ENVE 5204 Resource Industry Waste Management

Course Outline for Winter 2022

Recommended Background

Students should have taken a course with some element of flow in unsaturated or multiphase soils (there are a number of these courses offered at the institute).

Students should have taken courses on hydraulics and geotechnical engineering at the undergraduate level.

Evaluation

Assignments: 24%
Project: 16%

Final: 60%

Expected lecture and coursework schedule

Class date	Topic	Coursework
January 11th	Introduction, types of mine waste, Environmental problems arising from mine waste, Some important properties	
January 18st	Generation of tailings and waste rock: open pit and underground mining, mineral processing	
January 25th	Hydraulic transport of tailings as Newtonian and non-Newtonian flow, thickening of tailings	
February 1st	Elements of conventional slurry tailings deposition: upstream method,	Assignment 1: Hydraulic transport and design of a conventional tailings impoundment using consolidation

	water balance, consolidation, seepage, dam management; case studies of tailings dam failures	theory: Due February 15th
February 8th	Unsaturated soils in mine waste management	
February 15th	Geochemistry of mine waste – principles of acid generation, oxygen transport within mine waste	
March 1st	Closure: Soil Covers and Water covers	Assignment 2: Design of a closure plan for legacy tailings in North Western Ontario environment – Due March 22th
March 8th	Thickened, paste, and filtered tailings	
March 15th	Underground backfill: UCS strength, barricade design, Evolution of backfill properties over time	
March 22nd	Oil sand tailings: Conventional deposition Nature and special problems of fluid fine tailings Composite tailings technology (CT)	Project: Group presentation, plus 5 page Maximum short report from each student – Due April 3rd

March 29th	Oil sands tailings: New tailing technologies in Commercial and pilot scale demonstration (Centrifuged, thickened, AFD and TRO Mine waste, mine reclamation, and societal impacts	
April 5th		Project presentations

Wills, Barry. Mineral Processing Technology – E-book at Carleton Library

Vick, Steven. Planning, Design, and Analysis of Tailings Dams – Hardcopy in Carleton library

Some Potential Project Topics

Tailings dewatering technology

Collection and Treatment of Acid Rock Drainage

Carbon dioxide and other gas emissions from mine waste impoundments

Energy from mine waste

Subaqueous disposal in lakes and estuaries

Mineral extraction technology to minimize tailings generation

Re-vegetation and reclamation of legacy mine waste impoundments

Fundamental factors affecting oil sand tailings: residual bitumen, role of the extraction process