

## ENVIRONMENTAL QUALITY AND PROCESSES THEORY

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This is an introductory course for undergraduate students. This course provides an overview of the different facets of Environmental Engineering, particularly the underlying concepts and the intended applications to prepare a graduating engineer with the skills needed to effectively intervene in the safeguarding of the environment, in whatever role they ultimately play in the society. Pollutant mobility, toxicity, and amenability to treatment in the environment depend on the physical and chemical reactions the pollutant undergoes in the environmental systems. This course introduces fundamental principles and processes that govern the fate and transport of these chemicals in pristine and polluted soil, air, surface, and groundwater environments. The course examines the equilibrium and kinetics of chemical reactions relevant to environmental systems. For each reaction, the fundamental molecular interactions affecting the process are first examined. The quantitative application of the reaction to environmental behaviour is then presented.

Topics covered include acids and bases, mineral solubility, carbonate chemistry, chemical speciation, reduction-oxidation (redox) reactions, adsorption and ion exchange, and the speciation, mobility, and toxicity of metals and organic compounds. Furthermore, the theory and application of the physical and chemical processes of coagulation, flocculation, sedimentation, softening, filtration, and disinfection in water and wastewater treatment is presented. Principles that can be used in the analysis and modeling of environmental engineering processes, including material and energy balances, mass transfer, and reaction engineering are elucidated