UNIT- 1 **[12 Hours]**

Rates of Chemical Reactions: Feasibility of reaction, why kinetic studies, mechanism of reactions, practical measurements, rate expression. Experimental methods: Introduction, open and closed system, methods for following the progress of the reaction (physical, optical, chromatography, electrochemical, chromatography, NMR, ESR), Analysis of results. Choice of an equation to represent the results. 8hrs Application of Chemical kinetics in the elucidation of mechanisms of some Inorganic organic reactions- co ordinate complexes, ketonisation of acids in oxide catalysis. Non-kinetic methods of determining mechanisms.

UNIT II **[12Hours]**

Reaction at electrode surface: Introduction, electrode double layer at Interface, different aspects of electrochemical reactions, general approach to th elucidation of the electrode reaction, effect of adsorption of ions on the electrode surface on the rate of electrode reaction. Study of some inorganic and organic composite reactions (decomposition of Phosgene, Nitogen pentoxide, ,

Ozone, Ethane, acetaldehyde and hydrogen-oxygen reaction) 8hrs Potential energy surfaces, evaluation of activation energy. Futures of PE surfaces-attractive and Repulsive surfaces for Exothrmic reactions, Surfaces of intermediates type reactions, selective
enhancement of reaction. 4hrs

UNIT III: **[12 hours]**

Radioactivity and Nuclear Decay –Nuclear stability-Liquid drop, shell and collective modelsDecay modes of natural and artificial nuclides- Determination of half life, growth kinetics. Conditions of equilibrium. Theories of $\propto$, $\beta$and γ emissions. 4 hrs.

Radiation Detection and Measurement: Experimental techniques in the assay of radioactiveisotopes. Radiation Detectors-ionisation chambers, proportional and Geiger-Muller, scintillation and semiconductor radiation detectors (NaI-Tl and Ge(Li), HPGe solid state detectors). Liquid scintillators and multichannel analysers. 4 hrs.

Nuclear Reactions, Energy and Nuclear Power reactors - Nuclear fission and fusion. Typesof nuclear power reactors, basic features and components of a nuclear power reactor. An introduction to breeder reactors 4hrs

References:

1. Chemical Kinetics, K. J. Laidler, Pearson Education, AnandSons(India) 3rd ed., 2008.
2. Fundamentals of Chemical Kinetics, M. R.Wright, Harwood Publishing, Chichesrer, 1999.
3. Kinetics & Mechanisms of Chemical Transformations, J Rajaram& J C Kuriacose,
4. Nuclear and Radiation Chemistry –Friedlander, Kennedy Macias & Miller (Wiley) 1981.
5. Essentials of Nuclear Chemistry- H. J. Arnikar (Wiley Eastern) 1987.

ACP 557: INORGANIC**CHEMISTRY PRACTICALS –IV**

COURSE OUTCOME:

- The students will have practical experience in the determination of COD, DO,
- Students can study the presence of Nitrate, K in soil, Organic carbon, Sulphur and Phosphorus in Soil, Alkalinity of water samples,
- Fluoride in drinking water, Phosphoric acid in soft drinks, phosphates in detergents,
- Able to carry out Analysis of Heavy metals,

1. Determination of COD of a water sample,
2. Determination of dissolved oxygen (DO) by Winkler's method
3. Determination of nitrate & nitrite in water samples and sea water.
4. Analysis of heavy metals in waste water, sea water (Pb, Hg etc. By spectrophotometry)
5. Determination of available K in soil,
6. Determination of organic carbon in soil samples
7. Nephelometric determination of sulphate / phosphate.
8. Determination of alkalinity of water samples
9. Determination of fluoride in drinking water by spectrophotometry & ion selective electrode
10. Determination of phosphoric acid content in soft drinks
11. Spectrophotometric determination of sulphur and phosphorus present in soil.
12. Determination of phosphates in detergents
13. Any other experiment of interest.

REFERENCES:

1. A..I. Vogel : A Text book of Quantitative Inorganic Analysis, (ELBS), 1978.
2. APHA, AWWA and WPCF: Standard Method for the Examination of water and Waste Water (Washington DC),1989,
3. I. M. Kolthof and E.P. Sandell: Quantitative Chemical Analysis.McMillan,1980
4. I.Williams, Environmental Chemistry, Wiley, 2001
5. Lobinski and Marczenko, Comprehensive Analytical Chemistry, Vol.30, Elsevier,1996.

AC P 558: PHYSICAL CHEMISTRY PRACTICALS IV

COURSE OUTCOME:

- Includes large number of experiments which illustrate the principles of electrochemistry.
- The paper also includes few experiments from polymer chemistry topics. In addition to the above
- Able to study polymer preparation, kinetic & thermal studies.
- They learn Potentiometric titrations.

Electrochemistry :(**Any EIGHT experiments are to be carried out**).

1. (a) Determination of transport number of Cd^{2+} and SO_4^{2-} ions by EMF method.
2. Electroplating of (i)Nickel, (ii)Chromium,(iii) Aluminum and iv)copper on a copper plate.
3. Verification of Tafel equation of hydrogen evolution reaction.
4. . Study of rate of corrosion and inhibition efficiency of an inhibitor on mild steel/Al/Cu by weight loss method i) at different time intervals and ii) at different temperatures(to evaluate thermodynamic parameters)
1. (a) Identification of deposites by chemical spot tests.
   Determination of electrochemical equivalent of copper.
2. (a) Identification of metal ions in a mixture polarographically.
   Qualitative determination of electroreducible substances of (i)lead ion with dichromate & (ii)ferric ion with titanous ion and (c) Verification of Ilkovic equation.
6. Determination of (i) stability constant of a metal complex (lead oxalate or copper glycinate) and (ii) concentration of metal ions polarographically.
7. Kinetics of corrosion of mild steel and accelerated corrosion resistance tests.
8. Electrolytic preparation- peroxydisulphate, chlorate and perchlorate, calcium gluconate &tetrachloroquinine.