School of
Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

Prescription

This course introduces various approaches to analyse the sustainability of systems, such as cost-benefit analysis, life cycle analysis, and simulation modelling techniques, with a focus on system dynamics modelling. Practical work explores simulation using an industry- standard software package and a project to model and investigate the sustainability implications of an implemented renewable energy technology in a specific context; for example, a bioenergy system in an island community.

Course learning objectives

Students who pass this course should be able to:

1. Describe the various approaches to analyse the sustainability of technology systems
2. Undertake cost-benefit analyses of renewable energy interventions
3. Undertake system dynamics modelling of an energy transition
4. Undertake life cycle analyses of renewable energy systems

Course content

In 2021, it will be possible to take this course remotely, and distance-based versions of the lectures, tutorials, labs, and all other material will be available. However, the remote option will only be available for students with a good justification (for example, enrolling from overseas). Students who can be in Wellington must participate in the face-to-face tutorials and labs to develop the critical practical modelling knowledge and skills for the course.

Students taking this course remotely must have access to a computer with camera and microphone and a reliable high speed internet connection that will support real-time video plus audio connections and screen sharing. Students must be able to use Zoom; other communication applications may also be used. A mobile phone connection only is not considered sufficient. The comuputer must be adequate to support the programming required by the course: almost any modern windows, macintosh, or unix laptop or desktop computer will be sufficient, but an Android or IOS tablet will not.

If the assessment of the course includes tests, the tests will generally be run in-person on the Kelburn campus. There will be a remote option for students who cannot attend in-person and who have a strong justification (for example, being enrolled from overseas).
The remote test option will use Zoom for online supervision of the tests and you must be able to use Zoom with a camera, microphone, and screen-sharing. Students who will need to use the remote test option must contact the course coordinator in the first two weeks to get permission and make arrangements.

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The course consists of four components. First, the general principles and different modelling approaches, to understand the sustainability implications of technical systems, are reviewed, as well as the application of modelling techniques to inform decision- and policy-making. Second, the cost-benefit analysis technique is discussed with practical case studies, and the modelling of a proposed renewable energy intervention is undertaken. Third, the fundamentals of systems thinking and utilisation of the

system dynamics modelling technique – to understand real world problems – are studied in more depth, and applied to the energy sector, with a standard software package. Lastly, the standardised life cycle assessment technique is studied, and the modelling of a renewable energy technology in the New Zealand context is undertaken with another industry standard software package.

Withdrawal from Course

Withdrawal dates and process:
https://www.wgtn.ac.nz/students/study/course-additions-withdrawals

Lecturers

Alan Brent (Coordinator)

alan.brent@vuw.ac.nz 04 4635960

413 Alan MacDiarmid Building, Kelburn

Jim Hinkley

jim.hinkley@vuw.ac.nz 04 4635515

227 Alan MacDiarmid Building, Kelburn

Prof Bob Cavana, School of Management

Teaching Format

There are weekly contact and online lectures, tutorials, and laboratory sessions supported by online materials and discussions. The practical work in the labs involves software/spreadsheet modelling to analyse the cost-benefits of renewable energy projects, the life cycle impact of renewable energy systems, and the system dynamics implications of energy transitions.

Student feedback

Student feedback on University courses may be found at:
www.cad.vuw.ac.nz/feedback/feedback_display.php

Dates (trimester, teaching & break dates)

- Teaching: 05 July 2021 - 08 October 2021
- Break: 16 August 2021 - 29 August 2021
- Study period: 11 October 2021 - 14 October 2021
- Exam period: 15 October 2021 - 06 November 2021

Class Times and Room Numbers

05 July 2021 - 15 August 2021

- **Tuesday** 11:00 - 11:50 – 407, Alan MacDiarmid Building, Kelburn
- **Thursday** 11:00 - 11:50 – 407, Alan MacDiarmid Building, Kelburn

30 August 2021 - 10 October 2021

- **Tuesday** 11:00 - 11:50 – 407, Alan MacDiarmid Building, Kelburn
- **Thursday** 11:00 - 11:50 – 407, Alan MacDiarmid Building, Kelburn

Other Classes

Tutorials and laboratory sessions will be scheduled in AM407.

Set Texts and Recommended Readings

Required

Compulsory reading material is provided via Blackboard. All students are required to obtain a copy of the following textbook:
Maani KE, Cavana RY, 2007, Systems Thinking, System Dynamics: Managing Change and Complexity. 2nd Edition. Pearson New Zealand.
Available from:
https://www.pearsoned.co.nz/9781877371035

Mandatory Course Requirements

In addition to achieving an overall pass mark of at least 50%, students must:

- Achieve at least **40%** for each of the individual assignments.

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

Assessment

The assessment comprises of three modelling projects/assignments, with associated tutorials.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
Assignment 1, with a report (20 hours)	Week 4	CLO: 1,2	30%
Assignment 2a, group dynamic modelling presentation (15 hours)	Week 8	CLO: 1,3	15%
Assignment 2b, individual dynamic modelling report (25 hours)	Week 10	CLO: 1,3	25%
Assignment 3, with a report (20 hours)	Assessment period	CLO: 1,4	30%

Penalties

Late assessment will be penalised at the rate of 10% for every working day the assessment is late. The lecturer may refuse to mark work that has been handed in over a week late, and may also refuse if the assessment has been marked and returned to the class. In such instances, a zero grade for that assessment shall result.

Extensions

Individual extensions will only be granted in exceptional personal circumstances, and should be negotiated with the course coordinator before the deadline whenever possible. Documentation (eg, medical certificate) may be required.

Submission & Return

All the assessment items are submitted on Blackboard, and feedback will be provided electronically and discussed in class as appropriate.

Workload

Although the workload varies from week to week, students should expect to spend around 10 to 12 hours per week on the course, to give a total of 150 hours study time. A plausible approximate breakdown for these hours would be: lectures (2 hours); tutorials/laboratories (1 hours); reading, review and online discussions (3 hours); and modelling and written assignments (6 hours).

Teaching Plan

A detailed teaching plan is provided on commencement of the course via Blackboard.

Communication of Additional Information

Any additional information regarding this course will be posted on Blackboard.

Links to General Course Information

- Academic Integrity and Plagiarism: https://www.wgtn.ac.nz/students/study/exams/integrity-plagiarism
- Academic Progress: https://www.wgtn.ac.nz/students/study/progress/academic-progess (including restrictions and non-engagement)
- Dates and deadlines: https://www.wgtn.ac.nz/students/study/dates
- Grades: https://www.wgtn.ac.nz/students/study/progress/grades
- Special passes: Refer to the Assessment Handbook, at https://www.wgtn.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf
- Statutes and policies, e.g. Student Conduct Statute: https://www.wgtn.ac.nz/about/governance/strategy
- Student support: https://www.wgtn.ac.nz/students/support
- Students with disabilities: https://www.wgtn.ac.nz/st_services/disability/
- Student Charter: https://www.wgtn.ac.nz/learning-teaching/learning-partnerships/student-charter
- Terms and Conditions: https://www.wgtn.ac.nz/study/apply-enrol/terms-conditions/student-contract
- Turnitin: http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin
- University structure: https://www.wgtn.ac.nz/about/governance/structure
- VUWSA: http://www.vuwsa.org.nz

Offering CRN: 31129

Points: 15
Prerequisites: RESE 211, 212
Duration: 05 July 2021 - 07 November 2021
Starts: Trimester 2
Campus: Kelburn