ELEN90055 Control Systems

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus. Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures (3 one hour lectures per week) and up to 24 hours of workshops Total Time Commitment: 200 hours
Prerequisites:	One of: **Subject** / **Study Period Commencement:** / **Credit Points:** ELEN30012 Signals and Systems — Semester 2 — 12.50 MCEN30016 Mechanical Dynamics — Semester 1 — 12.5 MCEN30020 Systems Modelling and Analysis — Semester 2 — 12.5 BMEN30006 Circuits and Systems — Semester 1 — 12.5
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Anti-requisites for this subject are: **Subject** / **Study Period Commencement:** / **Credit Points:** ELEN30001 Control 1 (Classical Control) — Not offered 2016 — 12.50 MCEN30008 Control Systems 1 — Not offered 2016 — 12.50
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
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Subject Overview:	**AIMS** This subject provides an introduction to automatic control with an emphasis on classical techniques for the analysis and design of feedback interconnections. Automatic control

	systems, and feedback interconnections more generally, arise in diverse areas of science and engineering. The basic problem in automatic control is to achieve desired behaviour in circumstance where knowledge of the system dynamics and/or the operating environment is uncertain. Such modelling uncertainty is inevitable in engineering design and feedback is a key to dealing with it. This subject is a core requirement in the Master of Engineering (Electrical, Mechanical, and Mechatronics). **INDICATIVE CONTENT** Topics include: # Modelling for control – dynamical systems and the structure, stability, performance and robustness of feedback interconnections; # Frequency-domain analysis and design – Nyquist and Bode plots, gain and phase margins, loop-shaping with proportional-, integral-, lead-, and lag-compensators, loop delays, and fundamental limitations in single-input-single-output control system design; and # Actuator constraints and anti-windup compensation. This material is complemented by the use of software tools (e.g. MATLAB/Simulink) for computation and simulation, and exposure to operational control systems in the laboratory.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO's)** Having completed this subject it is expected that the student be able to: 1 Qualitatively and quantitatively describe the benefits of feedback in engineering systems 2 Apply fundamental frequency-domain techniques in the analysis and design of linear feedback control systems, as they arise in a variety of contexts 3 Use software tools to simulate and design the linear behaviour of automatic control systems.
Assessment:	One written examination, not exceeding three hours at the end of semester, worth 70% Continuous assessment of submitted project work completed in small groups (2-3 students), not exceeding 20 pages over the semester (approximately 25-30 hours of work per student), worth 20% A one-hour mid-semester test, worth 10%. Hurdle requirement: Students must pass the written exam to pass the subject. Intended Learning Outcomes (ILO's) 1 and 2 are assessed in the final written examination, the mid-semester test, and the submitted reports for two projects. ILO 3 is assessed as part of submitted project work and in-class discussions.
Prescribed Texts:	TBA
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:	Upon completion of this subject, students will have developed the following skills: # Ability to apply knowledge of basic science and engineering fundamentals # 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 # Capacity for independent critical thought, rational inquiry and self-directed learning # Ability to communicate effectively, with the engineering team and with the community at large
Notes:	Credit may not be obtained for both: # ELEN30001(431-324)Control1(classical control)and ELEN90055 Control Systems # MCEN30008 Control Systems1 and ELEN90055 Control Systems **LEARNING AND TEACHING METHODS** The subject is delivered through lectures and workshop classes that combine both tutorial and hands-on laboratory activities. **INDICATIVE KEY LEARNING RESOURCES**

	Students are provided with lecture slides, worked problem sets, project specifications, and reference text lists. **CAREERS / INDUSTRY LINKS** Exposure to industry standard engineering design automation tools through laboratory activities
Related Majors/Minors/ Specialisations:	B-ENG Electrical Engineering stream B-ENG Mechanical Engineering stream Master of Engineering (Electrical with Business) Master of Engineering (Electrical) Master of Engineering (Mechanical with Business) Master of Engineering (Mechanical) Master of Engineering (Mechatronics)