I B.Tech. syllabus

II semester (3 credit theory + 1 credit practical = 4 credit course)

CHIR 12

Objectives

To introduce the students to the fundamentals of chemical thermodynamics, chemical kinetics, electrochemistry, corrosion and solid state chemistry. To provide them a brief idea on the requirements of fuels and lubricants.

Chemical Thermodynamics

Second Law of Thermodynamics - Entropy change accompanying various processes (isothermal expansion, phase transition, heating, entropy of mixing of perfect gases); Absolute entropy and the Third Law of Thermodynamics; Spontaneity of a chemical reaction and Gibbs energy; Standard Gibbs energies of formation and reactions; Equilibrium constant through chemical potential (gas equilibria), relation between Kp & Kc.

Kinetics and Catalysis


Electrochemistry and Corrosion

Cell EMF, its measurement and applications - concentration cell - electrode (hydrogen gas electrode) and electrolyte concentration cell - concentration cell with and without transference - fuel cells - hydrox fuel cell.

Dry corrosion and wet corrosion, mechanisms, types of corrosion, Differential metal corrosion, differential aeration corrosion, inter granular, Passivity, Pitting, Polarization, over potential and its significance, Pourbix diagrams, Potentiodynamic Polarization.

Solid State Chemistry

Brief introduction to solid state chemistry, Preparative methods: Solid state reaction, chemical precursor method, co-Precipitation, sol-gel, metathesis, self-propagating high temperature synthesis, ion exchange reactions, intercalation / deintercalation reactions; hydrothermal and template synthesis; High pressure synthesis.

Fuels and Lubricants

Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion,
proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.

Outcome

Students will learn the basic principles of chemical thermodynamics, chemical kinetics, electrochemistry, corrosion and solid state chemistry. They will familiarize with the theory and applications of fuels and lubricants.

Reference Books

1. P. W. Atkins and J. de Paula, Physical chemistry by Oxford University Press

Practicals (Laboratory Experiments):

1. Corrosion rate by polarization technique
2. Conductometric titration
3. Potentiometric titration
4. pH metric titration
5. Determination of molecular weight of polymer by viscometry
6. Demonstration of sophisticated instruments and assignments on them

Outcome

They will have in hand experience of different titration methods, use of viscometer to get the mol. weight of polymer. In addition, they will get to know about the sophisticated instruments that are present in the department.

Reference Books

1. Laboratory Manual, Department of Chemistry, NITT