

Module Specification

Module Summary Information

1	Module Title	Control Engineering
2	Module Credits	20
3	Module Level	7
4	Module Code	ENG7148

5	Module Overview
<p>The module utilises the mathematical concepts such as transform calculus and matrix theory used to model systems using both the transfer function and state-space paradigms. You will then be able to design controllers for linear systems using time and frequency response methods, in particular, pole placement techniques will be applied using both input-output and state-feedback approaches. These will then be extended to observer design and LQR optimization.</p> <p>Teaching and assessment will comprise not only of traditional lectures and tutorials, but also the use of industry standard software for problem solving.</p>	

6	Indicative Content	
	Lecture Topics	Tutorial and Post-session Activities
	Linear System Modelling	Mathematical software
	The Root-Locus Method	Numerical Root Locus methods
	Lag-Lead and PID Controllers	Solution with Bode/Nyquist Plots
	State-Feedback Control Design	Pole Placement Solution
	State-Observer Design	Luenberger Solution
	Optimal Control	Solution using LQR Methods
	Optimal Observers	Kalman Filter Solution
	ON-OFF Control	Describing Functions
	Sliding Mode Control	Lyapunov Functions
	Optimal Seeking Controllers	Optimal Perturbation

7		Module Learning Outcomes
On successful completion of the module, students will be able to:		
1	Design classical controllers using Laplace, Fourier or Z-Transfer Function techniques.	
2	Implement pole placement controllers using state-feedback and modern control approaches.	
3	Formulate observers or Kalman filters.	
4	Apply modelling, simulation and control techniques using industry standard software to solve typical engineering problems.	

8		Module Assessment		
Learning Outcome		Coursework	Exam	In-Person
1-4			X	

9		Breakdown Learning and Teaching Activities
Learning Activities	Hours	
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	36	
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	N/A	
Private Study (PS) includes preparation for exams	164	
Total Study Hours:	200	