Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT301	**Mathematics-III**	**3L-1T-0P**	**4 Credits**

OBJECTIVES: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering.
- To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Chemical Engineering, III-Semester

CM302 Chemical Engineering Thermodynamics

COURSE OBJECTIVE

The objective of this course to understand the theory and applications of classical thermodynamics, thermodynamic properties, equations of state, methods used to describe, compression and expansion of fluids.

COURSE CONTENT

Basic concepts of work & heat system, properties and state of systems; first law of thermodynamics; application, batch flow processes; steady & unsteady state flow.

Critical properties corresponding state compressibility, PVT behavior of pure fluids viral equation, cubic equation, generalized correlation & eccentric factor, behavior of liquid, second law of T.D, & its application.
Adiabatic reactions, Equilibrium in homogeneous and heterogeneous reactions.

Carnot cycle, Carnot theorem, thermodynamics temperature scales, concept of entropy, calculation of entropy for various systems, entropy for real system.

Effect of pressure on specific heat, Joule Thompson effect, third law of thermodynamics & its applications.

Compression & expansion of fluids; single stage, multiple stage requirements & efficiency along with effect & engineering along with effects clearance, compression of real gas.

COURSE OUTCOMES

1. Ability to understand basic concepts of thermodynamics and first law
2. Ability to estimate PVT behaviors and critical properties of fluids.
3. To provide knowledge & application of second law of thermodynamics.
4. To provide knowledge & application of third law of thermodynamics.
5. To analyze effect of pressure on specific heat, compression & expansion of fluids.

EVALUATION

Evaluation will be based on continuous an integral part of the class as well through external assessment.

REFERENCES

1. Smith J.M and Van Ness-Introduction to Chemical Engg Thermodynamics –6th edition
2. Daubert; Chemical Engg thermodynamic; TMH
3. Rathakrishnan E; Fundamentals of Engg Thermodynamics; PHI
4. Dodge B.F. Chemical Engineering –Thermodynamics –McGraw Hill
5. Balzhiser, Samuels and Eliassen-Chemical Engg- Thermodynamics Prentice Hall
6. Sandler S.I Chemical Engg-Thermodynamics-John Wiley and son
7. Rastogi and Mishra-Chemical Engg Thermodynamics

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New Scheme Based On AICTE Flexible Curricula

Chemical Engineering, III-Semester

CM303 Advance Engineering Chemistry

Ceramics: Definition & Classification of ceramic materials based on composition, properties & applications, Electro-ceramics, magnetic ceramics, Fine ceramics & Glass-ceramics Natural ceramic minerals & materials such as Clay family, Quartz/Quartzite, Feldspar, Bauxite family, Dolomite, Magnesite.

Refractory: Introduction: raw materials, Fabrication and firing, General manufacturing techniques, Properties and applications of following refractories: Acid (Silica) Refractories, Basic Refractories, Burnt refractories ,Sintered, fused refractories,and Insulating Refractories, Castables.

Glass: Definition of glass: Thermodynamic study for glass formation, Glass transitions Conditions of vitrification; Glass processing**:** selection of raw materials, effects of different oxides on glass properties, batch preparation, melting in glass tank furnace, refining of glass, Forming process: Blowing, molding , shaping etc

Oils and Fats: Vegetable oils by solvent extraction, processing of animal fats, hydrogenation and esterification of oils; Soaps and Detergents Bathing & laundry soaps, cationic and anionic detergents;, surface active agents.

Chemical Kinetics: Rate constant, order and molecularity of a reaction, zero, 1st, 2nd and 3rdorder reactions; , methods of determination of order of reactions; chemical equilibria
Reaction rate theories, Arrhenius, parameters, Catalysis (including enzyme catalysis), effect of catalysis on reaction rate.

COURSE OUTCOMES

1. Ability to familiarize with ceramics and its processing.
2. Ability to understand concept of general manufacturing techniques of refractory.
3. Ability to understand concept of processing of glass and its casting.
4. Ability to understand the processing of oils and fats.
5. Ability to understand the reaction rate mechanism.

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. B.S.Bahl & G. D. Tuli- Essentials of physical Chemistry. S. Chand & Publishers.
2. Glasstone – Textbook on Physical Chemistry – Prentice Hall, India, New Delhi.
3. Dryden CE- Outlines of Chemical Technology- Prentice Hall, India, New Delhi
4. Levine; Physical Cheistry; TMH.
5. Sivasamkar; Engg Chemistry; TMH

6. Jain & Jain- Engineering Chemisry – Dhanpat Rai Publishing Company, Delhi.
7. Austin G.T, Shreeves; Chemical Process Industry – McGraw Hill – Kogmina
8 Gupta OP; Fuel and Combustion; Khana Pub

List of Experiments

1. To determine the viscosity of a viscous liquid by falling sphere method
2. Determination of saponification value of oil sample
3. Application of pH meter to find acidity and alkalinity of a solution.
4. To study the hydrolysis of cane sugar solution in the presence of an acid by Fehling's solution method and to find out the reaction constant.
5. To determine the % composition of a given binary liquid solution by polarimeter.
6. To determine the solubility of a sparingly soluble salt in water by conductance measurement.
7. Preparation of laundry soap and to determine its yield
8. Investigation of Appropriate Refractory Material for Laboratory
9. Manufacturing of glass and ceramics in laboratory scale.

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Chemical Engineering, III-Semester

CM304 Material & Energy Balance

COURSE OBJECTIVE The objective of this course to understand and apply the basics of calculations related to material and energy flow in the processes. In addition to make practical approach to solve industrial related material energy balance problems.

COURSE CONTENT

Mathematical and Engineering calculation- Units, different unit systems, conversion of unit from one system to other, dimensions, dimensional analysis, dimensional group, fundamental of mole concept, composition of solid, liquid and gases, Basic Stoichiometric calculation.

Ideal Gases & Vapor pressure- Introduction of ideal gas, behavior of ideal gases, real gas, Vander Waal equation, compressibility factor method to solve cubic equation , vapour pressure , Raoult's Law, Humidity, relative humidity, humid heat, humid volume ,dew point ,humidity chart and its use.

Material balance without chemical reaction - Fundamental of conservation of mass, Introduction of component balance, solving material balance without simultaneous equation for different unit operations, solving material balance at steady state and unsteady state, recycle, by pass and purge calculations. Aid of computer in solving material balance problems.

Material balance with chemical reaction- Introduction of component balance, solving material balance with chemical reactions, recycles, by pass and purge calculation with chemical reactions, combustion calculations.

Energy balance – Laws of thermo chemistry Heat capacity, calculation of enthalpy changes, calculation of standard heat of reaction, heats of formation, combustion, solution, mixing etc., effect of pressure and temperature on heat of reaction, energy balance with chemical reaction.

Topics for the Laboratory

1. Determination of boiling point relation with respect to concentration of caustic soda and verify Dehring' rule.
2. Application of dry and wet bulb thermometer to find out atmospheric humidity.
3. Use of humidity chart to find enthalpy dew point humid heat and saturation.
4. Solubility at room temperature and boiling point of urea in water and verify the material balance.
5. Crystallization of copper sulfate in saturated solution by cooling and finding out the crystal yield.
6. To find out the heating value of coal using a calorimeter
7. Combustion of coal & performing the material balance
8. Proximate analysis of coal sample
9. Measurement of flame temp and compare actual & theoretical temp (Bunsen-Burner, Sprit Lamp, Kerosene Lamp.)
10. To find the heat of reaction using calcium oxide and water.

COURSE OUTCOMES

1. Ability to familiarize with different unit systems and dimensional analysis.
2. Ability to understand concept of ideal gas, real gas, vapor pressure and humidity.
3. Ability to solve material balance problems involving recycle, bypass and purge, without chemical reaction.
4. Ability to solve material balance problems involving recycle, bypass and purge, with chemical reaction.
5. Ability to calculate energy balance using enthalpy changes and solve energy balance involving chemical reactions

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. O.A. Hougen, K.M. Watson, R.A. Ragatz; Chemical Process Principles Part I –CBS pub.
2. David M. Himmelblau-Basic Principles and calculations in chemical Engineering –PHI
3. B. I. Bhatt, S.M. Vora; Stoichiometry; TMH.

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Chemical Engineering, III-Semester

CM305 Chemical Instrumentation

COURSE OBJECTIVE

To gain the knowledge of different process instruments, which used in different chemical industries such as refineries, cement, polymer, insecticides, pesticides, fertilizers etc.

Unit I

Introduction: Chemical process instrumentation, Choice of Instruments for a Specific Application Process variables, static and dynamic characteristics of instruments & their general classification , Elements of Measuring systems & their functions, True value ,Measured Value, Errors, Classification Of Errors and Methods of Reducing errors.

Unit II

Temperature of Humidity Measurement: Principle, construction and operation of instruments for the measurement of Temperature: Liquid filled thermometers, Vapour Pressure Thermometers, Thermometers based on solid expansion like bimetallic type, Thermocouples, Resistance thermometers, Radiation Pyrometers, Optical Pyrometers, Photo electric Pyrometers. Principle, construction and operation of instruments for the measurement of Humidity and moisture

Unit III

Pressure Measurement: Principle, construction and operation of instruments for the measurement of pressure and Vacuum: Mechanical Pressure sensors e.g. Bourdon Tube, Diaphragm Pressure Elements, Bellows, Electrical Pressure Measuring Devices e.g. capacitance Manometer, Strain Gauge Pressure Transducers, Piezo Resistive Pressure Transducers, Resistive Pressure Transducers, LVDT Pressure Transducer. Measurement Of vacuum e.g Mcleod Gauge , Pirani gauge, Ionization gauge.

Unit IV

Flow Measurement: Principle, construction and operation of instruments for the measurement of Flow e.g. Variable Head flow meters, Variable Area flow meters, Hot Wire Anemometer, Principle, construction and operation of instruments for the measurement of Level e.g. Float and Displacer type Devices, Hydrostatic Methods, Capacitance type Devices , Radiation type Devices. Principle, construction and operation of instruments for the measurement of Density and Viscosity.

Unit V

Composition Measurement: Principle, construction and operation of instruments for the measurement of Composition e.g. Thermal conductivity analyzers, Paramagnetic Analyzers, Spectroscopic Methods, Gas Chromatograph, Process instrumentation diagrams and symbols, process instrumentation for process equipments such as Distillation column Absorption column, Heat Exchanger, Reactors, Evaporators, fluid storage vessels

COURSE OUTCOMES

1. Ability to familiarize basic concepts of chemical process instrumentation.
2. Ability to understand principle construction and operation of instrument for measurement.
3. Ability to understand control/recording of process variable like pressure flow level, humidity and composition.
4. Ability to familiarize principles of electromagnetic pneumatic, electrical and multipressure transducers.
5. Ability to design instrumentation diagrams for process equipment such as distillation column, heat exchanger and fluid storage vessel

Topics for the Laboratory

1. Time constant of pH-meter
2. Study of Bourdon tube pressure gauge
3. Study of Bellow tube pressure gauge
4. Calibration of different instruments used in chemical processes
5. Study of electro-pneumatic transducers for pressure, flow, level
6. Measurement of water level using differential pressure meter
7. Measurement of flow using electromagnetic flow meter
8. Measurement of flow using differential pressure cell across orifice/ venturimeter.

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. Albert D. Cooper-Modern Electronic Instrumentation, PHI
2. Eckman-Industrial Instrumentation
3. H.S. Kalsi-Electronic Instrumentation
4. Curties Johnson-Process Control Instrumentation Technique, IV Edn, PHI
5. Harriot; Process control; TMH
6. Patranabis; Principles of process control; TMH
7. Jaggi, Mathur; Engineering Mathematics; Khanna Publisher.
8. B.G. Liptak-Instrument Engineering 'Handbook, Volume 1: Process Measurement
9. Austin E. Fribance-Industrial Instrumentation Fundamentals, New York: Mcgraw-Hill 1962
10. Ernest Doebelin-Measurement Systems: Application and Design, McGraw-Hill

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Chemical Engineering, III-Semester

CM306 Computer Programming-I (JAVA)

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.