

Nonlinear Control - ELEC9732

Term III 2020

- Instructor:** Prof V. Solo
- E-Mail:** v.solo@unsw.edu.au [use subject: ELEC 9732]
- UOC:** 6
- Class Times:** Monday, 6pm-9pm zoomID emailed in week 1 + cloudstor link
Week 1 only, Friday 6pm-9pm zoom + cloudstor
- Prerequisites:** Undergraduate Control Course Very strong mathematics grades
- Aims:** Provide an introduction to nonlinear systems analysis and an introduction to nonlinear control design.
- Assessment:** Homeworks x 3 50%
Final Exam (Take-home) 50%
- Homeworks are to be completed on your own.
You cannot discuss with others.
You cannot copy from any source.
The work that you hand in (and any related working) must be yours alone.
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Resources: **Software:** Matlab
Textbook: none.
References: in Library Open Reserve
i JJ Slotine, W Li (1991). Applied Nonlinear Control (Prentice Hall)
ii H Khalil (1996,2002) Nonlinear Systems (Prentice Hall)
iii S Sastry (1999) Nonlinear Systems (Springer).
iv A Isidori (1995) Nonlinear Control (Springer).

Timetable for

Homeworks, Exam

| Item | Dates(week) | <u>Late</u> Homeworks are penalized: 15% per day. |
|----------------|--|--|
| HW 1 (10 days) | out - week 3 | due - week 4, pdf, moodle, Latex preferred |
| HW 2 (10 days) | out - week 5 | due - week 6, pdf, moodle, Latex preferred |
| HW 3 (10 days) | out - week 7 | due - week 8, pdf, moodle, Latex preferred |
| Final Exam | out - <i>Tuesday</i> <i>November 17</i> (week 10) | due - <i>Friday</i> <i>November 27th</i> , 4pm, pdf, moodle |

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 nonlinear systems and control, from both an analysis and a design point of view. The student will be able to use this knowledge to solve basic problems in nonlinear systems analysis and nonlinear control design.

Academic Honesty and Plagiarism

Plagiarism means copying. Apart from the lecture notes for this course, 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

For special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students; see <http://scoff.ee.unsw.edu.au/>.

| Week | Lecture | Topic |
|------|---------|---|
| i | 1 | Introduction |
| | 2 | Nonlinear Ordinary Differential Equations |
| ii | 3 | Phase Plane Methods |
| iii | 4 | Lyapunov Stability |
| iv | 5 | Input/Output Stability |
| v | 6 | Describing Functions |
| vi | 7 | Nonlinear Control - Introduction |
| vii | 8 | Feedback Linearization |
| viii | 9 | State Feedback Linearization |
| ix | 10 | Gain Scheduling |
| x | 11 | Sliding Mode Control |
| | 12 | Backstepping Design Method |

COVID-19

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW [health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#).

You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate. We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed.

If you are required to self-isolate and/or need emotional or financial support, please contact the [Nucleus: Student Hub](#).

If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for [special consideration](#) through the [Special Consideration portal](#).

To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this [form](#).

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the [Safe Return](#) to Campus guide for students for more information on safe practices.