ENEN90031 Quantitative Environmental Modelling

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 48 hours, comprising of two hours of lectures and two hours of computer laboratories per week Total Time Commitment: 200 hours
Prerequisites:	Admission to the 206EC/BU Master of Environmental Engineering **OR** Students must have completed either the following subject: **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20029 Engineering Mathematics / Summer Term, Semester 1, Semester 2 / 12.50 Or BOTH OF: **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20030 Differential Equations / Semester 2 / 12.50 MAST20009 Vector Calculus / Semester 1, Semester 2 / 12.50
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
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
Contact:	Professor Andrew Western Email: **a.western@unimelb.edu.au (mailto:a.western@unimelb.edu.au)**
Subject Overview:	**AIMS** Environmental problems are highly complex and challenging to analyse and are often addressed through modelling. Being skilled at environmental modelling is a core professional requirement for an Environmental Engineer. This subject focuses on environmental modelling methodology including the steps of model conceptualisation, model construction, model evaluation and model application using a range of energy, water and waste models in Matlab. The subject complements ENEN90032 Environmental Analysis Tools and ENEN90028 Monitoring Environmental Impacts which provide other core environmental engineering skills. It provides modelling skills for a wide range of discipline based subjects such as ENEN90006 Solid Wastes, ENEN90034 Environmental Applied Hydrology and ENEN90027 Energy for Sustainable Development. The subject is of particular relevance to all Environmental Engineers

	but is also of relevance to a range of engineering and environmental analysis disciplines that require advanced modelling skills. **INDICATIVE CONTENT** The relationship between theoretical and empirical understanding and their use in model conceptualisation and construction will be explored. This subject introduces a range of environmental modelling techniques applicable to different environmental problems. In this subject students will conceptualise and construct, evaluate and utilise their own model to undertake a technical evaluation of a specified range of potential solutions to an environmental problem. Students will also develop professional judgement skills to critically evaluate models and model results. Specific topic areas: # System conceptualisation # Model construction and validation (computational accuracy) # Model evaluation # Calibration and optimisation # Model uncertainty assessment techniques # Issues of appropriate model complexity # Students will have an opportunity to review a modelling topic of their choice
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this subject the student is expected to: 1 Select an appropriate approach to quantitative modelling of problems, given existing knowledge and data 2 Develop a conceptual model designed to investigate and solve engineering problems 3 Apply, calibrate and evaluate a quantitative model of the problem using generic modelling software in a MATLAB programming environment 4 Apply models to investigate problems and synthesise recommendations based on the modelling 5 Write and present engineering reports of modelling studies
Assessment:	One individual 500 word Matlab assignment, due week 2 (10%) associated with Intended Learning Outcome (ILO) 3 Two individual 1500 word modelling reports, due week 6 and Week 12 (50%) associated with ILOs 3, 4 and 5. One 1500 word individual critical literature review, due week 10 (30%) associated with ILOs 1, 2 and 5 One 10-minute oral presentation during the semester (10%) associated with ILOs 1, 2 and 5
Prescribed Texts:	None
Recommended Texts:	Beven, K. 2009 Environmental Modelling: An Uncertain Future? Routledge
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 undertake problem identification, formulation, and solution # Ability to utilise a systems approach to complex problems and to design and operational performance # Capacity for lifelong learning and professional development
Notes:	**LEARNING AND TEACHING METHODS** The learning in this subject is a combination of problem based learning in computer workshops and through assignments and lectures that provide the theoretical background for each. In addition each student undertakes and presents a literature review on an environmental modelling topic of their choice. The modelling assignments allow for choice between water, energy and waste focussed problems. **INDICATIVE KEY LEARNING RESOURCES** The subject textbook is Beven, K. 2009 Environmental Modelling: An Uncertain Future? Routledge. In addition a range of journal papers, many of which are review papers, are provided.

	Students are also expected to search the journal and other literature available through the library. MatLab self-paced learning is available at **http://aaee-scholar.pbworks.com/Learn-MATLAB (http://aaee-scholar.pbworks.com/Learn-MATLAB)** **CAREERS / INDUSTRY LINKS** Presenter(s) from industry present a modelling case study. Students who are already working in industry can base their literature review topic on an aspect of modelling relevant to their workplace.
Related Course(s):	Master of Engineering Structures Master of Engineering Structures Master of Environmental Engineering Master of Environmental Engineering Master of Information Technology Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Energy Efficiency Modelling and Implementation Energy Efficiency Modelling and Implementation Energy Studies Energy Studies Integrated Water Catchment Management Integrated Water Catchment Management Master of Engineering (Environmental) Tailored Specialisation Tailored Specialisation Waste Management Waste Management