UNSW Course Outline

CVEN2002 Civil and Environmental Engineering Computations - 2024

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General Course Information

Course Code : CVEN2002
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Civil and Environmental Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

An introduction to the application of advanced analytical, statistical and numerical techniques to the solution of engineering problems relevant to civil and environmental engineers and surveyors. Review of analytical techniques. Addressing issues of variability and uncertainty in

engineering. Descriptive statistics. Foundations of Probability. Random variables. Special distributions (discrete and continuous). Normal distribution, sampling distributions. Confidence Intervals. Hypothesis testing. Inferences for proportions, variances and means. Regression. ANOVA. Numerical solution of linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.

Course Aims

The aims of the course are to enable students to apply the fundamentals of Numerical Methods and Statistics to Engineering problems in the fields of Civil and Environmental Engineering and Surveying.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Apply numerical methods and statistics to problems in the fields of Civil and Environmental Engineering and Surveying.
CLO2 : Calculate numerical (as opposed to analytical) solutions to problems in linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.
CLO3 : Describe the various ways in which random variation arises in engineering contexts.
CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.
CLO5 : Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts.
CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.

Course Learning Outcomes	Assessment Item
CLO1 : Apply numerical methods and statistics to problems in the fields of Civil and Environmental Engineering and Surveying.	• Numerics Quizzes • Mid-term Test • Final Exam
CLO2 : Calculate numerical (as opposed to analytical) solutions to problems in linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.	• Numerics Quizzes • Mid-term Test • Final Exam
CLO3 : Describe the various ways in which random variation arises in engineering contexts.	• Statistics Quizzes • Mid-term Test • Final Exam
CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.	• Statistics Quizzes • Numerics Quizzes • Mid-term Test • Final Exam
CLO5 : Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts.	• Statistics Quizzes • Mid-term Test • Final Exam
CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.	• Numerics Quizzes • Statistics Quizzes • Mid-term Test • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Mobius, Matlab

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Numerics Quizzes Assessment Format: Individual	10%	
Statistics Quizzes Assessment Format: Individual	10%	
Mid-term Test Assessment Format: Individual	20%	
Final Exam Assessment Format: Individual	60%	Start Date: Formal Exam Period

Assessment Details

Numerics Quizzes

Assessment Overview

10 online weekly quizzes (1% each). Each quiz covers the content of the corresponding week (Numerics) and is expected to be completed within 10-20 min, with unlimited number of attempts and immediate feedback.

Course Learning Outcomes

- CLO1 : Apply numerical methods and statistics to problems in the fields of Civil and Environmental Engineering and Surveying.
- CLO2 : Calculate numerical (as opposed to analytical) solutions to problems in linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.
- CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.
- CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.

Statistics Quizzes

Assessment Overview

10 online weekly quizzes (1% each). Each quiz covers the content of the corresponding week

(Statistics) and is expected to be completed within 10-20 min, with unlimited number of attempts and immediate feedback.

Course Learning Outcomes

- CLO3 : Describe the various ways in which random variation arises in engineering contexts.
- CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.
- CLO5 : Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts.
- CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.

Mid-term Test

Assessment Overview

80 mins (40 min Statistics and 40 min Numerics). Students are expected to demonstrate their ability to apply the methods taught in the course (both, Statistics and Numerics).

Course Learning Outcomes

- CLO1 : Apply numerical methods and statistics to problems in the fields of Civil and Environmental Engineering and Surveying.
- CLO2 : Calculate numerical (as opposed to analytical) solutions to problems in linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.
- CLO3 : Describe the various ways in which random variation arises in engineering contexts.
- CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.
- CLO5 : Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts.
- CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.

Final Exam

Assessment Overview

2 hours. Paper based exam in the formal exam period. Students are expected to demonstrate their ability to apply the methods taught in this course. Equal halves for numerics and statistics.

Course Learning Outcomes

- CLO1 : Apply numerical methods and statistics to problems in the fields of Civil and Environmental Engineering and Surveying.

- CLO2 : Calculate numerical (as opposed to analytical) solutions to problems in linear and non-linear equations; numerical differentiation and integration, finite differences; differential equations, boundary value problems, initial value problems and partial differential equations.
- CLO3 : Describe the various ways in which random variation arises in engineering contexts.
- CLO4 : Apply various graphical and data analysis methods for summarising and understanding data.
- CLO5 : Apply various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts.
- CLO6 : Utilize the MATLAB environment and programming for calculating solutions to numerical problems, graphical and statistical analyses, including assignment problems in subsequent courses.

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Introduction to Numerical Methods: Mathematical Modelling and Programming (Chapter 1 & 2) Approximations and Taylor Series (Chapter 3 & 4)
	Topic	Statistics: Probability, Descriptive Statistics
Week 2 : 3 June - 9 June	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Bracketing Methods (Chapter 5) Open Methods (Chapter 6)
	Topic	Statistics: Random variables
Week 3 : 10 June - 16 June	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Roots of Equations (Chapter 8)
	Topic	Statistics: Special random variables
Week 4 : 17 June - 23 June	Lecture	Numerics (no lecture due to public holiday) Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Gauss Elimination (Chapter 9) Matrix Inversion (Chapter 10)
	Topic	Statistics: Sampling distributions and the Central Limit Theorem
Week 5 : 24 June - 30 June	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Numerical Integration (Chapter 21 & 22) Numerical Differentiation (Chapter 23 & 24)
	Topic	Statistics: Confidence intervals for means and proportions
Week 6 : 1 July - 7 July	Reading	Self-study (UNSW Flexibility Week)

Week 7 : 8 July - 14 July	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Assessment	Mid-Term Test
	Topic	Numerics: Introduction to ordinary differential equations (ODE) (Chapter 25) Numerical solutions of ODEs: Part I (Chapter 25)
	Topic	Statistics: Hypothesis testing
Week 8 : 15 July - 21 July	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Numerical solutions of ODEs: Part II (Chapter 26-27)
	Topic	Statistics: Inference concerning differences in means
Week 9 : 22 July - 28 July	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Introduction to partial differential equations (PDE) (Chapter 29) Numerical solutions of PDEs: Part I (Chapter 29)
	Topic	Statistics: Regression analysis
Week 10 : 29 July - 4 August	Lecture	Numerics - Monday 14-16 Statistics - Thursday 11-13
	Workshop	Numerics
	Laboratory	Statistics
	Assessment	Numerics - online weekly quiz Statistics - online weekly quiz
	Topic	Numerics: Numerical solutions of PDEs: Part II (Chapter 30)
	Topic	Statistics: Analysis of variance

Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled for the duration of the session.

General Schedule Information

Each week, there are two lectures (Numerics and Statistics) and two one-hour workshops/labs.

Course Resources

Prescribed Resources

Students are required to have an account on https://au.mathworks.com/

Recommended Resources

For the Numerical Methods strand of CVEN2002:

- Recommended: "Numerical Methods for Engineers": Steven C. Chapra, Raymond P. Canale; McGraw Hill, 7th Ed (2015) ISBN 978 0 07 339792 4 or the equivalent ebook:

- www.mheducation.com.au/9781308573083-aus-ebook-numerical-methods-for-engineers-7e

- Any other Numerical Methods / for engineers book eg "Numerical Methods", Author: Robert W. Hornbeck, Publisher: Prentice-Hall (1975), or "An Introduction to Numerical Methods and Analysis", Author: James Epperson, Publisher: John Wiley & Sons, Second Edition (2013), or "Elementary Numerical Analysis", Authors: Kendall Atkinson, Weimin Han, Publisher: John Wiley & Sons, Third Edition (2004)

- CVEN2002 class notes R. Lawther, W. Peirson, B. Cathers, X. Barthelemy, July 2015 (a pdf file on our Moodle site)

For the Statistics strand of CVEN2002:

Recommended textbook:

- "Applied Statistics for Engineers and Scientists", Authors: J. Devore and N. Farnum, Publisher: Duxburry Press, 2nd Edition

- "Applied Statistics for Engineers and Scientists", Authors: J. Devore, N. Farnum and J. Doi, Publisher: Cengage Learning, 3rd Edition

Additional references:

- "Probability and Statistics for Engineers and the Sciences", Author: J. Devore, Publisher: Duxburry, 7th Edition

- "Applied Statistics and Probability for Engineers", Authors: D. Montgomery and G. Runger, Publisher: Wiley, 5th Edition

- CVEN2002 class notes R. Lawther, W. Peirson, B. Cathers, X. Barthelemy, July 2015 (a pdf file on our Moodle site)

Course Evaluation and Development

Informal feedback will be gathered throughout the term and used to improve the course. Formal feedback will be gathered in the end of the term and used to improve the course in the upcoming years.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Elena Atrosh chenko		H20-607		appointment via e-mail	No	Yes
	Jeffrey Kwan				appointment via e-mail	No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular,

students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to

accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;

- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

Final Examinations

Final Exams in T2 2024 will be held on campus between the 9th - 22nd August, and Supplementary Exams between the 2nd - 6th September 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see [the Nucleus: Student Hub](#). They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.