RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Fluid Particle Mechanics

COURSE OBJECTIVE

The objective of this course is to understand basic principles of various mechanical operations, construction and working of the equipments.

COURSE CONTENT

Particulate Solid: Properties of particulate solids, evaluation of size & shape, shape factor, surface and population of particles, standard screens and screen analysis of solids, screen efficiency, standard screen series.

Size Reduction: Principles of communication, size reduction; crushing, grinding, pulverizing and ultra fining size reduction equipment, power requirement in comminution.

Mixing: Mixing of solids, mixing equipment's, design & power requirement of mixers, mixer effectiveness and mixing index.

Separation: Principles of separation techniques for system involving solids, liquids & gases, classification, sedimentation and filtration, separation equipments.

Transportation and Handling: Selection of conveying devices for solids: Belt, Chain, Screw – conveyors, Elevators and pneumatic conveying devices; elementary design aspects of the devices. visit to chemical engineering, industry engaged mainly with mechanical operation.

Fluidization: Particulate & aggregative fluidization, characteristic of fluidized bed due to particle size, size distribution, shape and density, pressure drop through a fluidized bed and packed bed, character of dense phase fluidization as revealed by pressure drop fluctuations, up flow and down flow fluidization, fluid catalytic process, bed drying, mass transfer in fluidized beds.

COURSE OUTCOMES

1. Ability to evaluate size, surface and population of particles, & screen analysis of solids.
2. Ability to understand principle of size reduction, crushing, grinding, pulverizing and ultra fining.
3. Ability to design mixing equipment and calculate power requirements.
4. Ability to understand principle of separation techniques for system involving solids, liquids and gases, sedimentation and filtration.
5. Ability to understand particulate and aggregative fluidization, pressure drop through fluidized bed.

Topics for the Laboratory

1. To analyses the given sample by differential, cumulative methods using standard screen.
2. Determination of size & surface area of irregular particles using a measuring gauge.

3. To study crushing behavior & to determine the Rittinger's & Bond's constant of the given solid in a jaw crusher.
4. To determine the efficiency of a ball mill for grinding a material of known.
5. To determine the power consumption of the hammer mill.
6. To determine the specific cake resistance for the given slurry by leaf filter.
7. To determine the efficiency of a given cyclone separator.
8. To determine the efficiency of fluidized characteristic bed.
9. To study the Dorr type of thickener.
10. To study the plate & frame filter press.

EVALUATION

Evaluation will be based on continuous an integral part of the class as well through external assessment. Laboratory assessment will be based on assignments, presentations, and interview of each candidate.

References:

1. Perry RH & Don WG; Perry's Chemical Engineering Hand Book; Mc Graw Hill.
2. Nevers De; Fluid Mechanics for Chemical Engineers; TMH
3. Banchero Badker; Introduction to chemical engg; TMH
4. McCabe S, Harriot ; Unit Operations of Chemical Engg; TMH
5. Narayan CM, Bhattacharya BC; Mechanical operations for chemical eng.; PHI
6. Swain A.K., Hemlata Patra, G.K. Roy , Mechanical operation; TMH

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Fluid Mechanics

COURSE OBJECTIVE

The objective of this course to understand basic concept of fluid flow and its application to chemical process industries including pipe flow and fluid machinery.

COURSE CONTENT

Review of fluid properties: Engineering units of measurement, mass density, specific weight, specific volume, specific gravity, surface tension, capillarity viscosity, bulk modulus of elasticity, pressure & vapor pressure, fluid statics: pressure at a point, pressure variation in static fluid absolute & gauge pressure, manometers, dimensional analysis & dynamic similitude dimensional homogeneity, use of Buckingham pi-theorem, calculation of dimension less numbers.

Kinematics of Flow: Fluid flow phenomena, types of flow-ideal & real, steady & unsteady, uniform & nonuniform, one, two and three dimensional flow, continuity equation for one and three dimensional flow, rotational & irrotational flow, boundary layer theory, flow in boundary layer, flow past immersed bodies, packed bed, fluidized bed.

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of moment of momentum equation, forces on fixed and moving vanes and other applications.
Fluid measurements: velocity measurement (Pitot tube, Prandtl tube, current meters etc.) flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Fluid flow: Introduction to laminar & turbulent flow, concept of Reynolds number & friction factor; friction factor for rough & smooth pipe loss of head due to friction in pipes & fittings.

Fluid Machinery: Pumps, compressor, power & head requirement for pumps, piping system (K Factor), valves and joints.

COURSE OUTCOMES

1. Ability to understand basic concept of fluid static, viscosity, pressure & vapor pressure and dimensional analysis.
2. Ability to understand different types of flow, streamlines & continuity equation.
3. Ability to understand Euler's equation of motion, Bernoulli's equation, linear momentum equation, velocity measurement and flow measurement
4. Ability to understand working of pump, fan blowers, compressor and vacuum pumps.
5. Ability to understand concept of Reynolds number and friction factor.

Topics for the Laboratory

1. To determine the local point pressure with the help of pitot tube.

2. To find out the terminal velocity of a spherical body in water.
3. Calibration of venturimeter.
4. Determination of Cc, Cv, Cd of orifices
5. Calibration of orifice meter
6. Calibration of nozzle meter and mouth piece
7. Reynolds experiment for demonstration of stream lines & turbulent flow
8. Determination of metacentric height
9. Determination of friction factor of a pipe
10. To study the characteristics of a centrifugal pump.
11. Verification of impulse momentum principle.

EVALUATION

Evaluation will be based on continuous an integral part of the class as well through external assessment. Laboratory assessment will be based on assignments, presentations, and interview of each candidate.

REFERENCES

1. McCabe Smith;Unit Operation for Chemical Engg. TMH
2. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
3. Som and Biswas; Fluid Mechnics and machinery; TMH
4. Cengal; Fluid Mechanics; TMH
5. White; Fluid Mechanics; TMH
6. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
7. Douglas; Fluid Mechanics; Pearson
8. R Mohanty; Fluid Mechanics; PHI
9. Gupta; Fluid Mechanics; Pearson.
10. Rajpoot R. K. ;Fluid Mechanics and Hydrolic Machine.
11. Bansal R.K.; Fluid Mechanics and Hydrolic Machine.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Inorganic Process Technology

COURSE OBJECTIVE

The objective of this course to understand preparation, characteristics and use of various inorganic materials such as soad ash, caustic soda, sulphar and their compound, nitrogen and their compound etc. In addition study the number of important product like cement, Halogen group based product etc.

COURSE CONTENT

Salts and sodium compounds, soda ash, caustic soda, chlorine and potassium salts.

Hydrochloric acid, Sulphur and sulfuric acid, Phosphoric acid and phosphates

Nitrogenous Industries, Ammonia and Nitric acid, Nitrogenous Fertilizer, mixed fertilizers, N-P-K Fertilizers and micronutrients.

Cement industries, Industrial gases: Nitrogen, Oxygen, Hydrogen, Helium and Argon.

Inorganic chemicals namely Bromine, Iodine and Fluorine, Alumina and Aluminium chloride, Inorganic pigments.

COURSE OUTCOMES

1. Ability to familiarize process flow diagram of salts and sodium compounds, soda ash, caustic soda.
2. Ability to familiarize process flow diagram of hydrochloric acid, sulphur and sulphuric acid, phosphoric acid and phosphate.
3. Ability to familiarize process flow diagram of nitrogenous industries, ammonia and nitric acid, nitrogenous fertilizer.
4. Ability to familiarize process flow diagram of cement industries and industrial gases
5. Ability to familiarize process flow diagram of bromine, iodine, fluorine, alumina and aluminium chlorides.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment, assignment, quiz etc.

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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Fuel Technology

COURSE OBJECTIVE

The objective of this course to understand processing and limitations of fossil fuels (coal, petroleum and natural gas) and necessasity of harnessing alternate energy resources such as solar, wind, nuclear, geothermal tidal and biomass. Also, to understand and practice various characterization techniques for fuels.

COURSE CONTENT

Solid Fuels & Coal carbonization: Coal & lignite reserves in India, classifications of coal, washing of coal, analysis of coal, proximate and ultimate analysis. Mechanism of low temperature carbonization and high temperature carbonization, properties of coke coal, pulverization, briquetting of solid fuels.

Liquid Fuels: Origin of petroleum production, Indian petroleum reserve, petroleum processing, distillation, cracking thermal & catalytic, coking, reforming, isomerizations, crude oil classification.

Transport fuels: petroleum product and their utilization, diesel, petrol, AVL (aviation liquid fuel), kerosene, fuel & furnace oil, testing of petroleum product: flash point, pore point, fire point, octane number, cetene number, viscosity and viscosity index, API.

Gaseous fuels: Natural gas, producer gas, water gas, coal gas, LPG, CNG and hydrogen as a fuel,
Fuel cell: Principle and working, various types, construction and application.

Renewable Energy Source: Types of solar cell and fabrication, wind energy, principal of tidal energy.

COURSE OUTCOMES

1. Ability to give the overview of coal reserves in India. Classifications and Washing of coal. Ability to understand mechanism of low and high temperature carbonization.
2. Ability to enhance the knowledge of petroleum processing like cracking, reforming, distillation and isomerization.
3. Ability to familiar with properties and testing of petroleum products.
4. Ability to know composition and properties of gaseous fuels and fuel cells.
5. Ability to understand renewable energy sources

Topics for the Laboratory

1. To carry on proximate analysis of the given coal sample.
2. To determine the calorific value of the coal by Bomb-Calorimeter method.
3. To determine the viscosity of the given oil sample by Redwood Viscometer. No. 1 and No. 2
4. To determine the viscosity of a given oil sample by Saybolt viscometer.
5. To determine viscosity of a given coal tar with the help of tar viscometer.

6. To determine the flash and fire points of the given oil sample by Penskey Martin'sapparatus..
7. To determine the flash and fire points of the given oil sample by Abel's apparatus.
8. To determine the flash and fire points of the given oil sample by Cleveland apparatus.
9. To determine the carbon residue of the given oil by Conradson method.
10. To determine cloud and pour point of given oil sample (coconut) by cloud and pour point apparatus.
11. To determine the composition of given gas by Orsat apparatus.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment. Laboratory assessment will be based on assignments, presentations, and interview of each candidate.

REFERENCES

1. Sarkar S; Fuel and Combustion; Orient Long men Ltd.
2. Gupta OP; Fuel and Combustion; Khana Pub
3. Gary ; Refining of Petroleum Techonology
4. D.P. Kothari, K. C. Signal, R. Rajan, Renewable Energy Sources and Emerging technology, PHI Learning pvt. Ltd.
5. G.D. Roy, Non Conventional Energy Source, Khanna Publisher
6. J. Twidel, T Weir, Renewable Energy Sources, Taylor and Francis

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Computer Programming

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall
6. Cay Horstmann, Big JAVA, Wiely India.

List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA

6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONTRUCTOR
10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester (Mathematics-III)

(Applicable to ME/AU/CM/FT/IP/Mining Branches)

COURSE OBJECTIVE- The objective of this course is to fulfill the needs of Engineers to understand the Applications of Fourier Series, Different Transforms, Complex Analysis & numerical methods in order to enable young technocrats to acquire Mathematical thinking of Formulating, Analyzing and Solving a wide range of Practical Problems Appearing in Science & Engineering.

Course Contents

Fourier Series: Fourier Series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, Half-range Fourier series, Complex form of Fourier Series,

Integral Transforms:

Fourier Transform-Complex Fourier Transform, Fourier Sine and Cosine Transforms, Applications of Fourier Transform in Solving the Ordinary Differential Equation. **Laplace Transform-** Introduction of Laplace Transform, Laplace Transform of elementary Functions, Properties of Laplace Transform, Change of Scale Property, First and Second Shifting Properties, Laplace Transform of Derivatives and Integrals. Inverse Laplace Transform & its Properties, Convolution theorem, Applications of Laplace Transform in solving the Ordinary Differential Equations.

Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integrals.

Numerical Solution of Ordinary Differential equations: Picard's Method, Taylor's Series, Euler's Method, Modified Euler's Method, Runge-Kutta methods, Milne's and Adam's Bashforth Methods.

COURSE OUTCOMES- The curriculum of the Department is designed to satisfy the diverse needs of students. Coursework is designed to provide students the opportunity to learn key concepts of Fourier Series, Different Transforms, Complex Analysis & Numerical Methods for Solving Ordinary Differential Equations of First Order.

EVALUATION- Evaluation will be continuous, an integral part of the class as well as through external assessment.

References:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. H C Taneja: Advanced Engineering Mathematics, I.K. International Publishing House Pvt. Ltd.
3. B.S. Grewal: Higher Engineering Mathematics , Khanna Publication.
4. S S Sastri: Engineering Mathematics, PHI
5. Ramana: Advance Engg. Mathematics, TMH New Delhi
6. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Chemical Engineering, IV-Semester

Systems Engineering

COURSE OBJECTIVE

This course in systems engineering examines the principles and process of creating effective systems to meet application demands. The course is organized as a progression through the systems engineering processes of analysis, design, implementation, and deployment with consideration of verification and validation throughout.

COURSE CONTENT

What is System Engineering, Origin, Examples of Systems requiring systems engineering,Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, SystemEngineering Approaches.

Structure of Complex Systems, System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.

Concept Development and Exploration, Originating a New System, Operations Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.

Engineering Development, Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction.

Integration and Evaluation, Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.

COURSE OUTCOME

After successful completion of the course, students would be able to Plan and manage the systems engineering process and examine systems from many perspectives (such as software, hardware, product, etc.) Students can distinguish critical functions, diagnose problems, and apply descoping strategies and judge the complexity of production and deployment issues.

EVALUATION

Evaluation will be a continuous and integral process comprising classroom and external assessment.

REFERENCES:

1. Alexander Kossiakoff, William N Sweet, “System Engineering Principles and Practice, Wiley India
2. Blanchard Fabrycky, Systems engineering and analysis, Pearson
3. Dennis M. Buede, William D.Miller, “The Engineering Design of Systems: Models & Methods” Wiley India
4. JeffreyL Whitten, Lonnie D Bentley, “System Analysis and Design Methods”
5. Richard Stevens, Peter Brook,” System Engineering – Coping with complexity, Prentice Hall