431-464 Control 2 (Advanced Control)

Credit Points:	12.50
Level:	4 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 2, - Taught on campus.
Time Commitment:	Contact Hours: Thirty-six hours of lectures, 12 hours of tutorials, laboratory or project work. Total Time Commitment: Not available
Prerequisites:	431-324 Control 1 (Classic Control) (prior to 2004 System Modelling and Control)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Assoc Prof Isaac Kao
Subject Overview:	On completion of this subject, students should have a good understanding of state-space discrete-time controller design methods and the MATLAB software package to perform such design. Topics include: motivation for advanced MIMO control; Industrial examples. Revision: input/output and state space models of LTI continuous-time and discrete-time systems. Discretisation of the plant with a zero order hold. Similarity coordinate transformations. Relations of transfer function and state space representations. Controllability and stabilisability. Observability and detectability. Kalman canonical decomposition. Pole-zero cancellation and relation to controllability/observability. Pole assignment by state feedback. Ackerman's formula. Observers. Separation principle. Internal model principle. Tradeoffs in controller/observer design. Optimal controller design (LQR deterministic and LQR and LQG). Optimal observer design (LQR and LQG). Connections of optimal control and estimation to pole assignment. Achieving integral action in LQR synthesis. Predictive control. Design study: an industrial application. Project: Modelling, analysis, controller design and implementation for a particular plant (on some of our lab equipment.)
Objectives:	On completing this subject the student will be able to: 1. Apply fundamental state-space techniques in the analysis and design of linear feedback control systems, as they arise in a variety of contexts; 2. Formulate control engineering problems in terms of optimising an objective function subject to constraints; 3. Use software tools to simulate and design the linear control systems.
Assessment:	Five homework assignments. Solutions of each assignment should be less than 10 A4 pages long using 12 pt font. (20%). One mid-semester test (20%). One 3-hour written final examination (60%).

Prescribed Texts:	None
Recommended Texts:	Information Not Available
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	# ability to apply knowledge of basic science and engineering fundamentals # ability to communicate effectively, not only with engineers but also with the community at large # in-depth technical competence in at least one engineering discipline # ability to undertake problem identification, formulation and solution # ability to utilise a systems approach to design and operational performance # ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member # understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development # expectation of the need to undertake lifelong learning, capacity to do so # capacity for independent critical thought, rational inquiry and self-directed learning # intellectual curiosity and creativity, including understanding of the philosophical and methodological bases of research activity # openness to new ideas and unconventional critiques of received wisdom # profound respect for truth and intellectual integrity, and for the ethics of scholarship
Related Course(s):	Bachelor of Engineering (Biomedical)Biosignals Bachelor of Engineering (Computer Engineering) Bachelor of Engineering (Electrical Engineering) Bachelor of Engineering (Software Engineering)