

N.G.PATEL POLTECHNIC, ISROLI – AFWA
CHEMICAL ENGINEERING DEPARTMENT

LIST OF EXPERIMENTS/TUTORIALS/SHEETS (New Syllabus – 151/152)

SEMESTER: 1

Subject : Chemical Engineering Drawing - 3310502

Sr. No.	Name of Sheet
1	Draw Symbols of various Equipments and Devices
2	Draw symbols of various controllers
3	Draw various types of Valves
4	Draw sketches of various Pumps
5	Draw sketches of different size reduction Equipments
6	Draw Jacketed reactor with agitator
7	Draw 1-1 Shell & Tube Heat Exchanger
8	Draw complete distillation tower assembly (Packed Tower, Tray Tower)
9	Draw process flow diagram of continuous manufacturing process
10	Draw a simple process & Instrumentation diagram of a manufacturing process

SEMESTER: 3

Subject : Mechanical Operation - 3330502

Sr. No.	Name of Experiment
1	Carry out differential & cumulative screen analysis
2	Measure volume surface mean diameter, mass mean diameter, number of particles using sieve shaker
3	Test Rittinger's law for grinding in ball mill and measure critical speed
4	Test Kicks law for crushing in jaw crusher
5	Test Bond's law for crushing in roll crusher
6	Measure power consumption in baffled and unbaffled agitation vessel
7	Measure efficiency of cyclone separator
8	Measure efficiency of separation in froth flotation cell
9	Find out rate of settling by sedimentation
10	Measure rate of filtration in gravity filtration
11	Measure rate of filtration in vacuum filtration
12	Measure cake resistance, filter media resistance in filter press.
13	Measure rate of filtration, cake resistance, filter media resistance in basket centrifuge
14	Evaluate mixing index in double cone mixer

Subject: Chemical Engineering Materials (Tutorial) - 3330501

Sr. No.	Name of Experiment
1	Principles of selection of materials
2	Control and prevention of corrosion
3	Comparison of properties of Ferrous metals and alloys
4	Comparison of properties of important Non-Ferrous metals and alloys
5	Comparison of properties of Refractories
6	Compounding of Plastic and Rubber
7	Study of Ingredients of Paints and varnishes
8	Study of thermal insulation
9	Study of FRP

Subject : Chemical Process Technology – I - 3330505

Sr. No.	Name of Experiment
1	Standardize sulfuric acid solution
2	Standardize hydrochloric acid solution
3	Standardize sodium hydroxide solution
4	Prepare hydrated lime
5	Determine calorific value of coal
6	Prepare nitrobenzene
7	Prepare soap
8	Prepare reactive dye
9	Prepare phenol formaldehyde
10	Prepare detergent
11	Prepare vat dye
12	Prepare indigo dye
13	Beneficiate ores
14	Use simple tests to identify some polymers

Subject : Fluid Flow Operation -3330503

Sr. No.	Name of Experiment
1	Use Reynolds's apparatus to identify types of flow
2	Measure absolute and kinematic viscosity using Oswald viscometer
3	Use Bernoulli's apparatus for mechanical energy balance
4	Estimate viscosity of water using Hagen-Poiseuille's equation
5	Measure friction losses through pipe, fittings and valves
6	Measure friction losses through packed bed
7	Measure pressure developed by reciprocating pump
8	Measure head developed by centrifugal pump
9	Measure friction losses through fittings and valves
10	Measure flow through pipe using venturimeter
11	Measure flow through pipe using orifice meter
12	Measure flow through pipe using rotameter
13	Measure flow through open channel using notches
14	Measure minimum fluidization velocity through fluidized bed

Subject: Industrial Stoichiometry -3330504

Sr. No.	Name of Tutorial
1	Systems of Units and Conversions
2	Numericals based on composition of mixtures and solutions
3	Numericals based on Ideal gas law and calculation of composition of gas mixture
4	Numericals based on mass balance for important unit operations
5	Numericals based on mass balance involving chemical reactions
6	(a) Numericals based on heat capacity and heat change (b) Numericals based on heat of formation and heat of reaction
7	Numericals on calorific values of fuel, theoretical air requirement and composition of flue gases

SEMESTER:4**Subject : Chemical Process Technology -II - 3340503**

Sr. No.	Name of Experiment
1	Estimate Acid value in oil sample
2	Estimate iodine value in oil sample
3	Prepare starch from maize
4	Extract vegetable oil from seed
5	Prepare Glycerin
6	Estimate NaCl content in sea water
7	Prepare pulp from bamboo
8	Estimate moisture, volatile matter and ash content in fuel
9	Prepare alcohol
10	Prepare citric acid

Subject : Mass Transfer - I – 3340502

Sr. No.	Name of Experiment
1	Determine diffusivity of gas-liquid system at room temperature
2	Determine diffusivity of gas-liquid system with respect to temperature
3	Determine diffusivity of liquid-liquid system at room temperature
4	Determine diffusivity of liquid-liquid system at different temperature
5	Find out rate of absorption in a tray or packed tower
6	Determine the efficiency of single stage extraction
7	Determine the efficiency of two stage cross current extraction
8	Determine the efficiency of continuous counter current extraction
9	Prepare ternary diagram for a system of three liquids
10	Obtain tie-line data for Acetic Acid, Benzene and water
11	Measure recovery of salt using sand-salt mixture in single stage leaching
12	Measure recovery of salt using sand-salt mixture in two stage leaching
13	Calculate efficiency of Leaching by shanks system
14	Compare different types of membrane module with detailed diagram.

Subject : Pollution Control & Effluent Treatment - 3340504

Sr. No.	Name of Experiment
1	Prepare detail charts of various Pollutants and sources of pollution
2	Removal of suspended Impurities from air using cyclone system
3	Determination of hydrogen ion concentration (pH) of sample using pH meter.
4	Determination of hardness(Temporary and Permanent hardness)of given water sample
5	Determination chloride concentration in given effluent sample
6	Determination of COD of the given effluent sample
7	Determination total dissolved solids in given effluent sample using heat treatment
8	To determine BOD of given sample
9	Prepare a charts of treatments for different solid wastes
10	Prepare an Environmental Audit report of any Chemical Industry

Subject: Process Heat Transfer - 3340501

Sr. No.	Name of Experiment
1	Determine the thermal conductivity of composite wall
2	Determine the overall heat transfer co-efficient in Agitated vessel
3	Determine the liquid-liquid overall heat transfer co-efficient for shell and tube heat exchanger
4	Determine the overall heat transfer co-efficient for horizontal double pipe heat exchanger.
5	Determine the overall heat transfer co-efficient for vertical double pipe heat exchanger.
6	Determine economy of open pan evaporator.
7	Determine the emissivity using Stefan Boltzmann apparatus
8	Determine critical radius of insulating material
9	Determine the overall heat transfer co-efficient for air to water heat exchanger
10	Compare different types of Evaporators

Subject : Safety & Hazard Management - 3340505

Sr. No.	Name of Experiment
1	Prepare a chart of Indian safety standards
2	Identify different hazards & chemical hazards in a given chemical plant
3	Identify colour codes for pipelines
4	Identify colour codes for gas cylinders
5	Identify different safety symbols for chemical industry
6	Demonstrate Personal Protective Devices
7	Prepare a handouts of safe handling practices for hazardous chemicals
8	Demonstrate Fire triangle and classes of fire
9	Demonstrate construction and working of different fire extinguishers
10	Apply HAZOP method using a case study

SEMESTER: 5

Subject : Chemical Engineering Thermodynamics - 3350505

Sr. No.	Name of Tutorial
1	Numerical based on force, pressure, work and energy
2	Phase rule and numerical based on degree of freedom for various systems
3	Numerical based on internal energy and enthalpy
4	Numerical based on first law of thermodynamics for non flow process
5	Numerical based on first law of thermodynamics for flow process
6	Numerical based on processes involving constant temperature and pressure for ideal gases
7	Numerical based on processes involving constant volume and adiabatic process for ideal gases
8	Numerical based on processes involving polytropic process for ideal gases
9	Numerical based on heat effects accompanying chemical reactions for heat of formation and combustion
10	Numerical based on heat effects accompanying chemical reactions for heat of reaction
11	Numerical based on Hess's Law of constant heat summation
12	Numerical based on entropy
13	Numerical based on entropy change during process involving ideal gas
14	Numerical based on entropy change during adiabatic mixing process

Subject : Mass Transfer -II - 3350502

Sr. No.	Name of Experiment
1	Demonstrate principle, construction and working of equipments for gas-liquid operations with models
2	Prepare vapour liquid equilibria curve at atmospheric pressure for Benzene-Xylene
3	Carry out simple distillation in glass assembly
4	Find out the effect of vacuum on distillation of liquid
5	Carry out continuous rectification in packed column
6	Find out amount of steam required in steam distillation
7	Find out the property of atmospheric air with the help of wet bulb and dry bulb temperature
8	Set desired conditions of humid air in humidity control cabin
9	Prepare drying curve of moist sand and moist limestone
10	Find out equilibrium moisture content and drying time of wet solid
11	Characterize industrial adsorbents and observe their samples
12	Remove colour impurities from water using charcoal
13	Find out the yield of crystals from saturated solution without seeding
14	Find out the yield of crystals of from saturated solution with seeding

Subject : Petroleum Refining & Petrochemical Technology - 3350503

Sr. No.	Name of Experiment
1	Prepare a detail chart of modern refinery
2	Prepare a detail chart of petrochemical products
3	Determination of flash point by Penskey Martin method
4	Determination of fire point by Penskey Martin method
5	Measurement of softening point and drop point of Grease
6	Measurement of Aniline point of lubricating oil
7	Determination of penetration number of Grease
8	Determination Carbon residue by Ram's bottom method
9	Determination Carbon residue by conradson method
10	Measurement of smoke point of kerosene
11	Measurement of cloud point lubricating oil
12	Measurement of pour point lubricating oil
13	ASTM distillation of petrol/diesel
14	Measurement of Viscosity of lube oil by Redwood /Saybolt/Engler viscometer

Subject: Utilities & Instrumentation In Chemical Plant -3350504

Sr. No.	Name of Experiment
1	Demonstrate water treatment in water treatment plant
2	Treat water using lime soda process
3	Generate steam in laboratory using baby boiler
4	Demonstrate construction and working of air compressor
5	Demonstrate different refrigeration cycles
6	Demonstrate use of thermometer and thermocouple
7	Demonstrate use Bi-metallic thermometer
8	Demonstrate mechanical pressure gauge
9	Measure gas flow rate
10	Measure level using direct method
11	Measure viscosity by capillary tube method
12	Measure specific gravity by Hydrometer
13	Measure humidity by Hair hygrometer
14	Measure pH by pH meter
15	Prepare a chart of components of DCS system
16	Demonstrate working of control valves and actuators using chart

Semester: 6

Subject : Chemical Engineering Plant Economics (Tutorial) - 3360502

Sr. No.	Name of Tutorial
1	Prepare a block type and equipment flow diagram
2	Prepare a block type material balance flow diagram
3	Prepare a block type energy balance flow diagram
4	Prepare a detailed process and instrumentation flow diagram
5	Prepare a specification sheet for 1-2 shell and tube heat exchanger
6	Prepare a specification sheet for packed type distillation column
7	Solve simple problems using cost-size relationship and cost- time relationship (Cost indices)
8	Solve simple problems to calculate depreciation using: (i) Straight line method. (ii) Declining balance method. (iii) Sum of the years digits method (iv) Sinking fund method.
9	Solve problems for finding out break-even point. (Analytical and Graphical methods)
10	Solve simple problems to determine optimum value using one variable and two variable methods. (Graphical and Analytical methods)

Subject : Chemical Reaction Engineering (Tutorial) - 3360503

Sr. No.	Name of Tutorial
1	Classify chemical reactions and express rate on various basis
2	Solve problems based on rate equation
3	Solve problems based on molecularity and order of reaction
4	Discuss temperature Dependency of rate from Arrhenius' Law and Solve problems based on Arrhenius law
5	Explain various methods of kinetic data analysis
6	Derive integrated rate equation for different order of reaction
7	Explain different Ideal reactors with sketch
8	Explain different multiphase reactors with sketch
9	Derive performance equation of Ideal batch, mixed flow and plug flow reactor
10	Solve problems based on performance equation of Ideal batch reactor
11	Solve problems based on performance equation of Ideal mixed flow reactor
12	Solve problems based on performance equation of Ideal Plug flow reactor

Subject: – Fertilizer Technology - 3360501

Sr. No.	Name of Experiment
1	Prepare detail chart of fertilizer classification with chemical formula and nutrient content
2	Find out nutrient content(Calculate % N, %P ₂ O, % K ₂ O) in different fertilizers from their chemical formula
3	Estimate percentage of Nitrogen in Ammonium chloride by substitution method
4	Estimate percentage of Nitrogen in Ammonium sulfate by substitution method
5	Estimate percentage of Nitrogen in Ammonium chloride by back titration
6	Estimate percentage of Nitrogen in Ammonium sulphate by back titration
7	Analysis of Urea by Formaldehyde method
8	Estimate percentage of Nitrogen in Ammonium chloride/Sulphate by Kjeldhal's method
9	Find out biuret content in Urea sample by colour comparison
10	Estimate percentage of Nitrogen in DAP by Formaldehyde method
11	Estimate percentage of Nitrogen in DAP by Kjeldhal's method
12	Preparation of potassium sulphate
13	Preparation of potassium chloride
14	Estimate ratio of Ammonia to Phosphoric acid in DAP
15	Preparation of potassium nitrate
16	Preparation of biofertilizer

Subject : Sugar & Food Technology -3360505

Prac. No.	Name of Practical
1.	Polarimeter – Determination of “POL”
2.	To find solid content in juice by brix hydrometer
3.	Analysis of bagasse
4.	To make grading of sugar
5.	To measure pH of given sugar solution
6.	To find out content in milk sample
7.	Analysis of Sugar
8.	Bread making in laboratory
9.	Preparation of Cheese
10.	Study of equipments used in sugar factory.
11.	Study of equipments used in food industry.
12.	Preparation of non – alcoholic carbonated beverages.