ENVE 3004 Contaminant and Pollutant Transport in the Environment

Physical phenomena governing the transport of contaminants in the environment: diffusion, advection, dispersion, sorption, interphase transfer. Derivation and application of transport equations in air, surface and groundwater pollution; analytical and numerical solutions. Equilibrium partitioning of contaminants among air, water, sediment, and biota.

Course Outline for Winter 2024

Evaluation

Assignments: 30%
Midterm: 20%
Final: 50%

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Expected lecture and coursework schedule

Week	Topic	Coursework
January 8th	Introduction Media 1: Water – Review of pipe flow, flow in lakes, rivers, oceans. Unique aspects of contaminant transport (e.g. partitioning to sediments, thermal stratification)	
January 15th	Physical processes of contaminant transport: Advection / dispersion / diffusion	
January 22nd	The Big Equation: Derivation of the Advection - Dispersion equation. Some analytical	Assignment 1: Transport of contaminant in a river

	solutions (eg. Ogata-Banks)	
January 29th	Mass removal mechanisms	
February 5	Your very own finite difference model for water transport	Assignment 2: Simulation of a conservative contaminant and sediment transport in a river-lake system
February 12th	Your very own finite difference model for solution of the advection-dispersion equation Midterm Review	
Break	Break	
February 26th	**Midterm on the Tuesday** Transport in the atmosphere (air)	**Midterm on the Tuesday**
March 4th	Stack emission modelling for urban environment	Assignment 3: Stack design problem
March 11th	Groundwater transport: differences in application of transport equations from other media	
March 18th	Groundwater transport: Analysis of plumes from old landfills	Assignment 4: Groundwater plume analysis and prediction

March 25th	Contaminant fate, toxicity, and ecological / impacts	
April 1st	Review	