

Course Code	Course Title	Credit Hours
ENE-813	Physico-Chemical Processes in Environmental Engineering	3 (3+0)

Course Description

This course is designed for engineers, considering the needs of the industries to comply with more stringent laws to control solid, wastewater and air pollution. This course introduces the principles and physicochemical methods to control wastewater, solid and air pollution. The course will be presented with numerical problems and case studies so that the students may adequately understand the subject and apply the knowledge after their graduation in industry.

Course Outline

Water treatment: Objectives, water related diseases, sources and characteristics.

Water treatment plant: Types, components, sources and design basis.

Reaction kinetics: Types of chemical reactions. Rate of reactions, reactor design, mass transfer models of CSTR and plug flow reactors.

Coagulation: Principal, types of coagulants, stability of colloidal matter, mechanisms for coagulation, chemistry, kinetics and design of coagulation systems.

Flocculation: Types, chemistry kinetics and design of flocculation systems.

Sedimentation: Types and sedimentation basins, design of sedimentation basins, and Floatation systems.

Filtration: Theory, types, slow sand filtration, rapid sand filtration, deionized exchange, mechanisms of water filtration, transport and attachment step, designing of water filtration systems, pilot plants.

Disinfection: Types and design.

Adsorption: Types, principals and application in the industry, kinetics of adsorption and adsorption isotherms.

Ion exchange and demineralization: Process, mechanisms, types, design of softening and demineralization systems.

Membrane processes: Dialysis, reverse osmosis.

Gas transfer: Theory and application.

Diffuse aeration systems

Taste and odour: Sources and control.

Corrosion: Sources and control, organic and inorganic removal.

Water treatment facility design

Recommended Books

1. Tom, D., Raynolts, Richard, P.A. 1996. Unit Operations and Processes in Environmental Engineering. PWS Publishing Company.
2. Mwh. 2012. Physico-chemical Processes in Environmental Engineering. John Wiley & Sons, USA.
3. Kawamura, S. 1990. Integrated Design of Water Treatment Facilities. Wiley Inter-science, NY.
4. Metcalf and Eddy. 2004. Wastewater Engineering by McGraw Hill.
5. Kawamura, S. 1990. Integrated design of water treatment facilities Willy Inter Science, NY.
6. Weber Jr., W.J. 1992. Physico-chemical processes for water quality control. Jhon Willy and Sons.