Instructors:
Part I: Prof Victor Solo
E-Mail: v.solo@unsw.edu.au [use subject: ELEC 9731]
Office Hours: Wednesday, 4pm-5pm Room TBA
Part II: Prof Andrey Savkin
E-Mail: a.savkin@unsw.edu.au [use subject: ELEC 9731]
Office Hours: TBA

Course Organisation
Prerequisites: Undergraduate Control Course
UOC: 6
Class Times: Monday, 6pm-9pm Room: OMB230

There are two parts to the course
Part I: Linear Systems and Control: weeks 1-6
See below.
Part II: Robust Control: weeks 7 -12
See below.

Aims:
Provide an introduction to linear system theory
and system identification
Provide an introduction to Robust Control
Optimal control, Optimal and Robust Filtering

Assessment:
To pass, students must obtain a pass level in each part of the course
Assignments (two for each part) 10% each
Exams (one for each part) (Take-home) 30% each

• Assignments should have a School Assignment Sheet as the first page.
  These sheets are available from the School Office,
  or may be downloaded from the School web page.
  Keep a copy your assignment
  Late assignments will be penalised at 10% of the maximum value per day late.

Exam The same arrangements apply as for Assignments.

Assignment & Exam Timetable
Assignment 1: out - week 2 ; due - week 4
Assignment 2: out - week 4 ; due - week 6
Exam: out - week 6 ; due - week 8
Assignment 3: out - week 8 ; due - week 10
Assignment 4: out - week 10 ; due - week 12
Exam: out - week 12 ; due - 16 days later

Course Webpage  https://subjects.ee.unsw.edu.au/elec9731/
Resources

Part I

**Software:** Matlab (including Simulink)

**Textbook:** none.

**References:** in Library Open Reserve

2. L. Ljung (1999), Theory for the User
   2nd.,edn., Prentice Hall. - HUC (003/164D)

Part II

**Software:** Matlab (including Simulink)

**Textbook:**

   Control Systems Design. Prentice Hall.

**References**

3. I.R. Petersen and A.V. Savkin. Robust Kalman Filtering for Signals and Systems with
4. I.R. Petersen, V.A. Ugrinovskii and A.V. Savkin. Robust Control Design Using

Teaching Strategies

**Lectures**

to give the basic material in written form,
and to highlight the importance of different sections,
and help with the formation of schema.

**Assignments**
to give practice in problem solving, and to assess your progress.

**Examination**
the final test of competency.

Learning Outcomes

At the end of the course the student will be familiar with
basic aspects of linear system theory and,
system identification.
The student will be able to use this knowledge to solve
basic problems in linear system theory and
system identification.

Academic Honesty and Plagiarism

Plagiarism means copying. You cannot copy other people’s work of any kind;
you cannot copy from any source. Plagiarism is a serious offence and (severe)
penalties will apply; see https://student.unsw.edu.au/plagiarism

Administrative Matters

On issues and procedures regarding such matters as special needs,
equity and diversity, occupational health and safety, enrolment, rights,
and general expectations of students, please refer to the School policies,
see http://www.engineering.unsw.edu.au/electrical-engineering/administrative-procedures
<table>
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<tr>
<th>Week</th>
<th>Topic</th>
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| 1    | Matrix Review Handout  
Including: eigenvector decomposition; singular value decomposition; matrix inversion lemma; projection lemma; generalised inverses. |
| 2a   | Review SISO State Space  
Including: transformation between transfer function and state space; modal transformation; controllability; observability. |
| 2b   | State space decomposition theorem; polynomial division; Sylvester resultant and coprimeness. |
| 3    | Introduction to System Identification.  
Including: Finite Impulse Response (FIR) Modeling. |
| 4    | Noise Models.  
Including: AR, ARMA, Spectrum. AR model fitting. |
| 5    | State Space Subspace (S^4) Methods.  
Including: Computational Aspects via SVD and QR algorithms. |
| 6    | Spectral Estimation & Estimation in Closed Loop.  
Including: Effect of filtering on spectra. Transfer Function estimation with cross-spectra. |