IMPERIAL

Module Specification

Basic details

UID

Cohorts covered — Earliest cohort

Long title: Systems Identification and Learning

New code: ELEC70092

New short title

Brief description of module *(approx. 600 chars.)*: The aim of the module is to introduce methods for constructing stochastic models of dynamical systems and learning their parameters from measurements of input and output signals. The module also covers basic techniques for prediction of unknown quantities exploiting available sensor data.

Available as a standalone module/ short course? No

Statutory details

	ECTS	CATS	Non-credit	HECOS codes
Credit value	5	10	N	

FHEQ level: L7

Allocation of study hours

	Hours	
Lectures	20	
Group teaching	0	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	0	*Incl. project supervision, fieldwork, external visits.*
Independent study	105	*Incl. wider reading/ practice, follow-up work, completion of assess*
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: 0

Delivery campus: South Kensington

Collaborative delivery

Collaborative delivery?	No

External institution	
External department	
External campus	

Associated staff

Role	CID	Given name	Surname
Module Leader		Thomas	Parisini
		0	0
		0	0
		0	0
		0	0
		0	0
		0	0
		0	0
		0	0
		0	0

Learning and teaching

Module description

Learning outcomes	Upon completion of the module, you will be able to: 1- construct discrete-time stochastic models of dynamical systems; 2- calculate parameters in stochastic models from input/output data; 3- develop and devise prediction algorithms making use of data provided by sensors, as well as historical data; 4- assess the quality of parameter estimates in stochastic models.
Module content	Stochastic dynamical systems and their description in terms of standard discrete time models; these include, for example, linear difference equation models known as ARMAX (Autoregressive Moving Average models with Exogenous input) model; Basics of estimation and learning theory; Least-squares parameter estimation; The statistical properties of parameter estimates; Recursive algorithms for parameter identification; Sources of parameter bias; The effects of over-parameterization; Techniques for selecting model order.
Learning and Teaching Approach	Lectures are delivered to illustrate the new concepts and provide examples of their use. A coursework component complements the learning experience and is designed to apply and verify the knowledge acquired.
Assessment Strategy	3 hour closed book written examination (75%) and coursework (25%) on identification of linear time-invariant models subject to stochastic disturbances.
Feedback	Formative feedback is given through comments on the submitted coursework delivered within 2 weeks of submission. Moreover, students are welcome to ask in person clarifications both during lectures or during office hours. Summative feedback is given in the form of provisional letter grades.
Reading list	Supplemental reading: 1) Ljung, L: System Identification: theory for the user, Prentice Hall, 1999. 2) Soderstrom, T: Discrete-time Stochastic Systems: estimation and control, Springer, 2002

Quality assurance

Office use only

Date of first approval	February 2022	QA Lead	
Date of last revision	April 2024	Department staff	
Date of this approval	May 2024	Date of collection	
		Date exported	
Module leader	Thomas Parisini	Date imported	
Notes/ comments			

Template version

Assessment details

			Pass mark
Grading method	Numerical		50%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	3 hour closed book written examination	75%	50%	N
Coursework	Data generation, Identification and Evaluation of LTI models	25%	50%	N
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
0	0	0%	0%	0.00
		100%		