ENEN90030 Groundwater Hydrology

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 48 hours, comprising of 32 hours of lectures, 8 hours of tutorials and 8 hours of laboratory sessions. Total Time Commitment: 200 hours
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	Knowledge from the following subjects will assist with learning in this subject:

Subject	Study Period Commencement:	Credit Points:
ENEN90031 Quantitative Environmental Modelling	Semester 1	12.50
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50

Non Allowed Subjects:	Students cannot enrol in and gain credit for this subject and: 421-491 Quantification of Physical Processes B OR

Subject	Study Period Commencement:	Credit Points:
CVEN90014 Hydrological Processes 2	Not offered 2015	12.50

Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Dr Dongryeol Ryu
Contact:	Dr Dongryeol Ryu **dryu@unimelb.edu.au (mailto:dryu@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject covers theoretical and practical aspects of groundwater flow, and groundwater contaminant transport. The subject includes the field methods to characterise aquifers, the modelling of groundwater flow, and transport of, pollutants through porous media and reactions. The subject takes students fundamental knowledge of advanced differential calculus and flow

	processes and applies them to movement of pollutants in groundwater systems. Techniques learnt in this course may be applied in capstone design and research projects. Concepts and techniques learnt in the subject are directly applicable to contemporary industry issues such contaminant movement through soils from poor historical industrial practice, the design and performance prediction of containment structures such as sanitary landfills or carbon dioxide geo-sequestration projects. The growth of manipulation of geological strata for coal seam gas extraction is another burgeoning area of industrial application of the learning of this subject. **INDICATIVE CONTENT** Specific topics include: # Groundwater flow in saturated aquifer systems # Characterisation of acquifer systems using various hydraulic tests # Numerical solution of groundwater flow # Groundwater flow in the vadose zone # Characterisation of unconfined aquifer systems # Mass transport in saturated media # Transformation, retardation and attenuation of solutes # Organic/inorganic compounds in groundwater # Nonaqueous-phase liquids in groundwater # Introduction to site remediation.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this subject the student is expected to: 1 Design hydrogeological tests to obtain basic aquifer parameters 2 Compute groundwater flow and contaminant transport in porous media 3 Identify major sources and types of groundwater contamination 4 Recognize chemical reactions and biodegradation of groundwater contaminants 5 Quantitatively assess the fate of contaminants via modelling 6 Design basic site remediation.
Assessment:	Three reports totalling 2500-words, due throughout the semester requiring approximately 80 hours of work (64%). Addresses Intended Learning Outcomes (ILOs) 1, 2, 5 and 6. Three 20-minute quizzes, held throughout the semester (6%) (Addresses ILOs 1 to 5). One 2-hour examination, held end of semester (30%) (Addresses ILOs 1 to 6).
Prescribed Texts:	None
Recommended Texts:	Fetter C.W., 2000, *Applied Hydrogeology*, Prentice Hall. Fetter C.W., 2008, *Contaminant Hydrogeology*, Waveland Pr Inc. Freeze R. A. and Cherry J. A., 1979, *Groundwater*, Prentice Hall.
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	# Ability to apply knowledge of science and engineering fundamentals # Ability to undertake problem identification, formulation, and solution # Proficiency in engineering design # Ability to conduct an engineering project.
Notes:	**LEARNING AND TEACHING METHODS** Key analysis methods are introduced in lectures, which are then followed up in tutorial and computer based exercises. **INDICATIVE KEY LEARNING RESOURCES** MODFLOW Software Analysis Toolpak of MS Excel. Fetter C.W., 2001. *Applied hydrogeology*. Upper Saddle River, N. J: Pearson Education.

	Fetter C.W., 1999. *Contaminant hydrogeology*. Upper Saddle River, NJ:Prentice Hall. **CAREERS / INDUSTRY LINKS** This subject provides key skills for careers in contaminated site remediation and groundwater modelling. Data from real sites and industry standard software (MODFLOW) is used in the assignments.
Related Course(s):	Master of Environmental Engineering Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Civil) Master of Engineering (Environmental)