DCM 601 Instrumentation And Process Control

Unit I

Process instrumentation diagrams and symbols, process instrumentation for process equipment's such as Distillation column Absorption column, Heat Exchanger, Reactors, Evaporators, fluid storage vessels.

Unit II

Concept about Laplace Transforms of simple functions, step, exponential, impulse, ramp and sine functions. Transforms of derivatives & integrals. Inversion by partial fractions. Solutions of ordinary differential equations.

Unit III

Concept about Laplace Transforms of simple functions, step, exponential, impulse, ramp and sine functions. Transforms of derivatives & integrals. Inversion by partial fractions. Solutions of ordinary differential equations.

Unit IV

First order system, -Physical examples of first order systems, –Mercury in Glass Thermometer, Liquid level system, mixing. Linearization of nonlinear systems. Response of first order systems in series(Simple Problems).

Unit V

Second order system, Definition of under damped, critically damped & over damped systems. , overshoot, decay ratio, rise time, response time, period of oscillation, natural period of oscillation, transportation lag

REFERENCES:

1. Process Systems Analysis And Control Donald R Coughnor
2. Chemical Process Control- An Introduction to Theory and Practice-- Stephanopoulos. Prentice Hall of India Pvt. Ltd., New Delhi
3. Principles of Process Control,-- Patranobis-- Tata McGraw-

List of experiments:

1. Calibration of rotameter.
2. To determine the first order response of a mercury in glass thermometer
3. To determine the characteristic curve of various types of thermocouples
4. Calibration of Bourdon Gauge using Dead Weight Tester .
5. Determination of temperature inside a furnace using Optical Pyrometer.
6. Study of control valve characteristics
7. Studies on dynamics and control of level control set up and temperature control set up.

DCM 602 Chemical Reaction Engineering

Unit I

Introduction: Scope of Chemical Reaction Engineering, Classification of reactions, Rate equation and rate of reaction, Factors affecting rate of reaction. Chemical kinetics and Thermodynamics/Equilibrium, Temperature dependency of rate constant from Arrhenius, Collision and Transition state theories, activated complex theory, Mechanism of reaction series.

Unit II

Kinetics of Homogeneous Reactions, Defining a rate equation and its representation, single and multiple reactions, Autocatalytic reactions, molecularity and order of reactions, Integral method of Analysis of data, Irreversible, zero, first, second, and nth order reactions (Uni-molecular and bimolecular type), Overall orders from half-life method.

Unit III

Design of ideal reactors: Concept of ideality. Development of design expressions for batch, tubular, and stirred tank reactors for both constant and variable-volume reactions, Design of Isothermal and non-isothermal batch, CSTR, PFR, reactors.

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Unit IV

Heterogeneous processes: Catalysis and adsorption; Classification of catalysts, Preparation of catalysts, Promoters and Inhibitors, General mechanism of catalytic reactions surface area and pore size distribution Rate equation of fluid solid catalytic reactions, Hougen - Watson & Poinule law models, Procurement and analysis of kinetic data, kinetics of catalyst deactivation

Unit V

Design of catalytic reactors, Isothermal & adiabatic fixed bad reactor staged adiabatic reactors, Non isothermal, non-adiabatic fixed bed reactors, Fluidized bed reactors, Slurry reactors, Trickle bed reactors

References: -

1. Chemical Reaction Engineering--Octave Levenspiel--Wiley
2. Chemical Engineering Kinetics JM Smith—McGraw Hill
3. Chemical Reaction Engineering –Foggler—Prentice Hall

List of experiments:

1. Determination of reaction rate constant for the Hydrolysis of Ethyl Acetate catalysed by Hydrochloric Acid (1st order)
2. To determine the rate constant of the Hydrolysis of Methyl Acetate in presence of an Acid Catalyst.

To study the influence of Ionic strength on reaction between Potassium Persulphate and Potassium Iodide solution
To study the kinetics of decomposition of Hydrogen peroxide in presence of Potassium Iodide.
To study the kinetics of Iodination of Acetone.
To study the influence of Ionic strength on reaction between Potassium Persulphate and Potassium Iodide solution
To study the kinetics of decomposition of Hydrogen peroxide in presence of Potassium Iodide.
To study the kinetics of Iodination of Acetone.

DCM 603 [A]-Petroleum Refining Process

Unit-I

Introduction: Origin of Petroleum. Composition of Petroleum. Classification of Petroleum, Nature of Indian Crude. Uses of Petroleum Products.

Unit-II

Desalting of Crude oil, Heating of Crude oil, Working principle of Pipe Still Heater. Description of Single Stage ,Two Stage & Three Stage Distillation Unit with diagram. Atmospheric & Vacuum distillation unit.

Unit-III

Sweetening process, : Doctor' Sweetening Process, Copper Chloride Sweetening process, , Solutizer Process, Catalytic Desulphurisation process, Hydrofining Desulphurisation process. Dewaxing process : Chilling & Pressing process, , Solvent Dewaxing (MEK & Propane)process, Urea dewaxing process. Deoiling of wax. Acid, Alkali & Clay treatmrnt of Petroleum products. Deasphalting Deasphalting process. Dearomatisation of Kerosene (Edeleanu Process).

Unit-IV

Properties Of Petroleum Products: Specific Gravity, Molecular Weight, ,Vapour Pressure, Viscosity (Red Wood Viscometer), Viscosity Index, Flash Point (Pensky Martin's apparatus), Fire Point.

Unit-V

Coal gasification technologies: various types of fuel gases: producer, water, coke oven, synthesis, LPG & natural gases.

References:

1. Austine G.T.and Shreeves; Chemicasl Process Industries; Mc GrawHill
2. Dryden C.E., M. Gopala Rao; Outlines Of Chemical Technology. Affiliated East-West Press
3. Pandey G.N.; Chemical Technology Volume- I; Lion Press, Kanpur.
4. Bose, P.K., Chemical Engineering Technology, Vol. 1,2, Books and Allied (Pvt Ltd, 2011.

DCM 603 [B]- PLASTICS PROCESSING

Unit – I

Engineering Plastics Sources of Raw Materials – Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications of Engineering Plastics, Polyoxymethylene, Polyamide (PA6, PA66, PA610, PA11, PA12 and PA46), Polyesters (PET, PBT), Poly Carbonate , Polyphenylene Oxide, UHMWHDPE, Polytetrafluoroethylene, Polyvinyl fluoride, Polyvinylidene fluoride, Thermoplastics Polyurethane

Unit – II

Basic Principles of Melt Processing of Thermoplastics – Effect of Polymer Properties on Processing - Thermal Behavior of Polymer Melt - Rheology of Ideal Fluids and Polymers – Newtonian & Non-Newtonian fluids - Processing of Thermoset Plastics - Different Types of Processes - Description and Limitation - Processing Flow Chart - Selecting a Process – Degradation - Orientation – Process Advantage of Plastics over Conventional Materials.

Unit – III

Basic Process Principle of Injection Moulding Process - Machine rating and Specification - Types of Machines – Construction - Parts and its functions - Start-up and shut down procedure - Operation procedure

Unit – IV

Extrusion : Introduction - principles - classification of extruders - single screw extruder - specification - screw nomenclature - types of screws - L/D ratio, compression ratio-back pressure - factors governing back pressure - output and factors affecting output-heating & cooling systems - breaker plate - screen pack & its functions - screw & hopper cooling-die entry effects and die exit instabilities - shark skin, melt fracture & bambooing.

Unit – V

Blow Moulding Basic principles – Process - Material requirement – Specification - Types of Blow Moulding - Processing parameters - Parison Programming - machine features - Design guideline for product performance & Appearance – Dies construction

Compression Moulding & Transfer Moulding Principle – Process - Machine Specification - Material Recommendation - Bulk factor - Moulding powder - Preforms & Preheating Techniques - Process Variables - Flash Mould - Positive mould - Semi Positive mould .

Text / Reference Books

1. Plastics Materials – J.A. Brydson.
2. Plastic Materials Hand Book – A.S. Athalye
3. Injection Moulding Theory & Practice – Rubin, Irvin.
4. Plastics Engineering Hand Book – Socity of Plastic Industry Inc.
5. Plastics Processing Data Hand Book – D.V. Rosato.
6. Plastics Materials & Processing – Brent Strong

DCM-604[A] ENERGY MANAGEMENT

Unit- I

Global and National Energy Scenario, Challenges and Future Options. Energy use patterns.

Unit-II

Energy conservation methods in power plants, conservation of energy in energy intensive industries. Importance of energy management.

Unit-III

Energy auditing, methodology, analysis of past trends (plant data), closing the energy balance, case studies.

Unit-IV

Heating, lighting and Air conditioning of building and measures for conservation of electrical energy. Energy conservation in domestic gadgets.

Unit-V

Measures for Reduction of losses in Transmission and distribution systems.Energy efficient electric drives, V.S.D. power factor improvement in power system. Load curve analysis and load managements, DSM, Energy storage for power systems.

Reference

1. Industrial Energy Management and Utilisation, . L.C.Witte, P.S.Schmidt, D.R.Brown ,
2. The Efficient Use of Energy I.G.C.Dryden
3. Energy Management Handbook W.C.Turner, .
4. Energy Conservation and Audit - Thumman
5. Energy Audit and Conservation - TERI

DCM-604[B] PROCESS SAFETY & HAZARD MANAGEMENT

Unit-I

Origin of process hazards, Laws Codes, Standards, Case Histories, Properties of Chemicals, Health hazards of industrial substances.

Unit-II

Toxicology: Toxic materials and their properties, effect of dose and exposure time, relationship and predictive models for response.

Unit-III

Fire & explosion: Fire and explosion hazards, causes of fire and preventive methods. Flammability characteristics of chemical, fire and explosion hazard, rating of process plant.

Unit-IV

Energy Hazards: Electrical hazards, noise hazard, radiation hazard in process operations, hazards communication to employees, plant management and maintenance to reduce energy hazards.

Unit-V

Risk Analysis: Component and plant reliability, event probability and failure, plant reliability, risk analysis, HAZOP AND HAZAN, event and consequence analysis (vapour cloud modelling) Designing for safety, measurement and calculation of risk analysis.

References:

1. Crawl D.A. and Louvar J.A, Chemical process safety fundamentals with applications.
2. Wentz, C.A, Safety health and environmental protection.
3. Smith, B.D, Design of equilibrium state process.
4. Van Winkle, Distillation.

DCM-605
MAJOR PROJECT

The aim of the final year project is to develop student's knowledge for solving technical problems through structure project research study in order to produce competent and sound engineers. It provides the students with the opportunity to design undertake or conduct an independent research or study related to their degree course.

Following are the compulsory objectives to be needed :

1. It should be from the approved area of the subject.
2. Students must submit a written report of the same.
3. Students must submit outline and action plan for the project execution
4. Each student is required to prepare a project report and present the same at the final examination with a ppt. demonstration.
5. The project should be authentic and must not be copied from anywhere and it should be working.