Course Outline (Higher Education)

School: School of Engineering, Information Technology and Physical Sciences

Course Title: SYSTEM DYNAMICS AND CONTROL

Course ID: ENGIN3404

Credit Points: 15.00

Prerequisite(s): (MATHS3001 or MATHS3040)

Co-requisite(s): Nil

Exclusion(s): (ENMEC3500 and ENMTX3040)

ASCED: 030101

Description of the Course:

The course 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 course in a physical 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 course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

Program Level:

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory						
Intermediate						

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Advanced			✔			

Learning Outcomes:

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

Knowledge:

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

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. Analyse and characterise the behaviour of a control system in terms of different system and performance parameters.
S4. Evaluate and analyse system performance using frequency and transient response analysis.
S5. Design and simulate control systems, using control software, to achieve required stability, performance and robustness.
S6. Critically analyse and outline the dynamic response of closed loop systems.

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.

Course Content:

Topics may include:

- Introduction and overview of control system.
- Modelling in frequency domain.
- Modelling in time domain.
- Time response.

- Reduction of multiple sub-systems.
- Stability.
- Root locus and frequency response techniques.
- Designing, modelling and real time realisation of different control systems using control software.

Values:

V1. Appreciate the involvement and importance of control system engineering techniques in various mechatronic industrial processes and systems.

V2. Assess the applicability of a control systems in different mechatronic systems and task.

Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor		**Development and acquisition of GAs in the course**	
		Learning Outcomes (KSA)	**Assessment task (AT#)**
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1-K8 S1-S6 A1-A2	1-3
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	K1-K8 S1-S6 A1-A2	1-3
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	A1-A2	1-3
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	K1-K8 S1-S6 A1-A2	1-3
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	K1-K8 S4,S6 A1-A2	1-3

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
S1-S6, A1-A2	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the course	Reports, demonstrations	10 - 30%
K1-K8, S1-S6	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the course	Assignments, quizzes	10 - 30%
K1-K8	Questions and problems related to the course contents	Exams / Tests	40 - 60%

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