

BEA- 401 Energy Ecology Environment & Society

UNIT-I

Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

UNIT-II

Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

UNIT-III

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

UNIT-IV

Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT-V

Society, Ethics & Human values– Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI

CMA- 402 Fluid Particle Mechanics

UNIT-1

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.

UNIT-II

Size Reduction: Principles of comminution, size reduction; crushing, grinding, pulverizing and ultra fining size reduction equipments, introduction to nano particles, power requirement in comminution.

UNIT-III

Mixing and Separation: Mixing of solids, mixing equipment's, design & power requirement of mixers, mixer effectiveness and mixing index. Principles of separation techniques for system involving solids, liquids & gases, classification, sedimentation and filtration, separation equipments, colloidal particles, flocculation and stabilization .

UNIT-IV

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.

UNIT-V

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.

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. Banchofer 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

List of Experiments:

- 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.

CMA- 403 Fluid Mechanics

UNIT-I

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 dimensionless numbers.

UNIT-II

Kinematics of Flow: Fluid flow phenomena, types of flow-ideal & real, steady & unsteady, uniform & nonuniform, one, two and three dimensional flow, path lines, streak lines, stream lines, stream tubes, 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.

UNIT-III

Dynamics of Flow: Euler's equation of motion along with 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 momentum equation, forces on fixed and moving vanes and other applications.

UNIT-IV

Fluid Measurements and Machines: velocity measurement (Pitot tube, Prandtl tube, current meters etc.) flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturi-meter, weirs and notches). Pumps, compressor, power & head requirement for pumps, piping system (K Factor), valves and joints.

UNIT-V

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.

References:

1. McCabe Smith; Unit Operation for Chemical Engg. TMH
2. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
3. Som and Biswas; Fluid Mechanics and machinery; TMH
4. Cengel; 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 Hydraulic Machine.
11. Bansal R.K.; Fluid Mechanics and Hydraulic Machine

List of Experiments:

- 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 C_c , C_v , C_d 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.

CMA- 404 Fuel Technology

UNIT-I

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, byproduct recovery from coke oven, properties of coke coal, grinding, pulverization, briquetting of solid fuels.

UNIT-II

Liquid Fuels: Origin of petroleum production, distillation, thermal & catalytic cracking, coking, reforming, isomerizations, crude oil classification, reserves of hydrocarbon in India, introduction to petroleum refining and processing.

UNIT-III

Petroleum Products Properties and Its Utilization : Petroleum product and their utilization, diesel, petrol, blending of petrol for octane number boosting, 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.

UNIT-IV

Gaseous fuels: Natural gas, synthesis gas, producer gas, water gas, coal gas, LPG, CNG and hydrogen as a fuel, composition properties and uses.

UNIT-V

Renewable Energy Sources and Fuel cell: Types of solar cell and fabrication, wind energy, principles of tidal energy. Principle and working of fuel cell, various types, construction and its application.

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

List of Experiments:

- 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's apparatus.
- 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.

CMA- 405 Inorganic Process Technology

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Inorganic chemicals, Bromine, Iodine and Fluorine, soaps and detergents, glass, ceramic and inorganic pigments.

References:

1. Austine G.T. and Shreeves; Chemicals 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.

List of Experiments:

1. To determine the process flow diagram of salts and sodium compounds, soda ash, caustic soda.
2. To determine the process flow diagram of hydrochloric acid, sulphur and sulphuric acid, phosphoric acid and phosphate.
3. To determine the process flow diagram of nitrogenous industries, ammonia and nitric acid, nitrogenous fertilizer.
4. To determine the process flow diagram of cement industries and industrial gases.
5. To determine the process flow diagram of bromine, iodine, Fluorine, soaps and detergents, glass, ceramic and inorganic pigments.

CMA- 406 Computer Programming –II (Computer Aided Process Calculations)

1. Introduction to Microsoft Excel.
2. Basic Operations
3. Using function
4. Unit conversions of chemical process.
5. Material Balance solution using Excel.
6. Energy Balance Solution Using Excel.

CMA- 407 Industrial Training –I

The following objective should be fulfilled in industrial training –I, and student must participate in any Chemical, Petrochemical, Pharmaceutical, Oil and Gas industry where they can learn to apply the Technical knowledge in real Industrial situations.

- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations.