BHAGWANT UNIVERSITY
Sikar Road, Ajmer
Rajasthan

Syllabus
(Yearly)

Institute of Engineering & Technology
Diploma
(Petro Chemical Engineering)

2nd YEAR

Subject code	Subject Name	Hours Per Week				Distribution of Maximum Marks					
						University Exam			Practical Exam		
		L	T	P	Total	Internal	External	Total	Internal	External	Total
02DYCM101	Chemical Engineering Materials	2	-	-	2	30	70	100	-	-	-
02DYCM102	Introduction to petrochemical technology	3	-	-	3	30	70	100	-	-	-
02DYCM103	Chemical Engineering – I (Mechanical Operation)	2	-	-	2	30	70	100	-	-	-
02DYCM104	General Chemical Technology	2	-	-	2	30	70	100	-	-	-
02DYCM105	Organic Chemistry	2	-	-	2	30	70	100	-	-	-
02DYCM106	Fertilizer Technology	2	-	-	2	30	70	100	-	-	-
02DYCM107	Process calculation	2	-	-	2	30	70	100	-	-	-
02DYCM108	Introduction to Petroleum	2	-	-	2	30	70	100	-	-	-
02DYCM109	Env. aspects in oils & allied industries	2	-	-	2	30	70	100	-	-	-
02DYCM110	Corrosion Engineering	2	-	-	2	30	70	100	-	-	-
	Practicals										
02DYCM201	Basics of information technology	-	-	2	2	-	-	-	50	50	100
02DYCM202	Chemical Engineering Materials	-	-	2	2	-	-	-	50	-	50

02DYCM203	workshop practice – ii	-	-	2	2	-	-	-	50	50	100
02DYCM204	introduction to petrochemical technology	-	-	2	2	-	-	-	50	50	100
02DYCM205	General Chemical Technology.	-	-	2/2	1	-	-	-	50	-	50
02DYCM206	Organic Chemistry	-	-	2	2	-	-	-	50	-	50
02DYCM207	Fertilizer Technology	-	-	2/2	1	-	-	-	50	-	50
02DYCM208	Physical & Analytical Chemistry.	-	-	2/2	1	-	-	-	50	-	50
02DYCM209	Process calculation		-	2/2	1	-	-	-	50	-	50
02DYCM301	DISCIPLINE & EXTRA-CURRICULAR ACTIVITIES	-	-	-	-	-	-	-	50	-	50
TOTAL		**21**	**-**	**14**	**35**	**300**	**700**	**1000**	**500**	**150**	**650**

Grand Total 1650

3rd YEAR

Subject Code	Subject Name	Hours Per Week				Distribution of Maximum Marks					
						University Exam			Practical Exam		
		L	T	P	Total	Internal	External	Total	Internal	External	Total
03DYCM101	Physical and Analytical Chemistry	2	-	-	2	30	70	100	-	-	-
03DYCM102	Heat Transfer	2	-	-	2	30	70	100	-	-	-
03DYCM103	Natural gas engineering	2	-	-	2	30	70	100	-	-	-
03DYCM104	Petroleum Refining and Petrochemicals	3	-	-	3	30	70	100	-	-	-
03DYCM105	Petroleum prod. Health	2	-	-	2	30	70	100	-	-	-

	Environment & Safety										
03DYCM106	Chemical Engineering – II (Fluid flow operation**)**	3	-	-	3	30	70	100	-	-	-
03DYCM107	Mass Transfer	2	-	-	2	30	70	100	-	-	-
03DYCM108	Water Treatment and Management	2	-	-	2	30	70	100	-	-	-
03DYCM109	Petroleum and its Products	3	-	-	3	30	70	100	-	-	-
03DYCM110	Refinery Process Design	3	-	-	3	30	70	100	-	-	-
	Practical										
03DYCM201	Plant Operation	-	-	2	2	-	-	-	50	50	100
03DYCM202	Petrochemicals Technology	-	-	2	2	-	-	-	50	50	100
03DYCM203	Process Instrumentation & Control	-	-	2	2	-	-	-	50	-	50
03DYCM204	Chemical Engineering I	-	-	2	2	-	-	-	50	50	100
03DYCM205	Chemical Engineering II	-	-	2	2	-	-	-	50	-	50
03DYCM206	Chemical Engineering III (Mass Transfer Operation **)**	-	-	2	2	-	-	-	50	50	100
03DYCM207	Chemical Engineering Thermodynamics & Kinetics	-	-	-	-	-	-	-	50	50	100
03DYCM208	Sedimentary & petroleum geology Lab	-	-	-	-	-	-	-	50	50	100
03DYCM301	DISCIPLINE & EXTRA-CURRICULAR ACTIVITIES	-	-	-	-	-	-	-	50	-	50
	TOTAL	**24**	**-**	**12**	**36**	**300**	**700**	**1000**	**450**	**300**	**750**

Grand Total 1750

SECOND YEAR

02DYPC101 CHEMICAL ENGINEERING MATERIALS

UNIT-I Introduction – scope of engineering materials, classification of engineering materials, fundamental nature and structure of material selection of materials

UNIT-II Engineering properties of materials MP, BP, Heat capacity, thermal conductivity Expansion co efficient, thermal insulation Stress, strain, Factors affecting properties of materials

UNIT-III Metals and Alloys 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, ldering of metal welding of metal.

UNIT-IV Ceramic materials 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.

UNIT- V Organic protective coatings Paints classification, ingredients, properties, Special types of paints & their application, Varnishes -definition, ingredients of varnishes classification.

REFERENCE BOOKS:

1. Brian S. Mitchell, An Itroduction to materials: Engineering and Science for Chemicals and Materials Engineers, Wiley Publications, 2003.
2. Don W. Green, Robert H. Perry Perry's Chemical Engineers' Handbook, Eighth Edition.
3. **Fahlman**, Bradley D. Materials Chemistry 2nd ed. 2011, XI, 736 p.

02DYPC102 INTRODUCTION TO PETROCHEMICAL TECHNOLOGY

UNIT-I Introduction to Petrochemical Refining, Indian Refineries,Their location and capacity, Global crude oil producers,

UNIT-II Characteristics of crude, Composition, constituents of crude oil.

UNIT-III Refining - Process of Refining of crude oil to obtain various fractions, Unit operations used in separation processess-Fractionation,Vacuum distillation, list of Hydrocarbons/fractions obtained, their Boiling Ranges and their uses,

UNIT-IV Unit Processess in Refineries: Flow charts, Reactions,Description, Hydrogeneration,cracking,Alkylation,Polymerisation,Hydrocracking.Isomerisatiopn, Reforming,Esterifiaction and Hydrationsss.

UNIT- V Manufacture of paraffin wax and microcrystalline waxes. Manufacture of lubricating Greases-Processes and equipments.

REFERENCE BOOKS:

1. Petroleum Products Hand Book By V. B. Guthrie
2. Petroleum Products Handbook McGraw-Hill Education (December 1960) ISBN-10: 0070252955 ,ISBN-13: 978-0070252950
3. Handbook Of Petroleum Product Analysis ,James G. Speight. Publisher: Wiley-interscience
4. Petroleum Fuels Manufacturing Handbook: Surinder Parkash. ISBN,0071632409 / 9780071632409.

02DYPC103 CHEMICAL ENGINEERING – I (MECHANICAL OPERATION)

UNIT-I Introduction - Definition of unit operation & unit process Difference of unit operation & unit process with examples.
UNIT-II 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
UNIT-III 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, Size reduction (Comminution).
UNIT-IV Criteria for size reduction characterisitics 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
UNIT- V 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.
REFERENCE BOOKS:

1. Taylor & Francis, Indian Chemical Engineer, Vol 53(1), 2011.
2. Kiran D. Patil, Mechenical Operations: Fundamental Principales and Applications. Nirali Prakashan 2007

02DYPC104 GENERAL CHEMICAL TECHNOLOGY

UNIT-I Introduction: Concept of chemical industries Flow diagrams & symbols used in flow Diagram. Inorganic chemical industries: Manufacturing of sulphuric acid, Nitric acid, Hydrochloric acid, Phosphoric acid, their raw Material, properties.
UNIT-II Caustic soda & chlore alkali industries: Manufacturing of caustic soda, soda ash, & Chlorine. Plant utilities : Water & its treatment, D.M. water, Boiler water, Air and it uses.
UNIT-III Industrial gases : Manufacturing of industrial fuel gases, water gas, producer gas, with properties & application.
UNIT-IV Carbohydrate & fermentation industry : Extraction of sugar cane for crystalline sugar Production, starch, ethyl alcohol by fermentation.
UNIT-V Pharmaceutical Industry: Introduction, Types of drugs, Antibiotics, Classification of drugs based on chemical process. Introduction to coal base, petroleum base & fertilizer industries
REFERENCE BOOKS:

1. Andreas Jess, Peter Wasserscheid, Chemical Technology: An Integral Textbook, John Wiley publication.
2. Nicholas P Cheremisinoff, Handbook of Chemical Processing Equipment, BH Publication.

02DYPC105 ORGANIC CHEMISTRY

UNIT-I Stereo chemistry: Isomerism: geometrical and Optical. Grignard's reagent - Organometalic compounds properties & uses.Girgnard reagent as an important tool for organic synthesis

UNIT-II Aliphatic compounds- Chemical reactions involved in methods of preparation, Properties & uses of Ketones, Aldehydes, Halogens carboxylic acids, esters, Aminocompounds.

UNIT-III 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.

UNIT-V 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.

REFERENCE BOOKS:

1. Jonathan Clayden, Nick Greeves, Stuart Warren, Organic Chemistry, Oxford University Press, 2012.
2. P S Kalsi, Textbook of Organic Chemistry, Macmilian India Ltd, 1999.

02DYPC106 FERTILIZER TECHNOLOGY

UNIT-I Introduction- Need of fertilizer, Types of fertilizers, Merits & Demerits of fertilizers, Natural fertilizers, Application of fertilizers Fertilizer industry in Gujarat, India & World.

UNIT-II Nitrogenous fertilisers

a) Ammonia sources of Nitrogen & Hydrogen steam reforming, partial oxidation of RFO, synthesis gas preparation properties, purification and synthesis of ammonia, Ammonia converters.

b) Urea – Physicochemical properties raw material, effect on conversion of process parameters changes, total recycle process steam carbon striping process, Snamprogetti
process material of construction of urea reactor.

c) Ammonium Nitrate – Physicochemical and agrochemical properties, manufacturing process material of construction, different neutraliser's storage & handling.

d) Ammonium Sulphate – Physicochemical properties and agrochemical properties, manufacturing process from Gypsum & as a by-product of caprolactum.

e) Sodium & Potassium Nitrate – Properties & manufacturing process.

UNIT-III Potassium fertilisers Significance of it to the plant life natural sources, properties of potash, potassium fertilisers like potassium sulfate, potassium bisulfate, potassium trisulfate, potassium hydroxide potassium chloride.

UNIT-IV Phosphatic fertilizers Significance to the plant life, classification sources types of rock phosphate, its composition, mining & processing of rock phosphate, manufacture of simple super phosphate, calcium phosphate, Nitrophosphate . Engg. Problems in different Processes. Concentrated or triple super phosphate, Manufacturing process construction & Working of cyclone mixer.

UNIT-V Compound fertilizers, Classification properties, Ammonium phosphate, Diammonium phosphate, Nitrochalk ,trace elements, other ingredients micronutrients. Introduction to bio fertilizers**.**

References:

1. Sidney Hoare Collins, Chemical fertilizers and parasiticides. Baillière, Tindall and Cox, 1920.
2. NPCS Board of Consultants & Engineers, Selected Formulary Book on Petroleum, Lubricants, Fats, Polishes, Glass 2008.

02DYPC107 PROCESS CALCULATION

UNIT-I Dimensions & Units: Introduction. Importance of process calculation, Dimensions & system of units, Fundamental, Quantities, derived quantities conversion to FPS, MKS, & SI system, recommendation for Use of units.

UNIT-II Basic chemical calculations : Definition & basic calculations, Mole Atomic Weight, Molecular weight, Equivalent weight, Specific gravity API gravity composition of Solid & liquid weight %, mole %, properties of solution, Raoults law, Henry's law Normality Molarity molality, gms/lit, PPM, TOC, THOD, BOD, COD.

UNIT-III Ideal gas law : Concept derivation of ideal gas, law definition of STP, NTP, Ideal gas law for mixtures Dalton's law, Amagat's law, relationship Between Mole %, Vol.%, pressure %, calculation of average molecular weight, density, mole %, Weight %, in SI/MKS system only, equation of State.

UNIT-IV Psychrometric Definition of DB and WB temp., Dew point Absolute humidity % humidity, relative Humidity, Humid heat, humid volume, vapour Pressure, partial pressure psychrometric chart Use of psychrometric chart simple problems Based on calculation of psychrometric Properties.

UNIT-V Material balance without chemical reactions: Introduction, process flow sheet principles of material simple balance, Recycling & By passing simple Problems based on material balance without Chemical reactions in various unit operations like Distillation Drying Absorption, Evaporation & crystallization extraction Leaching Introduction- Definition of heat capacity Specific heat, relation between
CP CV & R, Numerical values of
gas constant "R" Mean Heat capacity of gases calculation of Enthalpy of gases
& gaseous mixture using heat Capacity data .

REFERENCE BOOKS:

1. D C Sikdar, Chemical Process Calculations, PHI Learning pvt Ltd. Delhi, 2013.
2. KA Gavhane, Introduction to Process calculations Stiochiometry, Nirali Prakashan.

02DYPC108 INTRODUCTION TO PETROLEUM

UNIT-I.Overview & Structure of Petroleum Industry, Origin and occurrence of oil & gas, migration and accumulation of oil and gas, source and reservoir rocks, physical properties of oil bearing rocks, carbonate reservoirs, fracture, anticlines etc, types of reserves fluids, rocks and fluid properties.

UNIT-II.Oil & gas exploration methods, direct oil finding methods, geological and geophysical methods, basics principles of oil field development planning

UNIT-III.Introduction to drilling operations, planning of drilling programme, drilling equipment, basics of drilling mud functions, well completion fundamentals.

UNIT-IV.Production principles, types of reservoir drives, primary oil recovery, secondary oil recovery, enhanced oil recovery methods.

UNIT-V Introduction: Sub division &Importance of geology in petroleum engg., importance structure of the earth, Environment aspects of geology.

REFERENCE BOOKS:

1. D R Skinner, An Introduction to Petroleum Production, Gulf Pub 1981.
2. James G. Speight, An Introduction to Petroleum Technology, Economics, and Politics, John Wiley & sons.

02DYPC109 ENVIRONMENTAL ASPECTS IN OILS & ALLIED INDUSTRIES

UNIT- I Industrial pollution and its impact. Magnitude of industrial waste , Legislative regulations. Recycle and reuse of, waste water, recovery of by C0-product from industrial effluents.

UNIT-II Philosophy of waste treatment, scope of air and water pollution problems, economic considerations of waste disposal, separation and segregation of wastes, gaseous, liquid and solid waste disposal with special reference to oils and allied, product processing.

UNIT- III Waste Management Pollution prevention and environment Management system ISO 14000. Waste audit, Quality, management systems, Different regulation means & acts for air, water& solid pollution control.

UNIT-IV Waste liquid treatment**:** Pretreatment methods, centrifugation filtration, evaporator and concentrator, extraction and distillation, treatment of, dilute wastewater. Treatment requirements, Neutralization liquid-solid separation, biological oxidation, plant control, programme, absorption, liquid phase system, reclamation of waste water effluent and by-product recovery, ion exchange system, acid and alkali purification, continuous ion-exchange,. Case studies on vegetable oil processing, soaps and detergents.

UNIT-V Waste gas treatment: Air pollution control by mechanical method: mechanical collectors, electrostatic precipitator, filters, wet scrubbers, vapour phase system, activated carbon. Typical air purification system.

REFERENCE BOOKS:

1. Gilbert.M.Masters, 'Introduction to Environmental Engineering and Science, 2nd Edition Pearson Education 2004.
2. T.G.Miller, 'Environmental Science' Wads Worth publishing Co.

3. C.Townsend.J.Harper and Michael Bgon, Essentials of Ecology' Blackwell Science.
4. R.K.Trivedi and P.K. Goel' Introduction to Air pollution Techno science publications.
5. Bharuche Evach, 'The Biodiversity of India' Mapin Publishing Limited, Ahmadabad, India.
6. 'R.K. Trivedi' handbook of Environmental laws, Rules, Guidelines, Compliances and Standards, Vol I and II, Enviromedia.
7. Cunningham.W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia. Jaico Publication House, Mumbai.

02DYPC110 CORROSION ENGINEERING

UNIT-I Corrosion – introduction, definitions and types Electrochemical cells-definitions and Principles, Electrochemistry of corrosion Potential measurements – galvanic cells, concentration cells.EMF and Galvanic series – bimetallic couples. Eh-pH diagrams – fundamental aspects. Construction of Eh – pH diagrams. Fe-H2O-O2 diagram. Copper, Aluminium and general corrosion diagrams.

UNIT-II Electrode kinetics and polarization phenomena Electrode – solution interface –definition and types of polarization.Exchange current density –polarization relationships.Polarization techniques – corrosion rate determination. Mixed potentials – concepts and Basics.Mixed potential theory – bimetallic couples Mixed potential theory – activation and diffusion controlled processes

UNIT-III Methods of corrosion control Prevention strategies – design and coatings. Prevention strategies – inhibitors and surface engineering.Cathodic protection – principles and classification. Cathodic protection – influencing factors and monitoring.Design aspects for cathodic protection.Stray current corrosion. Passivity – definitions and influencing parameters Passivity – application of mixed potential theory. Passivity – design of corrosion resistant alloys.Anodic protection.

UNIT-IV Biological aspects of corrosion: Microbially influenced corrosion (MIC) – definitions, environments and microbiology.MIC - Electrochemical aspects and general mechanisms.MIC – Bacterial transport, attachment and affected materials. MIC - Role of aerobic and anaerobic microorganisms Mechanisms and models for SRB corrosion.

UNIT-V Metallurgy and testing procedures Metallurgical properties influencing corrosion. Laboratory experiments in corrosion engineering – I Laboratory experiments in corrosion engineering – II

REFERENCE BOOKS:

1. Denny A Jones, Principles and Prevention of Corrosion (second edition), Prentice- Hall, N. J. (1996).
2. M. G. Fontana, Corrosion Engineering (Third Edition) McGraw-Hill Book Company (NY) (1987).
3. H. H. Uhlig and R. W. Revie, Corrosion and Corrosion Control, Wiley (NY) (1985).
4. L. L. Shreir, Corrosion. Vol I and II, Butterworths, Kent (1976).
5. M.Pourbaix, Atlas of Electrochemical Equilibria in aqueous solutions, NACE, Houston (1974).
6. J. O. M. Bockris and A. K. N Reddy, Modern Electrochemistry. Vol. I and II, Plenum Press (NY) (1970).
7. J. D. A Miller, Microbial Aspects of Metallurgy, Medical and Tech. Pub. Co. Lancaster (1971).

8. C. A. C. Sequeira, Microbial Corrosion, European Federation of Corrosion, Maney Pub. (2000).
9. B. J. Little, Microbiologically Influenced corrosion, Wiley-Intersciene (2007)
10. H. Videla, J. F. Wilkes, R. A. Silva, Manual of Biocorrosion, CRC Press (1996).
11. S.W. Borenstein, Microbiologically influenced corrosion handbook, Woodhead Pub. Ltd, Cambridge (1994).

Practical's

02DYPC201 BASICS OF INFORMATION TECHNOLOGY

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:
o Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MSExcel, getting information while working
. Work books:
o 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:
o 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
a) 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.
b) Addition, deletion and saving of slides
c) Insertion of multimedia elements
- Adding text boxes
- Adding/importing pictures
- Adding movies and sound
- Adding tables and charts etc.
- Adding organizational chart
d) Formatting slides
- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template
e) How to view the slide show?

- Viewing the presentation using slide navigator
- Slide transition
- Animation effects etc.

8. Working with MS Access

a) Understanding different data types
b) Creation of table
c) Entering data in a table and modify it.
d) Creating simple Queries

9. Internet and its Applications

a) Log-in to internet
b) Navigation for information seeking on internet
c) Browsing and down loading of information from internet
d) 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

02DYPC202 CHEMICAL ENGINEERING MATERIALS

1. Use of metallurgical microscope
2. Measurement of corrosion of metal in Acid and alkaline media
3. Measurement of Hardness of metal
4. Froth flotation
5. Demonstration of

i. Ceramic materials
ii. Plastic materials
iii. Lubricants
iv. Adhesives
v. Insulation materials
vi. Metals & alloys
vii. Ores for metals
viii. Packaging materials

02DYPC203 WORKSHOP PRACTICE – II

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

02DYPC204 INTRODUCTION TO PETROCHEMICAL TECHNOLOGY

1. Determination of Aniline Point.
2. Determination of Fire Point, Flash Point.
3. Determination of calorific value.
4. Determinaton of viscosity index.
5. Preparation of Ethyl Acetate by Esterification.
6. Preparation of Resin.
7. Preparation of Biodiesel by Transesterification.
8. ASTM, TVP Distillation.
9. Determination of Drop Point.
10. Determination of Pour Point**.**

02DYPC205 GENERAL CHEMICAL TECHNOLOGY.

1. Available chlorine in bleaching powder
2. Temporary & permanent hardness in water
3. Chloride in water
4. Preparation of azodye
5. Preparation of Aspirin
6. Preparation of Soap
7. Preparation of detergent
8. Preparation of Boric acid
9. Preparation of Alum
10. Preparation of nitrobenzene
11. Saponification value of oil.
12. Properties of boiler feed water and (D.M.water)

02DYPC206 ORGANIC CHEMISTRY

1. Determination of melting point of an organic compound
2. Determination of boiling point of an organic compound
3. Distingiush between aldehydes & ketones by tollen's reagent
4. Crystallisation of impure sample of any of the following alum , 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

02DYPC207 FERTILIZER TECHNOLOGY

1. Sampling & sizing of fertilizer.
2. To determine nitrogen content in given sample of urea by distillation method.

3. To determine total nitrogen content in given sample of ammonium nitrate.
4. To determine nitrogen content in given sample by formalin method.
5. To determine K2O content in given sample of potash fertilizer.
6. To determine P2O5 content in given sample of phosphatic fertilizers.
7. To determine moisture content in given sample of urea.
8. Preparation of Ammonium Sulfate.
9. Preparation of Phosphatic fertilizers.
To determine total P2O5 content in phosphatic fertilizers.

02DYPC208 PHYSICAL & ANALYTICAL CHEMISTRY.

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, AgNO3
7. First order and second order kinetics
8. Refractometer

02DYPC209 PROCESS CALCULATION

1. Prepare a standard solution(N/25 or M/50) of oxalic acid. With its help determine the normality (or molarity) & strength of given solution of KMnO4.
2. Determine the percentage purity of ferrous sulphate (FeSo4 . 7H2O) in given solution of known strength (15)
3. Determine volumetrically the equivalent weight & the no. of water molecules of crystallisation in a given sample of oxalic acid COOH.XH2O |COOH
Provided N/20(or M/100) KMnO4 solution.
4. To determine BOD of given sample
5. To determine COD of given sample
6. To determine the enthalpy of dissolution of solid cuso4.5H2O in water at room temperature.
7. Estimation of moisture in the given coal sample gravimetrically
8. Estimation of ash in the given coal sample gravimetrically
9. Crystallisation of impure sample of Potash alum,K2SO4. Al2(SO4)3.2HH2O
The given solution has been prepared by dissolving O.S.G of an alkali metal permangenate in 500 cm3 of the solution.Determine volumetrically the atomic weight of alkali metal.

THIRD YEAR

03DYPC101 Physical & Analytical Chemistry

UNIT-I 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

UNIT-II 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.

UNIT-III. Ionic equilibria -

Introduction sparingly soluble salts, Acids & Bases Hydrolysis, Hydrolysis constant, Buffer Solution, Acid base titrations.

UNIT-IV 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.

UNIT-V Adsorption - Langmuir's adsorption theorem Gibbs adsorption equation, solid-liquid, Liquid – liquid interfaces. 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.

:

References

1. Gordon M. Barrow, Physical Chemistry, Sixth Edition, Tata McGraw Hill (1998).
2. Peter Atkins & Julio de Paula, Atkins' Physical Chemistry, 7th Edition, Oxford university press.(2002).
3. Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building, George E.P. Box, J. Stuart Hunter & William G. Hunter.

03DYPC102 Heat Transfer

UNIT-I CONDUCTION - Modes of heat transfer – Steady and unsteady state heat transfer – Concept of heat conduction – Fourier's law of heat conduction – General heat conduction equation in spherical coordinates – One-dimensional steady state heat conduction equation for flat plate, hollow cylinder, hollow sphere –Analogy between flow of heat and flow of electricity – Effect of 42 temperature on thermal conductivity – Critical insulation thickness– Transient heat conduction – Lumped heat parameter model.

UNIT-II CONVECTION- Concept of heat transfer by convection , Natural and forced convection , Concept of LMTD , Local and overall heat transfer coefficient , Application of dimension analysis for convection ,Empirical Equations for forced convection under laminar, transient and turbulent conditions , Empirical equations for natural convection ,Influence of boundary layer on heat transfer , Heat transfer through packed and fluidized beds , Heat transfer with phase change: boiling, vaporization and condensation.

UNIT-III RADIATION - Concept of thermal radiations , Black body concept – Stefan Boltzman's law ,Emissive power ,Black body radiation , Emissivity , Planck's law ,Radiation between black surfaces ,Gray surfaces , Radiation shields , Radiation applications, Pipe still heaters.

UNIT-IV. HEAT EXCHANGERS - Heat exchanger types , Parallel and counter flow heat exchangers , Overall heat transfer coefficient ,Log mean temperature difference for single pass ,Correction factor for multi pass heat exchangers , Heat exchanger effectiveness ,Number of transfer units , Chart for different configurations ,Dirt factor.

UNIT-V EVAPORATORS -Evaporation – Single effect and multiple effect evaporation,Boiling point elevation ,Effect of liquid head , Capacity and economy of multiple effect evaporators ,Evaporation equipments.

Reference

1. Kern, D.Q., "Process Heat Transfer", Tata McGraw Hill Publishing Co., 1990.
2. Hollman, "Heat Transfer", 8th Edition, McGraw Hill, 1997.
3. Kreith, F., "Principles of Heat Transfer", 4th Edition, Harper and Row, 1976.

03DYPC103 NATURAL GAS ENGINEERING

UNIT – I Natural gas technology and earth science: Branches of petroleum Industry. Sources of Information for natural gas engineering and its applications. Geology and earth sciences: Earth sciences-Historical geology, Sedimentation process, Petroleum reservoirs, Origin of petroleum. Earth temperatures & pressure, Earth temperatures, Earth pressure. Petroleum: Natural gas, LP gas, Condensate, & Crude oil.

UNIT – II Properties of Natural Gases: and hydrocarbon, Liquids. typical compositions. Equations of state: general cubic equations, specific high accuracy equations. Use of equation of state to find residual energy properties, gas measurement gas hydrates, condensate stabilization, acid gas treating, gas dehydrations, compressors, process control deliverability test, gathering and transmission, and natural gas liquefaction.

UNIT-III Gas Compression: Positive displacement and centrifugal compressors; fans. Calculation of poser requirements. Compressible Flow in PBMDs: Fundamental equations of flow: continuity, momentum, elegy equations.

UNIT-IV Isothermal flow in pBMDs: the Weymouth equation. Static and flowing bottom-hole pressures in wells. Fundamentals of Gas flow in porous media: Steady state flow equations. Definition of pseudo-pressure function. Transmission of Natural Gas, Underground storage and conservation Gas flow in cylindrical reservoirs: general equation for radial flow of gases in symmetrical homogeneous reservoirs

UNIT-V Non-dimensional forms of the equation; derivation of coefficients relation.dimensionless to real variables. Infinite reservoir solution: Pseudo-steady-state solution. Gas Well Deliverability Tests: Flow-after-flow tests: prediction of IPR curve and AOF for the well. Isochronal tests. Draw down tests: need for data at two flow rates**.** Sweetening and Processing for LPG, LNG,CNG, system., Unconventional source of Gas

References

1. Natural Gas Engineering (Production & Storage): Katz D.L.etal ,Mc Graw –hill Singapore
2. Slandered Hand Book of Petroleum & Gas Engineering II Edition William C Plisga Gulf Professional Publishing
3. Gas Production Operations : Beggs DH ,Technip1984
4. Gas reservoir Engineering : LeJ Wattenbarger R a ,Society of Petroleum engineers TX USA 1996
5. Natural Gas production engineering : Ikoku Chi, John Wiley and Sons 1984
6. Gas Production Engineering :Kumar Sanjay, Gulf Professional publishing TX USA 1987
7. Hand Book ofNatural Gas Transmission & Processing : Mokhatab S Poe and W A & Speight , Gulf Professional Publishing 2006

03DYPC104 PETROLEUM REFINING AND PETROCHEMICALS

UNIT-I Crude oil and its Distillation**:** Origin, exploration and production of Petroleum, Types of crudes, composition, characteristics, Impurities in crude oils, Crude oil distillation; atmospheric distillation, vaccume distillation, Operation of fractionating columns and improvements in fractionating columns.

UNIT-II Lube oil manufacturing processing: Vaccum distillation, Solvent deasphalting, Solvent Extraction, Solvent Dewaxing, Solvent deoiling.

UNIT-III –Corrosion Control in Refinery Processes: Types of Corrosion, corrosion control in crude oil distillation, thermal cracking, fluid catalytic cracking, amine gas processing, steam and condensate lines. Corrosion from combustion process.
UNIT-IV Unit processes: Alkylation, oxidation, dehydrogenation, nitration, chlorination, sulphonation and isomerisation.
UNIT-V Polymerisation**:** production of polyethylene, PVC, Polypropylene, SAN, ABS, SBR, Polyacrylonitrile, Polycarbonates, Polyurethanes, Nylon, PET.

References

1. "Modern Petroleum Refining Processes" Edition 3, :B.K. Bhaskara Rao ,Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.
2. "Unit Processing in Organic Synthesis" Edition 5: Groggins, Tata McGraw Hill 198
3. " Petroleum Refining Technology" by Ram Prasad ,Khanna Publishers Delhi
4. "Advance Petrochemicals " by G. B N Sarkar ,Khanna Publishers Delhi
5. "Petroleum Refining " by Dr G N Sarkar,Khanna Publishers Delhi
6. Nelson W.L., "Petroleum Refinery Engineering", McGraw Hill Publishing Company Limited, 1985
7. Watkins, R.N., "Petroleum Refinery Distillation, second edition, Gulf Publishing Company, Texas 1981

03DYPC105 PETROLEUM PRODUCTION HEALTH ENVIRONMENT & SAFETY

UNIT-I. Environment: Concept of environment, components of environment, Ecological aspects of environment. Pollution: Water pollution, Air pollution, Noise pollution, Radioactive pollution.
UNIT-II Global environmental problems: Introduction, acid rain, greenhouse effect, and ozone layer depletion. Measures against global problems.
UNIT-III. Energy conservation: Conventional & non-conventional energy sources of energy. Renewable & non-renewable energy sources re use of water
UNIT-IV Industrial Acts: Introduction factory acts, Industrial Disputes Act, Boiler Act, Pollution Control Act, ESI Act, Workmen's Compensation Act. Industrial Safety, Introduction, Causes of accidents, Types of accidents, safety procedures, safety during maintenance, operation, safety. Permit system.
UNIT-V. Safe handling of hazardous chemicals: Chemical reactions & properties of hazardous chemicals like chlorine, Ammonia, caustic soda sulfuric acid, hydrochloric acid Nitric acid carbon monoxide phosgene LPG transportation of hazardous chemicals, storage of hazardous chemicals, Hazop / Hazan study disposal of hazardous chemicals. Health & Safety hazards: Toxicology, pressure related safety, temperature related Safety.

REFERENCE:

1. Hallmark, R.G. 2009. Institutionalization of HSE. Presented at the SPE Americas E&P Environmental & Safety Conference, San Antonio, Texas, USA, 23-25 March. SPE-120576-MS
2. Arnold k. surface production operation

03DYPC106 CHEMICAL ENGINEERING – II (FLUID FLOW OPERATION)

UNIT-I Introduction : Dimensional analysis – Dimensional equation Dimensionally Homogeneous equation. Dimensionless groups & their significance
UNIT-II 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.

UNIT-III 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.

UNIT-IV 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.

UNIT-V 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 ,Flow measurement , Fluid moving machinery .

REFERENCE:

1. Perry's *Chemical Engineer's* Handbook
2. RIGGS, JAMES B. , HIMMELBLAU, DAVID M. **(**Basic Principles and Calculations in Chemical Engineering**)**

03DYPC107 MASS TRANSFER

UNIT-I DIFFUSION - Diffusion in fluids , Molecular and eddy diffusion , Measurement and calculation of diffusivities , Ordinary diffusion in multi component gaseous mixtures ,Diffusion in solids , Molecular and Knudsen diffusion in solids ,Theories of mass Transfer ,Film theory, penetration theory and surface renewal theories of mass transfer..

UNIT-II INTERPHASE MASS TRANSFER -Interphase Mass Transfer , Local and overall mass transfer coefficients ,Steady state co current and counter current mass transfer process ,Stage and stage efficiencies , Concept of NTU and HTU , Equilibrium and operating lines , JD Factor, Equipments for gas-liquid contact operations , Bubble columns , Tray towers and packed towers.

UNIT-III ABSORPTION - Gas Absorption: Principles of absorption and desorption ,Selection of solvents for absorption , Tray tower absorber , Absorption factor , Calculation of number of theoretical stages , Murphree efficiency ,Point efficiency , Tray efficiency and overall tray efficiency , Calculation of actual number of trays.Packed tower absorber ,Tower packing and characteristics . Calculation of NTU, HTU,HETP and height of absorption towers ,Absorption with chemical reactions.

UNIT-IV DRYING - Drying – Principle and definitions , Estimation of drying rates, drying rate curve . Critical and equilibrium moisture content ,Calculation of drying time under constant drying conditions , Different types of dryers.

UNIT-V HUMIDIFICATION AND CRYSTALLIZATION -Humidification – Definitions, psychometric charts , Wet bulb temperature , Methods of humidification ,Types of cooling towers, spray chambers and spray ponds. Crystallization – Factors governing nucleation and crystal growth , Theory of Crystallization ,Classification of crystallizer and their applications – Product size distribution.

References

1. Coulson, J.M. and Richardson, J.F., "Chemical Engineering", Vol.I, II and III,Pergamon Press, 1977.
2. Bennett, C.O. and Myers, J.E., "Momentum, Heat and Mass Transfer", McGraw Hill Book Company, 3rd Edition, 1983.
3. Christie J. Geankoplis, "Transport Processes and Unit Operations", 3rd Edition,Prentice Hall of India Pvt. Ltd, 2000.

4. Binay K.Dutta,"Principles of Mass Transfer and Seperation Processes",PHI Learning Ltd,2013. PC6503 PETROLEUM

03DYPC108 WATER TREATMENT AND MANAGEMENT

UNIT-I. INTERNAL TREATMENT PROCESS -Character and properties ,Water problem and solution , Water Sedimentation ,Coagulation , Filtration , Disinfection , Theory, necessity, process, equipment, application, location, limitation.

UNIT-II EXTERNAL TREATMENT PROCESS -Softening by Ion , exchange process, Demineralization .Cation exchange materials .Removal of ion, Manganese, odour, colour taste , Deaeration , Oxidation ,Fluoridation , Dealkalisation ,Desalination by Reverse osmosis

UNIT-III BOILER WATER AND COOLING WATER -Concept , Importance , Location ,Commonly used desalination process ,Distillation , Electrodialysis , Reverse osmosis ,Freezing , Solar distillation, Purpose ,Problem associated with water quality and equipment , Steam system fundamentals , Hot water closed system , Measurement and control of pH, corrosion, fouling , Microbial analysis , Ozone control ,Study of microorganism , Energy efficient operations and maintenance.

UNIT-IV WASTE WATER TREATMENT - Waste water in Industry, Home and Agriculture ,Various waste water treatment processes , Optimization , Benefits and costs , Microbial and sanitation water treatment , Biofilm formation and removal ,Microbial trend analysis ,Pretreatment system and equipment.

UNIT-V WATER MANAGEMENT IN INDIA -Water resources and planning , Water policy ,Indian scene .Main aspects of water management , Hydrological cycle , Hydrosphere ,Water transport , Water exchange ,Causes and problems in irrigation, rural water, urban water – Water conservation resource management ,Rain Harvesting..

References

1. Austin G.T., "Shreve's Chemical Process Industries", Fifth Edition, McGraw Hill, 1998.
2. S.C. Rangwala, "Water supply and Sanitary Engineering", Eighteenth Edition,Charotar Publishing House, 2003.
3. Pandey G.N., "Text Book of Chemical Technology", Vikas Publishing House Pvt. Ltd., New Delhi, 1992

03DYPC109 PETROLEUM AND ITS PRODUCTS

UNIT-I Introduction of mineral oils, their origin and mode of occurrence. Oil resources and refineries in India. Composition of petroleum Refinery products and their test methods.

UNIT-II Evaluation of oil stocks introduction to processing of petroleum; general processing and crude distillation, refinery products and their applications, natural gas, gasoline, naphtha kerosene, fuel oils and gas oils, petroleum waxes, lubricating oils, tar and asphalt.

UNIT-III Petroleum refining processes and operation: Thermal cracking, catalytic cracking, hydro forming, catalytic forming, alkylation's, polymerization, isomerisation.

UNIT-IV auxiliary process e.g. vis-breaking, de-waxing and de-asphalting operations. Manufacture of paraffin wax and microcrystalline waxes.

UNIT-V Introduction to petrochemicals; manufacture of alkyl aryl compounds, ethylene oxide condensation products benzene, toluene, xylem, butadiene's, vinyl chloride and styrene etc.

References

1. Petroleum Products Hand Book By V. B. Guthrie
2. Petroleum Products Handbook McGraw-Hill Education (December 1960) ISBN-10: 0070252955 ,ISBN-13: 978-0070252950
3. Handbook Of Petroleum Product Analysis ,James G. Speight. Publisher: Wiley-interscience

4. Petroleum Fuels Manufacturing Handbook: Surinder Parkash. ISBN,0071632409 / 9780071632409

03DYPC110 REFINERY PROCESS DESIGN

UNIT- I MULTICOMPONENT DISTILLATION -Dew point and bubble point for multi component mixtures. Design of multi component distillation column, Number of variables, Selection of key components, Selection of column pressure, Feed condition, Plate-to-plate calculations, Empirical short cut methods, Introduction to rigorous solution procedures.

UNIT -II PETROLEUM REFINERY DISTILLATION -TBP, EFV, ASTM distillation curves and their relevance, Material balance and flash zone calculations for petroleum refinery distillation columns, Pump around and pump back calculations, Overall energy requirements, Estimation of number of equilibrium stages, Design using Packie charts and Watkins method, Introduction to rigorous solution procedure based on pseudo components.

UNIT -III COLUMN DESIGN -Process design of distillation towers. Flooding charts. Trays and packings. Vacuum devices.Pressure drops. Height,diameter,supports.Piping requirements. Aspects of mechanical design. A typical P&ID for a distillation column.

UNIT -IV FIRED HEATERS - Heat load calculations for furnace heaters used in crude refining, Basic constructional features, Different furnace types, Review of factors to be considered in the design of fired heaters, Introduction to manual calculations methods.

UNIT- V PUMPS AND COMPRESSORS - Types of pumps and compressors. Selection criteria. Power rating calculations based on process duty.Use of operating curves of centrifugal pump. NPSHR and NPSHA. Pump Cavitation. Surge problem in compressors.

References

1. Van Winkle M., “Distillation”, McGraw Hill, 1967.
2. Watkins, “Petroleum Refinery Distillation”, McGraw Hill, 1993
3. Sinnott R. K., “Coulson and Richardson’s Chemical engineering”, Vol. 6, Third Edition, Butter Worth-Heinemann, 1999.
4. Kern D. Q., “Process Heat Transfer”, McGraw Hill, **1965.**
5. Cao Eduardo,”Heat Transfer in Process Engineering”, McGraw Hill,2010

03DYPC201 PLANT OPERATION

1.To determine control valves characterstics.
2. To determine response of shell and tube type heat exchanger with PID control
3. Study of spray and fluidized bed dyer
4. Study of cooling tower

03DYPC202 PETROCHEMICALS TECHNOLOGY

1. Cleveland open cup (Flash point of Lube oil)
2. Flash point in Penskey Martin (closed up) apparatus
3. ASTM distillation
4. Carbon residue (Conardson method)
5. Cloud & Pour point
6. Drop point of grease
7. Penetration number
8. Reid vapour pressure
9. Smoke point
10. Aniline point
11. Dielectric strength
12. Abel's apparatus
13. Redwood viscometer
14. Saybolt viscometer
15. Ostwald viscometer
16. Orsat gas analysis

03DYPC203 PROCESS INSTRUMENTATION AND CONTROL LAB

PROCESS CONTROL LAB

1. Operation of interacting and non-interacting systems.
2. Closed loop response of Flow control loop.
3. Closed loop response of Level control loop.
4. Closed loop response of Temperature control loop .
5. Closed loop response of Pressure control loop.
6. Study of complex control system (ratio/cascade/feed forward)

INSTRUMENTATION LAB:

1. Calibration of Flow meter.
2. Viscosity measurement.
3. pH meter standardization and measurement of pH values of solution.
4. Calibration of pressure gauge.
5. Conductivity meter calibration and measurement of conductivity test solution.
6. IR spectrophotometer

03DYPC204 CHEMICAL ENGINEERING I (HEAT TRANSFER OPERATION)

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**.**

03DYPC205 CHEMICAL ENGINEERING – II (FLUID FLOW OPERATION)

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

03DYPC206 CHEMICAL ENGINEERING III (MASS TRANSFER OPERATION)

1. Verification of Rayliegh equation
2. Vapour liquid equilibrium data
3. Steam distillation
4. Vacuum distillation
5. Single stage – Liquid – Liquid extraction
6. Three stage – Liquid – Liquid extraction
7. Batch drying
8. Single stage leaching

9. Binodal curve & Tieline
10. Adsorption on charcoal.

03DYPC207 CHEMICAL ENGINEERING THERMODYNAMICS & KINETICS.

1. Kinetics of first order
2. Kinetics by half-life.
3. Determination of activation energy.
4. Integral method of analysis.
5. Differential method of analysis
6. Study of pilot plant reaction

03DYPC208 SEDIMENTRY & PETROLEUM GEOLOGY PRACTICAL

1. Physical Properties of Minerals
2. Physical Properties of Rocks
3. Identification of Minerals in Hand Specimen
4. Identification of Rocks in Hand Specimen
5. Identification of Geological features through wooden Models
   a) Structural Geological Diagrams
   b) Petrological Diagrams

c) Engineering Geological Diagrams

6. Interpretation of Geological Map (10 Nos.)
7. Dip & Strike Problems (8 Nos.)

8 Estimation of Thickness, distance &Depth of ore body

9 Estimation of Throw &nature of the faults

10 Identification of important sedimentary rocks in Microscopic level