

ES 6xx: Water Quality Engineering

Fundamental theory and application of the physical and chemical processes in water and wastewater treatment:

Introduction to water quality parameters, standards, Fundamentals, optimization and design of the following processes for water treatment: Coagulation, Flocculation: Destabilization mechanism, pC-pH (coagulation) diagram, Flocculation kinetics, Sedimentation: Design equations for settling basins, Water Conditioning, Softening: Chemical Reactions for softening, Softening process design, Disinfection: Breakpoint chlorination, CT concept and inactivation kinetics, Reactor design: CSTR, batch, plug flow reactor equations, tracer tests

Ozone contactor design: Transport model for contactor design, Air stripping: Design and apply equation for air stripping process, Membrane Processes: Membrane materials, module types, High Pressure Membrane Process: Nanofiltration, Reverse Osmosis - models and their application, Low Pressure Membrane Process: Microfiltration, Ultrafiltration - models and their application, Activated Carbon Adsorption Process: Adsorption isotherms, required carbon dose, Ion exchange: Types of ion exchange resin, ion exchange design equation, Design Project: Design a water purification system for a sea-side town with the results of field tests of several water supplies in the town given.

Texts/References:

- AWWA (1999) *Water Quality and Treatment 5th Edition*
- Clark, M. M., *Transport Modeling for Environmental Engineers and Scientists*, John Wiley and Sons, Inc., 1996.
- American Water Works Association, *Water Treatment Plant Design*, McGraw-Hill, Inc, 3rd ed., 1998.
- Reynolds, T. D. and Richard, P. A. *Unit Operations and Processes in Environmental Engineering*, PWS Publishing Company, 2nd ed., 1996.
- Weber, W. J., *Physicochemical Processes for Water Quality Control*, John Wiley and Sons, Inc., 1972.
- Weber, W. J., *Environmental Systems and Processes: Principles, Modeling, and Design*, John Wiley and Sons, Inc., 2001.