetics for Chemical Engineering by Wales, McGraw Hill Publication
5. Chemical Reaction Theory-An Introduction by Denbigh and Turner, Cambridge University Press Publication
6. Chemical Reaction Engineering by K.A. Gavhane, Nirali Publication

PETROCHEMICALS TECHNOLOGY (DPE504)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Origin formation & composition of petroleum: History, origin and formation of petroleum, world reserves of petroleum Indian petroleum industries types location & capacities development of petroleum refining, composition of petroleum & chemistry of petroleum, Exploration & production of petroleum methods of exploration, drilling, transportation of petroleum products. (6 hrs)

2. Petroleum processing data: Evaluation of petroleum, properties of petroleum fractions, Distillation characteristics and important products, properties & test methods: gas, gasoline, Naphtha, kerosene, Diesel, Lube oil, Bitumen significance & methods of testing for above petroleum products. (10 hrs)

3. Fractionation of petroleum: Dehydration, Desalting & crude heating of crude – pipe, Still heaters, distillation of petroleum AU, VDU Topping Operation. (7 hrs)

4. Manufacture of sulphur from under-ground, Freuch process, H_2S partial oxidation method. **Hydrogen –** properties, hydrogen as fuel, manufacturing of H_2 from naphtha cracking and from hydrocarbons by partial oxidation. **Petroleum cake –** uses and manufacturing by hot oven method. (10 hrs)

5. Petrochemicals: Definition, History, Major petrochemical products & their Producers in India raw materials for petrochemicals

C_1 compounds: Methanol & formaldehyde.

C_2 compounds: Acetylene, ethylene, vinyl chloride, ethanol, acetic acid, acetaldehyde and higher olefins from naphtha, process economics.

C_3 compounds: Propylene, Acetone & cumin, acrylonitrate, acrylic acid, M.M.A.

C_4 compounds: Butadiene, isobutylene, butanol. (10 hrs)

6. Aromatics: Solvent extraction, Benzene, toluene, xylene production, phenol, benzaldehyde, terphthalic acid, DMT, phthalic anhydride, maleic anhydride. (4 hrs)

7. Lubricating oils: Production of petroleum waxes, greases, asphalt Bitumen & carbon black. (4 hrs)

Books:

1. Petroleum Refinery Engineering by WL Nelson, 5th edition, Mc Graw Hill, 1985
2. Petroleum Processing by RJ Hengsbeck
3. Modern Petroleum Refining Proesses, B.K. Rao, 5th Edition, Oxford and IBH Publishing Co, 2009
4. Introduction to Petrochemicals, S. Maiti, Oxford and IBH Pub.Co. Ltd. New Delhi, 1992
5. The Chemistry of Petrohemicals, M.J. Astle, Reinhold.

PLANT UTILITIES (DPE505)

Credits: 04

L T P
4 0 0

Detailed Contents:

Chapter 1. Water (08 hrs)
- Sources of water
- Types of water
- Raw water and treated water – Soft water and DM water
- Quality of water (temporary and permanent hardness), COD, BOD, PH, TDS
- Treatment of water – filtration and bleaching
- Storage of water

Chapter 2. Demineralization of Water (10 hrs)
Flow diagram for demineralization of water, ion and cation exchanger, regeneration of ion & cation exchanger, degasser, reaction with resins (cation and anion resins)

Chapter 3. Steam Generation (10 hrs)
Saturated and superheated steam, quality of steam, simple numericals related to the enthalpy changes using steam tables and mollier diagrams, non-condensables in steam.

Chapter 4. Fuels (06 hrs)
Classification of fuels, solid (coal), liquid and gaseous fuel and their properties.

Chapter 5. Steam Distribution (04 hrs)
Specification of steam pipe, layout of piping, steam trap, steam ejectors

Chapter 6. Cooling water (10 hrs)
Cooling towers, recycling of water, principles, details of problems like scaling, use of inhibitors like sodium hexameta phosphate, sodium triphosphate etc.
Types of cooling towers-induced draught, forced draught.

Chapter 7. Utility Equipment (16 hrs)
- Boilers: Coalfired, oil fired, Babcox, water tubes and fire tube - Cochran, Lancashire,
- Compressors: Centrifuge, reciprocating
- Blowers: Centrifuge, reciprocating
- Refrigeration, absorption, compression and vapor compression.

Bools:
 1. Engineering Chemistry by PC Jain
2. Standard Test Methods for Water by Alpha
3. Industrial Boiler by Advance Training Institute, Ludhiana
4. Plant Economics by Peter Timmerhaus, McGraw Hill Publication
5. Unit Operation of Chemical Engineering by McCabe and Smith, McGraw Hill Publication
6. Applied Process Design for Chemical and Petrochemical Plants by E. Ludvig, Gulf Publishing, Houston, Texax

PLANT OPERATION (DPE506)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Concept of maintenance theory of failure Accident Record keeping failure or break down failures. (5 hrs)

2. Organization check list & for maintenance, preventive maintenance, Types of preventive maintenance, Record of maintenance & their relative usefulness, Modern management & maintenance techniques. (5 hrs)

3. Construction working & operation aspect (include Start up shut down trouble shooting & maintenance) for the equipment's like valves, pipes, fittings, flow meters pumps & compressor. (5 hrs)

4. Construction, working & operation aspects (including start up, shut down trouble shooting & maintenance for equipment's like size reduction machines, filtration centrifuges & classifiers. (5 hrs)

5. Construction working & operation aspect (including start up, shut down, trouble shooting & maintenance) for equipment's such as Heat Exchangers & Evaporators. (5 hrs)

6. Construction working & operation aspects (including start up, shut down & trouble shooting & maintenance) for equipment's such as distillation tower, absorption tower & extractor. (5 hrs)

7. Construction working & operation aspect & (including start up, shut down trouble shooting & maintenance) for the equipment such as dryers, crystallisers & cooling tower. (5 hrs)

8. Construction working & operation aspect (including start up, shut down trouble shooting & maintenance) for various reactors. (5 hrs)

9. Trouble shooting in plants (plant emergency) Electricity of cooling water DM water & feed failure, instrument air failure, steam failure, pump failure & remedial actions to be taken. (5 hrs)

10. Commissioning Activities. (3 hrs)

Books:

1. Coulson, Richardson & Sinnott R.K., Chemical Engineering Volume-6 – an Introduction to Chemical Engineering Design, 4th Ed., Elseveir Butterworth Heinemann, 2005.

2. Perry R.H., Green D. W., Chemical Engineers' Handbook, 8th ed., Mc-Graw Hill, 2008.

3. Brownell L.E. and Young E. H., Process Equipment Design, Wiley Interscience, 1959.

4. Bhattacharya, R.C., An Introduction to Chemical Equipment Design-Mechanical Aspects, 1st Ed., CBS Publication, 1985.

5. Mahajani V.V., Umarji S.B., Joshi's Process Equipment Design, 4th Ed., Macmillan Indian Ltd., 2009.

HEAT TRANSFER (PRACTICAL) (DPE507)

Credits: 01

L T P
0 0 2

List of Practicals:
1. Determination of thermal conductivity of metal, insulation powders.
2. Heat transfer co-efficient in natural convection and forced convection.
3. Determination of overall H.T. co-efficient in shell & tube heat exchanger
4. Determination of overall H.T. co-efficient in parallel flow and counter flow
5. Determination of overall H.T. co-efficient in condenser
6. Determination of H.T. co-efficient in an agitated tank.
7. Study of drop wise & film wise condensation phenomena
8. Calculation of capacity economy in an open pan evaporator
9. Study of H.T. equipment; shell & tube heat exchanger, long tube evaporator
10. Determination of H.T. co-efficient in finned tube exchanger.

CHEMICAL REACTION ENGINEERING (PRACTICAL) (DPE508)

Credits: 01

L T P
0 0 2

List of Practicals:
1. Kinetic studies in a Batch reactor
2. Kinetic studies in a PFR followed by a CSTR
3. RTD studies in a PFR
4. RTD studies in CSTRs in series
5. Demonstration of heterogeneous catalytic
6. Study of temperature dependence of rate constant using CSTR
7. Study of kinetics of first order
8. Study of kinetics by half-life.
9. Determination of activation energy.
10. Integral method of analysis.
11. Differential method of analysis

PROJECT WORK – I (DPE509)

Credits: 02

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0 0 4

Some selected topics will be given in a group of 4-5 students. Students will do Literature survey and well be required to present that topic in seminar to be held during the college hours. The topics will be interchanged and all students will have the knowledge of all the topics of seminar work.

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6TH SEMESTER SYLLABUS

BASICS OF MANAGEMENT (DPE601)

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Credits: 04

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4 0 0

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Detailed Contents:

1. **Introduction:** Definition and concept of Management, functions of management viz. planning, organizing, staffing, coordinating, controlling; Various areas of management: Human Resource Management (HRM): recruitment, training, retraining and compensation policies; Financial Management: payback period, Net Present Value (NPV), Internal Rate of Return (IRR), profitability ratio, cost benefit analysis; Materials Management: economic order quantity, re-order point, safety stock, Just-in-Time Technique of Materials Management; Marketing Management: necessity, advertisement, print media, electronic media, sales promotion(5 hrs)
2. **Structure of Industrial Organization:** Concept and structure of an organization, hierarchical management structure (top, middle and lower level management) and functional management structure.(4 hrs)
3. **Leadership:** Concept, importance, types and qualities of a good leader(3 hrs)
4. **Motivation:** Concept and importance of motivation - drives and incentives, intrinsic and extrinsic motivation, brief about theories of motivation.(4 hrs)
5. **Ethics and Values:** Introduction, importance of attitude, values and ethical behaviour. Professional ethics – its need and development(4 hrs)
6. **Customer Relationship Management (CRM):** Need, various types of customers, customer satisfaction, life- long customer, Customer Satisfaction Index (CSI) and its significance Legal Aspects of Business, Elementary knowledge of Income Tax, Sales Tax, Excise Duty, Provident Fund,   Employees State Insurance Act.,Labour welfare schemes, systems of wage payment, incentives,Salient features of Factory Act 1948 with special reference to health, safety and welfare measures, working hours, annual leave with wages, Payment of Wages Act 1936, Minimum Wages Act 1948,Intellectual Property Rights (IPR), concept, definitions, infringements related to patents, copyright, trademark(10 hrs)
7. **Total Quality Management**: Introduction to Total Quality Management (TQM) and steps to achieve this ,MIS: Concept, importance and steps for its development (4 hrs)
8. **Knowing Drug Abuse**.:Type of Drugs used and their ill effects,Consequences of drug abuse, Symptoms and Prevention,Rehabilitation(4 hrs)
9. **Traffic Laws**: Importance of knowing traffic laws and safe driving ,Traffic rules Controlling road rage among young drivers, Law regarding traffic, Social responsibility towards injured in case of road accidents.(4 hrs)

Books:
1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar , New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.

5. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr.: Prentice Hall of India Pvt Ltd, New Delhi.

6. Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.

7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi

8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.

9. Intellectual Property Rights and the Law by Dr. GB Reddy.

10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.

11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi

12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

MASS TRANSFER – II (DPE602)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Distillation: Vapour liquid equilibria pressure ,temperature. Concentration diagram, Relative volatility, ideal solutions, Raoult's law, Flash Vaporisation, differential or simple distillation (Rayleigh equation), steam distillation, vacuum distillation, principles of rectification, Binary system, material balance and energy balance for fractionating column, calculation of ideal stages by McCabe Thiele method, Introduction of feed, location of feed tray, Minimum reflex ratio and infinite reflux ratio, Optimum Reflux ratio, condenser & reboiler heat duty, continuous Contact equipment, HTG, NTG, HOG, NOG, Types of Distillation column. Types of tray, construction & Operation of distillation column.(8 hrs)

2. Crystallization: Definition, crystal forms, crystal geometry, crystallization Equipments, phase diagram, crystal yields, material and Energy balance calculation, Mier's supersaturation theory and its limitation effect of operating condition on caking of crystals prevention of caking.(6 hrs)

3. Membrane separation processes: Types of Membrane – Brief introduction of membrane separation processes, Reverse osmosis, Micro filtration Ultra filtration, Dialysis, pervaporation, permeation (6 hrs)

4. Extraction (Liquid – Liquid): Definition –Field of usefulness, properties of solvent, solvent requirement equilateral triangular diagram, System of three liquids one pair partial soluble system, System of three liquids – two pair partially solubles System of two pairs partially soluble liquids with one Solid Effect of temperature and pressure on solubility diagram, Stagewise contact, calculation for single stage Extraction and multi-stage extraction equipments – Settlers, Mixer setter cascade sieve tray tower Continuous contact Extractor, spray tower, Mechanically Agitated countercurrent extractor pulsed column, Centrifugal extractor. (8 hrs)

5. Drying: Definition of various terms, equilibrium, principles of Drying rate of drying curve, Time of drying, Batch Drying and continuous drying. Drying equipments. Direct dryers and indirect dryers, Tray dryer, Rotary Dryer, Drum dryer, spray dryer.(6 hrs)

6. Adsorption and Ion exchange: Definition- Industrial application, types of adsorption, Adsorption equilibria, equilibrium adsorption of single Vapour & gas mixture in brief, adsorption in liquids, Adsorption of solute from dilute solution Freundlich Equation & its scope, nature of adsorption, examples, Properties and application of typical adsorption, Adsorption operation of various equipments, Ion Exchange, principles, use of Ion exchange in D.M. water. (6 hrs)

7. Leaching : Definition of various terms, preparation of solid, Temp. of leaching methods of operation, unsteady state Operation. In place leaching, Heap leaching, calculation for single stage leaching, stage efficiency, equipments Percolation tank, Shank system Agitated vessels, Bollman extractor.(6 hrs)

Books:
1. W.L. McCabe & J.C. Smith "Unit operation of chemical Engg" 6th Edition, Mc. Graw Hill Book.
2. W.L. Badger & J.T. Banchero "Introduction to Chemical Engg" Tata McGraw Hill Publishing Co,Ltd., New Delhi – 1997
3. R.E. Treybal "Mass Transfer Operation" McGraw Hill Book Co. 1986
4. Robert H. Perry – and D.W. Green "Perry's Chemical Engineers Hand book" 7th Edition, McGraw Hill Book Co. Singapore – 1997.

INDUSTRIAL HAZARDS & SAFETY (DPE603)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Safety (06 hrs)
Definition of safety and loss prevention, importance of safety in chemical process industry, statutory requirement for safety norms to be maintained by the industries, concept of toxicity, flammability etc.

2. Toxic Gases/Chemicals (12 hrs)
Concept of threshold limit value, hazards and their classification, hazards from gases/chemicals, symptoms and their remedial action. Effect on ecosystem, hazards prevention techniques

3. Accidents and Safety (10 hrs)
Classification, precautions, treatment after accident, promotion of safety practices.

4. Personal protective equipment and clothing used in industry (10 hrs)

5. Fire and Prevention (12 hrs)
Classification of fires, flammable and inflammable liquids, concept of fire triangle, various types of fire extinguishers with their applications, Boiling Liquid Expansion Vapor Explosion, concept of lower and upper flammability limits and limiting oxygen concentration(theoretical only)

6. Safety in Chemical Industry (14 hrs)
Receiving, storing and transporting chemicals. Precautions in the case of processes/operations involving explosives or inflammable dusts, gases, vapours, concept of Materials Safety Data Sheets for various chemicals

Books:
1. Industrial Safety Management by Tarafdar Nishith Kumar and Tarafdar Koustuv Jyoti, Dhanpat Rai & Co, New Delhi.
2. Safety and Accident Prevention in Chemical Operation by Fawelt and Wood, Inter Science Publication
3. Chemical Engineering, Vol I, II, II and IV by Coulson and Richardson, Pergamon Press Publication
4. Safety in Process Plant Design by Wills, G.L.
5. Loss Prevention in Process Industries by Less, F.P.
6. Safety for Chemical Engineers, AI.ChE Publications, 1976-77

POLYMER TECHNOLOGY & PROCESSING (DPE604)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Introduction: What are Polymer, History, and structure of Polymer, Molecular Weight and its determination.(3 hrs)

2. Chemistry of polymerization: Different types of polymerization, chain polymerization, and Free radical polymerization.(4 Hrs)

3. Polymerization methods: Bulk polymerization, Solution polymerization, Suspension Polymerization, emulsions polymerization, and melts polymerization, Polycondensation.(4 hrs)

4. Chemical and geometrical structure of polymer molecules: Microstructure based on chemical structure, Microstructure based on geometrical structure, Introduction to polymer blends, polymer compounds Glass transition temperature.(5 hrs)

5. Individual polymers: Introduction classification of plastics raw materials. Manufacturing process for the products like Polyethylene, High density polyethylene, Linear Low-density polyethylene. Polyvinylchloride, polystyrene Polypropylene, Engineering Plastics like, ABS, PMMA, TEFLON, Polycarbonates(6 hrs)

6. Rubbers: Classification rubbers, natural rubber, synthetic rubber like SBR, Polybutadiene, Polyethylene, Propylene & Butyl rubber, Nitrile rubber, Neoprene rubber, reclaim rubber, applications of rubber.(5 hrs)

7. Resins for Adhesives & protective coating: Introduction, Phenol formaldehyde, Amino resins, polyester resin, Alkyd resins, Epoxy resin, polyurethene resins, polyamide resins, vinyl resins, vinyl alcohol resins, vinylidene resins, styrene resins, acrylic resins, protective coatings . (6 hrs)

8. Fiber & Film: Introduction, properties of fiber, cellulosic fiber, polyamide fiber, polyester fiber, acrylic fiber, and inorganic fiber like glass Carbon. Films: Viscose & cellulose acetate, polyolefins, PVC.(5 hrs)

9. Plastics processing: Processing of thermoplastics, thermosets and plastics, and recent developments.(3 hrs)

10. Quality control: Identification of plastics, Testing of plastics.(2 hrs)

Books:
1. Polymer Science by Gwarikar, John Wiley & Sons
2. Polymer Science and technology by Joel R. Fried, Prentice Hall of India, Publication
3. Polymer Science and Technology by P. Gosh, Tata McGraw Hill Publication

PROCESS INSTRUMENTATION & CONTROL (DPE605)

Credits: 05

L T P
5 0 0

Detailed Contents:

1. Introduction (32 hrs)
Importance of instruments in chemical process industry, general classification of instruments, indicating and recording type instruments, static and dynamic characteristics of instruments. (4 hrs)
Description and construction details, working principle, range and application of following instruments:
a) Pressure and vacuum gauge: manometers, bourdon tube gauge, mcleod gauge, pirani gauge (6 hrs)
b) Thermometer and Pyrometer: liquid expansion thermometer, bimetallic thermometer, thermocouple, resistance thermometer, optical and radiation pyrometer (8 hrs)
c) Liquid level meter: visual indicator, float actuated level meter, bubbler system, diaphragm box system (5 hrs)
d) Flow meters: Orifice meter, Venturimeter, Pitot tube, Rota meter (4 hrs)
e) Analyzers: pH meter, chemical composition analyzer, various types of analyzers i.e. oxygen analyzer, infra red analyzer, orsat analyzer (5 hrs)
2. Transmission (06 hrs)
Pneumatic and electrical transmission (Induction Transmission only) and their fields of application
3. Process Instrumentation (06 hrs)
Control centre, instrument diagrams, instrumentation in modern chemical plant
4. Basic concept of automatic process control, advantages of automatic control (06 hrs)
5. Types of feedback controllers (10 hrs)
Proportional, Integral, Derivative and their combination and their applications in chemical industry
6. Types of control valves (04 hrs)
Pneumatic: air to open, air to close, electronic, hydraulic

Books:
1. Industrial Instrumentation by Donald P Eckman, Wiley Eastern Publication
2. Principles of Industrial Instrumentation by D Patranabis, Tata McGraw Hill Publication, 2nd Edition, 1999
3. Process System Analysis and Control by Coughnour, McGraw Hill Publication, 2nd Edition, 1991
4. Industrial Instrumentation by SK Singh, Tata McGraw Hill Publication, 2nd Edition, 2007
5. Process Instruments and Controls Handbook by Considine, 2nd Edition, McGraw Hill , 1974
6. Process Instrumentation and Control by A.P. Kulkarni, Nirali Publication

ENVIRONMENTAL STUDIES (DPE606)

Credits: 04

L T P
4 0 0

Detailed Contents:

1. Basics of ecology, eco system and sustainable development. (2 hrs)
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table. (3 hrs)
3. Sources of pollution - natural and man-made, their effects on living and non-living organisms. (2 hrs)
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms. (3 hrs)
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms. (6 hrs)
6. Sources of noise pollution and its effects. (2 hrs)
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods. (5 hrs)
8. Mining, blasting, deforestation and their effects. (3 hrs)
9. Legislation to control environment. (2 hrs)
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements. (3 hrs)
11. Current issues in environmental pollution and its control, Global warming, Green house gases, non-conventional sources of energy, introduction to clean technology. (6 hrs)
12. Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form. (3 hrs)
13. Role of non-conventional sources of energy in environmental protection. (2 hrs)

Books:
1. Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284p.
3. Rao M. N. & Datta A.K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 45p.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.
6. Environment Pollution Control Engineering by Rao, C.S.
7. Perspectives in Environmental Studies by Kaushik, A.
8. Elements of Environment Science & Engineering by Meenakshi.
9. Element s of Environment Engineering by Duggal.
10. PBS Environmental Science by Dr. Navmeet Kaur.

MASS TRANSFER - II (PRACTICAL) (DPE607)

Credits: 01

L T P
0 0 2

List of experiments
1. To verify the Rayleigh's equation for batch distillation.
2. To find the mass transfer coefficient for the vaporization of organic vapour to air.
3. To find out mass transfer coefficient in a drop wise liquid –liquid extraction (LLE).
4. Determination of liquid holds up in a packed column (LLE).
5. To find the efficiency of rotary drier using a granular solid.
6. To find the yield of a natural oil by leaching from biomass (SLE).
7. Study of simple, vacuum and steam distillation.
8. To study the adsorption characteristics and plot adsorption isotherm.
9. Study of packed bed distillation column and packing material.
10. Determination of psychometric properties of the air-water system.

INDUSTRIAL HAZARDS & SAFETY (PRACTICAL) (DPE608)

Credits: 01

L T P
0 0 2

List of experiments
1. Demonstration of different types of fire extinguishers.
2. Demonstration of various personal protective equipments.
3. Study of important parameters governing quality of water.
4. Estimation of chlorides, nitrates, sulphur, carbon dioxide.
5. Determination of hardness.
6. Determination of turbidity/ TDS.
7. Estimation of pH.
8. Determination of acidity/ alkalinity.
9. Determination of DO, BOD & COD in liquid effluent.
10. Study of colour codes for different pipelines.
11. Determination of air pollutants and measurement of noise.

PROCESS INSTRUMENTATION AND CONTROL (PRACTICAL) (DPE609)

Credits: 01

L T P
0 0 2

List of experiments
1. Two tank interacting system.
2. Two tank non-interacting system.
3. Time constant of a resistance thermometer.
4. Time constant of a thermocouple.
5. Study of control valve characteristics.
6. Time constant of manometer.
7. Characteristics of a flapper nozzle system
8. Study of constructional detail of chart recorder
9. Study of constructional details of strip chart recorder

PROJECT WORK – II (DPE610)

Credits: 02

L T P
0 0 4

Based on the theoretical knowledge and laboratories during five semesters, the student is required to prepare project work report. This is supplemented by four weeks of in-plant training/plant visit during final year. The student has to submit a training report for which separate weightage is given. Making use of the above, the student will be given any one of the Chemical Product For which the report is to be prepared by him in the following format:
1. Introduction (a) Objective (b) Application including market survey.
2. Properties (a) Raw material (b) Products (c) Byproducts
3. Chemistry / Mechanism of the process.
4. Different processes used in the industry
5. Selection of the process technology
6. Description of the process selected.
7. Material balance / Energy balance - simple calculation for production of it on some basis.
8. Simple Equipment design - Calculation of height, diameter, thickness of any one of the major chemical equipment and its detailed drawing.
9. Operation: Operation of chemical plant, start up, shutdown procedure, Maintenance aspect.
10. Safety of the process equipment.
11. Process Instrumentation Diagram - Instrumentation and process control
12. Details of any one of the major chemical equipment.
13. Cost estimation.
14. Entrepreneurship and management aspect of the project. Conclusion (a) Results (b) Usefulness in the industry (c) Interpretation.