School of Civil and Environmental Engineering

Term 1, 2020

CVEN4503 GROUNDWATER RESOURCE INVESTIGATION

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Part 1: Classes and Workshops	Tuesday, 9:00 – 11:00	Old Main Building Room 151 (OMB151)
	Tuesday, 11:00 – 13:00	Old Main Building Room 151 (OMB151)
Part 2: Field Course at Wellington	16th March to 20th March (Week 5). Travel to Wellington on Monday the 16th of March in the afternoon and return to Sydney on Friday the 20th March by noon.	
Part 3: Workshops	Tuesday, 9:00 – 13:00	Old Main Building Room 151 (OMB151)

Course Coordinator and Lecturer	A/Prof Martin S. Andersen m.andersen@unsw.edu.au office: CE303
Lecturers	A/Prof Will Glamore w.glamore@unsw.edu.au office: CE313 Dr Christian Anibas c.anibas@unsw.edu.au
Demonstrator	Dr Mahmood Sadat-Noori m.sadat-noori@unsw.edu.au

INFORMATION ABOUT THE COURSE

This subject is offered in the 4th year of Civil and Environmental Engineering. The prerequisite is CVEN3501.

IMPORTANT NOTE: The Wellington field component is mandatory. Students will be required to pay for food and accommodation while in Wellington. The costs will be communicated in the lecture.

HANDBOOK DESCRIPTION

Link to virtual handbook

https://www.handbook.unsw.edu.au/postgraduate/courses/2020/CVEN4503

OBJECTIVES

The aim of this course is to develop the understanding of groundwater processes and provide students with techniques to investigate its occurrence and quality.

List of programme attributes:

- The skills involved in scholarly enquiry
- An in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context
- Capacity for analytical and critical thinking and for creative problem solving

- Ability to engage independent and reflective learning
- Information literacy and the skills to appropriately locate, evaluate and use relevant information
- A respect for ethical practice and social responsibility
- Skills for effective communication List the objectives of the course.

TEACHING STRATEGIES

Private Study	• Review course notes and lecture material • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Lectures	• Find out what you must learn • See methods that are not in the course notes • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments (assignments and report)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Laboratory Work	• Hands-on work, to set studies in context

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

EXPECTED LEARNING OUTCOMES

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should:

Learning Outcome		**EA Stage 1 Competencies**
1.	*Have a professional understanding of groundwater processes*	*PE1.1, PE1.2, PE1.3, PE2.1, PE2.3*
2.	*Understand the principles behind the development of a groundwater resource*	*PE1.2, PE1.3, PE1.5, PE2.1, PE2.3*
3.	*Understand the theoretical background for methods for investigating groundwater occurrence and its quality*	*PE1.1, PE1.2, PE1.3, PE2.1, PE2.2,*
4.	*Ability to apply selected field investigation methods to data*	*PE2.1, PE2.2,*
5.	*Gained competencies in using methods in the field*	*PE2.1, PE2.2, PE3.1, PE3.5, PE3.6*
6.	*Ability to report on hydrogeological field data and their interpretations*	*PE3.1, PE3.2, PE3.3, PE3.4, PE3.6*

COURSE PROGRAM

Lectures and exercises will be presented in Weeks 1-4 of Trimester 1. There will then be a 3 day short course at the UNSW Field Station in Wellington (NSW) where practical work will be undertaken to consolidate the understanding achieved in the 4 weeks of lectures. The field course will commence on Monday 16th of March and conclude on Friday 20th of March. A bus will be hired for the transport to and from Wellington. On the Monday evening we will hold a BBQ at the field course accommodation on arrival.

TERM 1, 2020

Week	Date	Topic	Assessments Due	Lecturer
1	18th Feb	Introduction to hydrogeology		M. Andersen
2	25th Feb	Physical properties of soil and water and equations of groundwater flow	Following Monday	W. Glamore
3	3rd March	Geochemical investigation	Following Monday	M. Andersen
4	10th March	Geophysical investigation methods	First day of the field course	C. Anibas
5	16th – 20th March	**Wellington Field Course**		M. Andersen W. Glamore C. Anibas M. Sadat-Noori
6	24th March	Individual report work on Wellington data: Hydrogeology Q&A		W. Glamore
7	31st March	Individual report work on Wellington data: Geophysics Q&A		C. Anibas
8	7th April	Individual report work on Wellington data: Hydrogeochemistry Q&A		M. Andersen
9	14th April	Individual report work		
10	21st April	**No class - Major Wellington assignment due**	**Friday 24th April by 5 pm**	

ASSESSMENT

This course will be assessed by three minor assignments and one final report (Note: **There is no exam at the end of this course**). The three minor assignments, which total 50% of the course mark, are meant to test that the students understand the content of key chapters in the course notes and test their competencies in using groundwater investigation methods. They will also provide the students with early feedback on how they are progressing with the course. The final report (50% of the course mark) will consist of 1) a summary of the field activities at the Wellington Field Research Station; 2) presentation of the results; and 3) an integrated synthesis of the groundwater processes at the field station based on all results. The final report is a group exercise, but each student will be assessed individually on a part of the report.

The final report will assess the students understanding of the methods demonstrated in the field, ability to present and critically assess the quality of groundwater field data obtained by a range of methods and finally their ability to interpret the findings in relation to groundwater processes. The purpose of the assessment tasks are to enable students to develop the necessary depth of understanding of groundwater resources so that they can enter the workforce and contribute accordingly.

Students who perform poorly in the minor assignments are recommended to discuss progress with the lecturer during the semester. The final grade is calculated based on the individual assessments. Passing the course requires a final grade of 50%. The Course Coordinator reserves the right to adjust the final scores by scaling if agreed by the Head of School.

ASSESSMENT OVERVIEW

Details of each assessment, the marks assigned to it, criteria by which marks will be assigned, and the dates of submission are set out below.

Assessment item	Weight	Issue date	Due date/time	Deadline for absolute fail	Marks returned	Assessment criteria	Learning outcomes assessed
Assignments:							
Assignment 1 Chapter 2 and Chapter 3	18%	Tuesday 25/02	Tuesday 3/03 9 am	Friday 6/03 9 am	Tuesday 10/03	This assignment will assess how well the student understand material in Chapter 2 and Chapter 3 and ability to use the physical properties of water for calculating groundwater flow	*PE1.1, PE1.2, PE1.3, PE2.1, PE2.3*
Assignment 2 Chapter 4	17%	Tuesday 3/03	Tuesday 10/03 9 am	Friday 13/03 9 am	Tuesday 17/03	This assignment will assess how well the student understand material in Chapter 4 and ability to use methods groundwater chemistry in groundwater investigations	*PE1.1, PE1.2, PE1.3, PE2.1, PE2.2*
Assignment 3 Chapter 5	15%	Tuesday 10/03	Tuesday 24/03 9 am	Friday 27/03 9 am	Tuesday 31/03	This assignment will assess how well the student understand material in Chapter 5 and ability to use methods for surface and borehole geophysics in groundwater investigations	*PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.3*
Final Report:							
Wellington assignment	50%	Monday 16/03	Friday 24/04 5pm	Monday 27/04 9 am	Monday 11/05	This assignment will assess the students understanding of the methods demonstrated in the field, ability to present and critically assess the quality of groundwater field data obtained by a range of methods and finally their ability to interpret the findings in relation to groundwater processes.	*PE1.1, PE1.2, PE2.1, PE2.2, PE3.1, PE3.2, PE3.3, PE3.5, PE3.6*

NOTE: Feedback will be given for Assignment 1 before 15th of March

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks.

PENALTIES

Late submissions will be penalised at the rate of 10% per day after the due time and date have expired. Submissions more than 3 days late without a valid reason will automatically receive a fail (0 marks).

RELEVANT RESOURCES

Extensive notes are provided in the form of a book containing individual chapters for the course material.

General texts worth purchasing are:

- Applied Hydrogeology - Fourth Edition (2001) by C.W. Fetter; published by Prentice Hall - For a basic introduction.
- Physical and Chemical Hydrogeology - Second Edition (1997) by Domenico and Schwartz; published by John Wiley and Sons - More detailed theoretical discussion of many aspects.
- Groundwater Hydrology - Conceptual and Computational Models (2003) by K.R. Rushton; published by Wiley - Excellent practical and theoretical approach to groundwater resource assessment.
- Water Wells and Boreholes - Misstear, Banks and Clark (2006); published by Wiley
- Groundwater in the Environment - An Introduction: by Paul L Younger (2007); published by Blackwell
- Geochemistry, Groundwater, and Pollution (2005); Appelo, C.A.J., Postma, D.; 2nd ed. A.A. Balkema, Rotterdam. 649 pp. ISBN: 04 1536 428 0. - Best textbook on the market for groundwater chemistry! It can be ordered via website www.crcpress.com

The UNSW Connected Waters website provides a portal to the groundwater world. This can be accessed at: http://www.connectedwaters.unsw.edu.au. The Hydrogeology Journal is the academic publication of the International Association of Hydrogeologists. The web address for the IAH is http://www.iah.org/ and journal articles are on line at http://link.springer.de/link/service/journals/10040/index.htm.

Additional materials will provided on Moodle during the course.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://student.unsw.edu.au/dates

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:

https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE (Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership