



CE 443 – Groundwater Engineering

Code and Name: CE 443 – Groundwater Engineering

Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:

- *Water Resources Engineering by David Chin, 3rd Ed., Pearson, 2013*

Other References:

- *The Handbook of Groundwater Engineering by John H. Cushman and Daniel M. Tartakovsky; 2016*

- *Course handouts: distributed on a regular basis to provide more information on the topic*

Course Description:

Introduction to Surface Water Hydrology and Types of Aquifers. Introduction to Groundwater Hydrology and Types of Aquifers. Hydraulics of Porous Media, Introduction to Darcy Law, Flow Net and Mass Balance Equations. The Concept of Safe Yield, Storage. Estimation of Groundwater Recharge. Well Hydraulics and Design of Aquifer Pumping Tests. Introduction to Numerical Modelling of Groundwater Flow: Estimation of Flow Net and Seepage Analysis using Excel and AQUAFEM. Introduction to Groundwater Contamination and Saltwater Intrusion

Pre-requisites: CE340 *Water Resources Engineering*

Co-requisites: None

Course Learning Outcomes:

With relation to ABET Student Outcomes (From Fall 2019-SOs: 1-7)

- Determine the saltwater intrusions (4)
- Estimate the spread out of a sub-surface contaminant using analytical solutions; (4)
- The ability to identify the field experiments needed to estimate the aquifer transmissivity, storativity and safe yields; (1)
- Determine the impact of using number of wells on the drawdown at vicinity; (1)
- Determine the effective hydraulic conductivity of a heterogeneous material (2);
- Apply Darcy's law & calculate the seepage flow and draw flow-net (2)

Topics to be covered:

- Introduction to Surface Water Hydrology and Types of Aquifers.
- Introduction to Groundwater Hydrology and Types of Aquifers.
- Hydraulics of Porous Media, Introduction to Darcy Law, Flow Net and Mass Balance Equations. The Concept of Safe Yield, Storage.
- Estimation of Groundwater Recharge. Well Hydraulics and Design of Aquifer Pumping Tests.
- Introduction to Numerical Modelling of Groundwater Flow: Estimation of Flow Net and Seepage Analysis using Excel and AQUAFEM.
- Introduction to Groundwater Contamination and Saltwater Intrusion

Grading Policy:

The grading for the course are 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes for the remaining 20%.

