Unit Outline (Higher Education)

Institute / School:	Institute of Innovation, Science & Sustainability
Unit Title:	ADVANCED CONTROL SYSTEMS ENGINEERING
Unit ID:	ENGIN5405
Credit Points:	15.00
Prerequisite(s):	Nil
Co-requisite(s):	Nil
Exclusion(s):	(ENMTX4020)
ASCED:	039999

Description of the Unit:

This is a capstone unit enhancing students knowledge and skills in the advanced topics of control system engineering. Through this unit students will appraise their understanding of the applications and importance of control system in mechatronic applications. Students will be able to interpret, analyse and exemplify different areas of automated control systems, digital control systems, predictive control systems and real time realisation using suitable control system software. Integrating this unit with the knowledge and understanding obtained in previous units, students will be able to distinguish between the principles of different control systems and will be able to apply them in developing and designing appropriate engineering processes. The theoretical knowledge will be complemented with projects and laboratory exercises. The activities will allow students to enhance their skills in designing software based models for controlling mechatronic systems. The students will also learn to appreciate applications of the developed knowledge and skills in industrial environment.

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

Work Experience:

No work experience: Student is not undertaking work experience in industry.

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 advanced understanding of the theory and applications of control systems and controllers.
K2. Analyse and interpret principles of digital control system.
K3. Demonstrate understanding of performing stability analysis of control systems.
K4. Explain and appraise different transformation techniques and methodologies.
K5. Demonstrate understanding of different control systems design.

Skills:

S1. Design, evaluate and critically analyse different control systems for stability and performance to ensure relevant criteria are met.
S2. Transform and evaluate different control systems.
S3. Design, analyse and perform real time realisation of different control systems using control software.

Application of knowledge and skills:

A1. Apply mathematical and theoretical knowledge to design and model an effective control system for a practical engineering process.
A2. Design and apply a suitable automatic control system in order to automate an industrial engineering process.

Unit Content:

Topics may include:

- Review of control system engineering including stability and steady state errors.
- Design via root locus, frequency response and state response.
- Introduction to the advanced principles of digital control system.
- Digital control system stability; the z-transform and stability analysis in z-domain.
- Overview of tustin transform, w-transform and higher harmonic control.

- Discrete system design and analysis.
- Predictive control system: modelling and principles.
- Optimal control: principles, designing and modelling.
- Stochastic optimal control and nonlinear optimisation.
- Advanced applications of calculus of variations to optimal control.
- Computer / microprocessor based control, adaptive control and fuzzy logic control systems.
- Multivariable controllers based on fuzzy logic and neural network methods.
- 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-S3, A1-A2	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the unit.	Reports, demonstrations	10-30%
K1-K5, S1-S3	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-K5	Questions and problems related to the unit contents.	Exams / Tests	40-60%

Alignment to the Minimum Co-Operative Standards (MiCS)

The Minimum Co-Operative Standards (MiCS) are an integral part of the Co-Operative University Model. Seven criteria inform the MiCS alignment at a Course level. Although Units must undertake MiCS mapping, there is NO expectation that Units will meet all seven criteria. The criteria are as follows:

1. Co-design with industry and students
2. Co-develop with industry and students
3. Co-deliver with industry
4. FedTASK alignment
5. Workplace learning and career preparation
6. Authentic assessment
7. Industry-link/Industry facing experience

MiCS Course level reporting highlights how each Course embraces the principles and practices associated with the Co-Operative Model. Evidence of Course alignment with the MiCS, can be captured in the Course Modification Form.

MICS Mapping has been undertaken for this Unit No

Date:

Adopted Reference Style:

Other (IEEE-Refer to the library website for more information)

Refer to the library website for more information

Fed Cite - referencing tool