



**Course Name:**

Numerical Methods in Water Engineering

<b>Course Number:</b> 20-640	<b>Credit:</b> 3
<b>Program:</b> Graduate	<b>Course Type:</b> General Selective
<b>Prerequisite:</b> -	<b>Corequisite:</b> -

**Course Description (Objectives):**

The course aims to equip students with the knowledge and skills to apply numerical methods for solving complex water engineering problems. It focuses on modeling, partial differential equations, and various numerical techniques such as finite differences, finite elements, and boundary element methods for analyzing fluid flow and related phenomena.

**Course Content (outline):**

- Chapter 1: Modelling, Numerical model and protocol of numerical simulation
- Chapter 2: Characteristics for Partial differential Equations
- Chapter 3: Finite Difference Approximations
- Chapter 4: Diffusion Equation
- Chapter 5: Advection Equation
- Chapter 6: Advection-Dispersion Equation
- Chapter 7: Open Channel Flow
- Chapter 8: Variably Saturated Flow
- Chapter 9: Finite element approximations
- Chapter 10: Groundwater flow
- Chapter 11: Boundary element method
- Chapter 12: Shallow water wave

**References:**

- "Numerical Methods for Differential Equations," M.A. Celia & W.G. Gray, 1992.
- "Fundamentals of Numerical Reservoir Simulation," D.W. Peaceman, 1977.
- "Numerical Recipes," B.P. Flannery et al., W.H. Press, 1986.