

Course Profile

THE UNIVERSITY OF
NEW SOUTH WALES

SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

CVEN 4501/9612

CATCHMENT AND WATER RESOURCES MODELLING



COURSE DETAILS

Units of Credit 6
Contact hours 2 x 3 day short courses

Class **Short Course 1:** July 31 (OMB230), August 1-2 (CE109)
 Short Course 2: October 9-11 (CE701)

Course Convenor Gregoire Mariethoz
 email: gregoire.mariethoz@unse.edu.au
 Room 312, Civil and Environmental Engineering, UNSW
 +61-2-9385 5474

Lecturers Ashish Sharma, email: a.sharma@unsw.edu.au
 Jeff Exbrayat, email: j.exbrayat@unsw.edu.au

INFORMATION ABOUT THE COURSE

An introduction to lumped and distributed catchment runoff models; an introduction on the rationale used for model verification and validation, model development and parameter estimation; Bayesian methods for estimating model parameters; reservoir and channel routing; reservoir operation and design; wetland design and conceptual processes; introduction to hydrologic time series characterization and stochastic modeling in the context of water resources management.

HANDBOOK DESCRIPTION

Refer to Online Handbook available at:

<http://www.handbook.unsw.edu.au/undergraduate/courses/2013/CVEN4501.html>
<http://www.handbook.unsw.edu.au/postgraduate/courses/2013/CVEN9612.html>

OBJECTIVES

Objective of the course is to impart advanced knowledge in Water Engineering with a focus on Hydrology and Water Resources Engineering methodologies. The course consists of two halves, both being taught as short courses. The first part focuses on catchment surface models, and the second part focuses on water resources management.

TEACHING STRATEGIES

The teaching strategies that will be used include:

- **Lectures** that will focus on the development and application of the development of rainfall-runoff models, catchment hydrological characteristics and processes and approaches to time series analysis, optimization approaches and other statistical techniques for hydrological investigation.
- **Tutorial** classes will concentrate on strategies for solving such problems. You will be encouraged, from time to time, to work in small groups to solve problems.
- **Computer Laboratory** exercises will also be used to assess operational application of analytical techniques and other concepts developed throughout the course.

Suggested approaches to learning in this course include:

- Regular participation in lectures and tutorials. Review lecture and tutorial material. Follow worked examples.
- Reflect on class problems and quizzes.
- Regular reading and reviewing of your learning.
- Appropriate preparation for tutorial activities.
- Planning your time to achieve all assessment requirements (see assessment)
- We encourage you to work with your peers. A good way to learn the material is in small study groups. Such groups work best if members have attempted the problems individually before meeting as a group.

Successful completion of this course will require active involvement by the student in:

Private Study	<ul style="list-style-type: none"> • Review lecture material • Do set problems and assignments • Reflect on class problems and assignments • Do internet and library searches on topics related to the course • Participate in class discussions on review questions at end of lecture notes
Lectures	<ul style="list-style-type: none"> • Find out what you must learn • Follow worked examples • Hear announcements on course changes
Tutorials	<ul style="list-style-type: none"> • Be guided by tutors • Practice solving set problems • Ask questions
Assessments (tests, examinations, assignments)	<ul style="list-style-type: none"> • Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

It is expected that the student will have a clearer understanding of Water Engineering, its relevance in engineering design, and its application in water resources management. The student will be familiar with the development and operation of rainfall-runoff models, be familiar with the range of observation and modeling tools available to the water resource manager, understand the limits of models and the importance of calibration/validation, and how to undertake data and modeling analysis using a range of statistical and other analytical approaches.

For each hour of contact it is expected that a student will put in at least 1.5 hours of private study.

ASSESSMENT

The assessment is separate for the two halves of the course, but there is related course material.

CATCHMENT MODELLING SHORT COURSE 1:

Assignment = 25%
Exam = 25%

CATCHMENT MODELLING SHORT COURSE 2:

Assignment = 20%
Exam = 30%

A mark of at least 40% in the final examination is required before the class work is included in the final mark. The formal exam scripts will not be returned. Students who perform poorly in tutorials are recommended to discuss progress with the lecturer during the semester.

Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

ASSIGNMENTS		
weight	Topic	Deadline
Assignment 1 (25%)	Rainfall-Runoff Modelling and Computation	12 August 2013
Assignment 2 (20%)	Reservoir Modelling Application	18 October 2013

Late work will be penalised at the rate of 10% per day after the due time and date have expired.

COURSE PROGRAM

SHORT COURSE 1: JULY 31 – AUGUST 2

Time	Topic
Day 1	
09:00 – 09:30	Introduction to the course
09:30 – 12:00	- Watershed concepts and characteristics - Catchment processes i.e. rainfall, evaporation, infiltration, runoff - Understanding the hydrograph - Flood routing approaches
12:00 – 13:00	Class Tutorial: Process representation and flood routing
13:00 – 14:00	Lunch
14:00 – 16:00	Rainfall-runoff modelling: - the role of modelling - objectives and concepts - types of models - model components and procedures
16:00 - 17:00	Class Tutorial : Further problems and discussion

Day2	
09:00 – 11:00	Analysis of rainfall-runoff models - ABC model - IHACRES - AWBM
11:00 – 12:00	TOPMODEL (Fiona Johnson)
12:00 – 13:00	Class Tutorial: Applications of hydrological models
13:00 – 14:00	Lunch
14:00 – 17:00	Sensitivity analysis, parameterization, calibration, validation, and evaluation (Jeff Exbrayat).
Day 3	
09:00 – 11:00	Application of hydrological models, data requirements, realities and limitations. (Ashish Sharma)
11:00 – 13:00	Class Tutorial on Bayesian parameter estimation
13:00 – 14:00	Lunch
14:00 – 17:00	Laboratory Tutorial: AWBM + RORB

SHORT COURSE 2: OCTOBER 9-11

Time	Topic
Day 1	
09:00 – 11:00	Introduction, reservoir design and operation
11:00 – 13:00	Reservoir design tutorial
13:00 – 14:00	Lunch
14:00 – 16:00	Reservoir simulation methods, definition of storage capacity
16:00 – 17:00	Reservoir storage tutorial
Day 2	
09:00 – 11:00	Recap of statistical concepts, bases of geostatistics
11:00 – 13:00	Introduction to time simple series models
13:00 – 14:00	Lunch
15:00 – 17:00	Tutorial in computer room
Day 3	
09:00 – 11:00	Advanced time series simulation methods, seasonal models
11:00 – 13:00	Bias correction, downscaling models (Jeff Exbrayat)
13:00 – 14:00	Lunch
14:00 – 15:00	Non-parametric models, direct sampling
15:00 – 17:00	Tutorial in computer room

RELEVANT RESOURCES

Reference and Additional Readings

- Lecture notes (handed to students at start of lecture)
- Water Resources Engineering, by Larry W. Mays, John Wiley and Sons, 2001 (or any other standard hydrology text-book located online or in the UNSW library).

Technology Enabled Learning and Teaching Web Site and login to Blackboard

<http://telt.unsw.edu.au/>

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

COURSE EVALUATION AND DEVELOPMENT

The School of Civil and Environmental Engineering evaluates each course each time it is run through (i) the UNSW Course and Teaching Evaluation and Improvement (CATEI) process, and (ii) Focus Group Meetings.

As part of the CATEI process, your student evaluations on various aspects of the course are graded; the Course Coordinator prepares a summary report for the Head of School. Any problem areas are identified for remedial action, and ideas for making improvements to the course are noted for action the next time that the course is run.

Focus Group Meetings are conducted by the four Year Managers (academic staff) for any students who wish to attend, in each year of the civil and/or environmental engineering programs. Student comments on each course are collected and disseminated to the Lecturers concerned, noting any points which can help improve the course.

COMMON SCHOOL INFORMATION

Common School information may be found at:

<http://www.civeng.unsw.edu.au/info-about/our-school/policies-procedures-guidelines/academic-advice>

The **Common School Information** site has information on the following:

1. **Dates to Note** - important dates relating to enrolling and disenrolling, and a University website (via MyUNSW) with a calendar of other important UNSW dates (semester dates, recess weeks, stuvac dates and exam periods).
2. **School Contacts**
 - i. for enrolment or timetable difficulties,
 - ii. referral chain of contacts for course difficulties:
Course Coordinator/Lecturer → Year Coordinators → Grievance Officer,
 - iii. Advanced Standing, and
 - iv. Mentoring.
3. **Course Requirements**
 - i. attendance at lectures, tutorials and laboratory classes,
 - ii. participation in tutorials, and
 - iii. completion of assessment work.
4. **Notes on Assessment**
 - i. plagiarism (with link to UNSW Learning Centre web site on plagiarism),
 - ii. keep a copy of written submissions,
 - iii. submitting assignments, and
 - iv. late submissions (obtaining extensions and special consideration)
5. **Supplementary Exams** – includes link to School website with School policy on supplementary exams.
 - i. Special Consideration – includes link to UNSW website (New South Q) for downloading forms, requirements for lodging special consideration forms.
6. **Solutions to Problems – Troubleshooters**
 - i. Learning Centre,
 - ii. student counsellors, and
 - iii. student support services.
7. **CEVSOC** – student committee membership and link to (unofficial) student CEVSOC website.