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

Prescription

This course builds on and extends the principles of modern control systems engineering introduced in ECEN 315 to enable students to develop mathematical models and use these to design optimal control systems for real-world multivariable engineering systems. Kalman filters and linear quadratic regulators will be introduced and the principles and benefits of modern model-based predictive control systems will be outlined. Methods will be developed for continuous time system descriptions but techniques for converting to discrete time descriptions and for designing controls for discrete time systems will also be presented.

Course learning objectives

Students who pass this course should be able to:

1. Produce state-space models of a variety of linear and nonlinear electronic and mechanical systems (BE graduate attributes 3(a),3(c)),
2. Design continuous and discrete time controllers using state-space techniques, including optimal control methods such as LQR (BE graduate attributes 3(a),3(b)),
3. Design Luenberger state observers and Kalman filters, (BE graduate attributes 3(a),3(b),3(e)),
4. Use the Matlab software package to solve practical problems in control engineering (BE graduate attributes 3(d),3(f)).

Withdrawal from Course

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

Lecturers

Christopher Hollitt (Coordinator)

christopher.hollitt@vuw.ac.nz 04 4636965

223 Alan MacDiarmid Building, Kelburn

Teaching Format

During the first half of the trimester there will be three lectures per week, dropping back to two after the mid-trimester break. The third lecture slot will continue to be used for occational tutorials or catch-up session as necessary.

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 March 2018 - 08 June 2018
- Break: 23 April 2018 - 27 April 2018
- Study period: 11 June 2018 - 14 June 2018
- Exam period: 15 June 2018 - 04 July 2018

Class Times and Room Numbers

05 March 2018 - 01 April 2018

- **Monday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Tuesday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Wednesday** 10:00 - 10:50 – 249, Cotton, Kelburn

09 April 2018 - 22 April 2018

- **Monday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Tuesday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Wednesday** 10:00 - 10:50 – 249, Cotton, Kelburn

30 April 2018 - 10 June 2018

- **Monday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Tuesday** 10:00 - 10:50 – 249, Cotton, Kelburn
- **Wednesday** 10:00 - 10:50 – 249, Cotton, Kelburn

Set Texts and Recommended Readings

Required

There are no required texts for this offering.

Recommended

- Astrom and Murray "Feedback Systems: An Introduction for Scientists and Engineers"

Mandatory Course Requirements

There are no mandatory course requirements for this course.

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

This course will be assessed through assignments, a test, and a final examination.

Assignments (2)	Weeks 6, 11	CLO: 1,2,3,4	20%
Project	Week 12	CLO: 1,2,3,4	20%
Test	Week 7	CLO: 4	20%
Examination	Examination Period	CLO: 1,2,3	40%

Penalties

Work submitted late will be subject to a penalty of 10% of the total mark per day (or part thereof). No work will be accepted once the solutions have been posted and we may post the solutions immediately after the due date.

Submission & Return

All work should be submitted via the submission page on the course web site. Unless otherwise noted, all work should be submitted as pdf files. Handwritten work that is scanned as a pdf is fine. Submission of matlab code alone will not be adequate.

Workload

In order to maintain satisfactory progress in ECEN 415, you should plan to spend an average of at least ten hours per week on this paper. A plausible and approximate breakdown for these hours would be:

- Lectures and tutorials: 3 hours
- Reading and Extra Problems: 4 hours
- Assignments: 3 hours

Teaching Plan

See: https://ecs.victoria.ac.nz/Courses/ECEN415_2018T1/LectureSchedule

Communication of Additional Information

All online material for this course can be accessed at
https://ecs.victoria.ac.nz/Courses/ECEN415_2018T1/

Links to General Course Information

- Academic Integrity and Plagiarism: https://www.victoria.ac.nz/students/study/exams/integrity-plagiarism
- Academic Progress: https://www.victoria.ac.nz/students/study/progress/academic-progess (including restrictions and non-engagement)
- Dates and deadlines: https://www.victoria.ac.nz/students/study/dates
- Grades: https://www.victoria.ac.nz/students/study/progress/grades
- Special passes: Refer to the Assessment Handbook, at https://www.victoria.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf
- Statutes and policies, e.g. Student Conduct Statute: https://www.victoria.ac.nz/about/governance/strategy

- Student support: https://www.victoria.ac.nz/students/support
- Students with disabilities: https://www.victoria.ac.nz/st_services/disability/
- Student Charter: https://www.victoria.ac.nz/learning-teaching/learning-partnerships/student-charter
- Terms and Conditions: https://www.victoria.ac.nz/study/apply-enrol/terms-conditions/student-contract
- Turnitin: http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin
- University structure: https://www.victoria.ac.nz/about/governance/structure
- VUWSA: http://www.vuwsa.org.nz

Offering CRN: 18519

Points: 15
Prerequisites: ECEN 315 (or PHYS 422)
Duration: 05 March 2018 - 04 July 2018
Starts: Trimester 1
Campus: Kelburn