Nonlinear Control - ELEC9732 Session II 2015

Instructor: E-Mail: UOC: Class Times: Prerequisites: Office Hours:	Prof Victor Solo v.solo@unsw.edu.au 6 Wednesday, 6pm-9pm Undergraduate Control Course Monday, 4pm-5pm	Office: Room 237 [use subject: ELEC 9732] Room: TBA
Aims:	Provide an introduction to nonlinear systems analysis and an introduction to nonlinear control design.	
Assessment:	Homework 30% Final Exam (Take-home) 40% Project(Report + talk) 30% Homeworks are to be completed on your own. You may discuss with other students.But you cannot copy from them or any other source.NB. No details of working \Rightarrow no marks.Exams are to be completed on your own. You cannot discuss with others.And you cannot copy from any source.The work that you hand in (and any related working) must be yours alone.	
Project :	The project is intended to be a piece of work bigger than any homework could be. This gives the student a chance to go into a topic in some detail. It will consist of repeating simulations in a research paper + background material: mathematical description of system; system analysis; control design. 1-2 students per group. No more than two groups per project. One independent report from <u>each</u> student + oral presentation. Use IEEE-CDC style (max 6-10pp) for the report; you must cite the original papers used. All projects involve SIMULINK modelling. Available projects are (see web page): Hovercraft modelling and control Double Inverted Pendulum Bicycle modelling and control Teleoperation Spherical Pendulum Surface vehicle Stirred Tank Reactor Optimal Attitude Control or - A relevant project of interest proposed by the student and approved by the instructor.	

Resources:	Software: Textbook: References: i JJ Slotine, W Li (1991). Applied Nonlinear Cont ii H Khalil (1996,2002) Nonlinear Systems (Prenti iii S Sastry (1999) Nonlinear Systems (Springer). iv A Isidori (1995) Nonlinear Control (Springer).			
Timetable for	Homeworks, Project, Exam			
Item	Dates(week)	<u>Late</u> Homeworks are penalized.		
HW 1	out - week 4	due - week 6		
HW 2	out - week 6	due - week 8		
HW 3	out - week 8	due - week 10		
Project	Email 2 topics in order of preference: due Tuesday One page proposal due Friday August 21(week 4) Talks held week TBA	<u> </u>		
Final Exam	report due - Wednesday October 21(week 12) out - Wednesday October 21(week 12)	due - Friday October 30th		
Teaching Strategies Lectures Assignments Examination	to give the basic material in written form, and to highlight the importance of different sections and help with the formation of schema. to give practice in problem solving, and to assess your progress. 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				
	Plagiariam means <u>copying</u> . You cannot copy other peoples work of any kind; you cannot copy from any source. Plagiarism is a serious offence and (severe) penalties will apply; see http://www.lc.unsw.edu.au/plagiarism			
Administrative Matters				
	For special needs, equity and diversity, occupation rights, and general expectations of students; see h			

Week Topic

- 1 Introduction
- 2 Nonlinear Ordinary Differential Equations
- 3 Phase Plane Methods
- 4 Lyapunov Stability
- 5 Input/Output Stability
- 6 Describing Functions
- 7 Nonlinear Control Introduction
- 8 Feedback Linearization
- 9 State Feedback Linearization
- 10 Gain Scheduling
- 11 Sliding Mode Control
- 12 Backstepping Design Method