Unit Outline (Higher Education)

Institute / School: Institute of Innovation, Science & Sustainability

Unit Title: Control System Engineering

Unit ID: ENGRG4201

Credit Points: 15.00

Prerequisite(s): (ENGRG1004)

Co-requisite(s): Nil

Exclusion(s): (ENGIN3404)

ASCED: 031301

Description of the Unit:
The unit provides students with solid foundation in control system engineering alongside study of the effect of non-linearity on the systems dynamic response. The students will be facilitated to use the theoretical knowledge in laboratory demonstrations, projects and assignments. This will enhance the students level of understanding of the subject as well as allow them to appreciate the application of the unit in a physical environment.

Grade Scheme: Graded (HD, D, C, P, MF, F, XF)

Work Experience:

No work experience

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the Unit but gained a final mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment

Course Level:

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Introductory						
Intermediate						
Advanced			✔			

Learning Outcomes:

On successful completion of the unit the students are expected to be able to:

Knowledge:

K1. Demonstrate the principles of control system theory.
K2. Describe the role of Masons rule, PID Control, Nyquist and Routh stability criterion.
K3. Explain different control terms and parameters to evaluate the system behaviour.
K4. Examine transient and frequency response analysis.
K5. Discuss feedback control mechanisms of dynamic systems.
K6. Analyse and synthesise a multivariable control system.
K7. Explain the principles of system stability and dynamic systems.
K8. Interpret the behaviour of a control system when an input is applied.

Skills:

S1. Generate mathematical models of dynamic control system by applying differential equations.
S2. Analyse and characterise the behaviour of a control system in terms of different system and performance parameters.
S3. Design and simulate control systems, using control software, to achieve required stability, performance and robustness.
S4. Critically analyse and outline the dynamic response of closed loop systems.
S5. Evaluate and analyse system performance using frequency and transient response analysis.

Application of knowledge and skills:

A1. Apply mathematical and theoretical knowledge to design control system for a practical dynamic mechatronic process to achieve desired robustness and stability.
A2. Apply systematic engineering methods in solving and analysing complex mechatronic control systems.

Unit Content:

Topics may include:
1. Introduction and overview of control system.
2. Modelling in frequency domain.
3. Modelling in time domain.
4. Time response.
5. Reduction of multiple sub-systems.
6. Stability.
7. Root locus and frequency response techniques.
8. Designing, modelling and real time realisation of different control systems using control software.

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
S1-S5, A1-A2	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the unit.	Reports, demonstrations	10 - 30%

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
K1-K8, S1-S5	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the unit.	Assignments, quizzes	10 - 30%
K1-K8	Questions and problems related to the unit contents.	Exams / Tests	40 - 60%

Adopted Reference Style:

IEEE

Refer to the library website for more information

Fed Cite - referencing tool