IMPERIAL

Module Specification

Basic details

UID		Cohorts covered	Earliest cohort: Latest c:
Long title	Control Engineering		
New code	ELEC70089	New short title	
Brief description of module *(approx. 600 chars.)*	This module aims to introduce you to state-space methods for the analysis and design of control systems. You will learn how to obtain state-space models from transfer functions and vice versa. You will assess the stability properties of dynamical systems and structural properties such as reachability and observability. Finally, you will design feedback controllers in a systematic way to modify the behaviour of the system.		

425 characters

Available as a standalone module/ short course? No

Statutory details

	ECTS	CATS	Non-credit	HECOS codes
Credit value	5	10	N	
FHEQ level	Level 7			

Allocation of study hours

	Hours	
Lectures	20	
Group teaching	0	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	2	*Incl. project supervision, fieldwork, external visits.*
Independent study	103	*Incl. wider reading/ practice, follow-up work, completion of assessments*
Placement	0	*Incl. work-based learning and study that occurs overseas.*
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 1	Other	

Ownership

Primary department	Department of Electrical and Electronic Engineering
Additional teaching departments	
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N

External institution	N/A
External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module leader		Giordano	Scarciotti

Learning and teaching

Module description

Learning outcomes	Upon successful completion of this module, you will be able to: 1. Construct models of dynamical systems using differential and difference equations 2. Compute a state-space representation from a given transfer function and vice versa, and quantify difference between the two representations 3. Assess stability properties of dynamical systems and structural properties 4. Devise feedback controllers in a systematic way to modify the behaviour of dynamical systems 5. Assess a priori what behaviour can and cannot be achieved in a dynamical system 6. Devise, implement and validate a linear regulator
Module content	Abstract dynamical systems; Differential and difference equations; State space models; Lyapunov stability; Structural properties (controllability and observability); Kalman decomposition; Pole placement via state feedback and dynamic output feedback; Observer design.
Learning and Teaching Approach	This module is taught as a traditional module with theoretical lectures supported by exercises and examples. The lectures cover the topics from a theoretical point of view. Concepts, problems and solution methods are explained and justified from a theoretical and intuitive point of view. The coursework requires understanding a new topic, such as Adaptive Control, the Regulator Theory, and solve a design problem.
Assessment Strategy	The module is assessed by a 3-hour, closed book, written examination (75%) and by a Coursework component (25%).
Feedback	You will be provided with written comments on exam example answer sheets. Feedback to the coursework will be provided within 2 weeks, with comments on the script and a grade.
Reading list	

	Antsaklis, P.J., & Michel, A.N.: Linear Systems Primer, a, Springer, 2007

Quality assurance

Date of first approval	
Date of last revision	April 2024
Date of this approval	May 2025
Module leader	Giordano Scarciotti
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version #####

Assessment details

Grading method	Numerical	Pass mark	50%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	3 hour closed book written examination	75%	50%	N
Coursework	CW on a selected topic in systems and control theory. The CW requires understanding a new topic, such as Adaptive Control, the Regulator Theory, and solve a design problem.	25%	50%	N
		100%		