IMPERIAL

Module Specification

Basic details

UID		Cohorts covered (Earliest cohort)	
Long title	Laboratory in CSP		
New code	ELEC70095	New short title	
Brief description of module *(approx. 600 chars.)*	This laboratory course aims to foster best practice in experimental work, while supporting the lecture courses and giving practical exposure to real systems. It also aims to prepare students for experimental work of the MSc project.		

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit	
Credit value	10	20	N	HECOS codes

FHEQ level: Level 7

Allocation of study hours

	Hours	
Lectures		
Group teaching		*Incl. seminars, tutorials, problem classes.*
Lab/ practical	30	*Inc. professional and research skills training*
Other scheduled		*Incl. project supervision, fieldwork, external visits.*
Independent study	220	*Incl. wider reading/ practice, follow-up work, completion of assess*
Placement		*Incl. work-based learning and study that occurs overseas.*
Total hours	250	
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	Electrical and Electronic Engineering
Additional teaching departments	
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N

External institution	
External department	
External campus	

Associated staff

Role	CID	Given name	Surname
Module Leader		Cong	Ling

Learning and teaching

Module description

Learning outcomes

Upon successfully completing this module you should have acquired both theoretical knowledge and implementation/design skills in 5 of the following subjects:
- the advantages and drawbacks of different methodologies for designing and implementing discrete time filters
- the theory of wavelet transformations and the demonstration of over conventional transforms using typical image processing applications
- the concept of sparse signals and the easy-to-understand techniques for sparse signal recovery
- the key elements of MIMO communication theory, and furthermore, the concepts of channel capacity, fading channel, QAM modulation and MIMO detection, combined with practical simulations related to the above concepts
- the algorithms for adaptive signal processing with particular emphasis given to the Least Mean Square (LMS) and Recursive Least Square (RLS) adaptive algorithms, with their performance being investigated when they are used for echo cancellation, system identification and channel equalisation
- the properties of conventional Fourier transform-based techniques compared with modern model-based methods for power spectral density estimation
- the scenarios where one would want to transmit energy and information simultaneously over a single line, using power-limited receivers that can harvest the received energy
- the theoretical framework for handling various problems in array communication and processing with emphasis on the so-called super-resolution approaches
- the implementation of a speech coder based on Linear Predictive Coding (LPC) and the investigation of LPC analysis through a series of tests on speech data
- the examination and implementation of several fundamental image processing algorithms, ranging from elementary operations to more complicated image processing

Module content

Adaptive signal processing and adaptive systems, array communications & processing, speech processing, channel coding with software defined radio, digital filter design, image processing, MIMO-OFDM systems, multi-input multi-output communications, spectral estimation techniques, wavelet transforms versus conventional transforms.

Learning and Teaching Approach	The Learning and Teaching approach for each experiment consists of three elements: - Independent study: the student must acquire a substantial amount of both the theoretical knowledge and the practical skills related to the experiment through reading and implementing algorithms, using the resources provided by the academic in charge. - Demonstrator: for each experiment, a demonstrator (usually a PhD student) will be in the laboratory for three hours per week, on both weeks of the experiment, and they will be on standby (often in their office) for a further 6 hours each week. The above times are all scheduled in CELCAT, but they can be modified after communication between the demonstrator and the individual group of students who are conducting an experiment at a certain period. During this time, the demonstrator will provide feedback to students on their progress, suggest further improvements, and answer questions regarding the theory and practical implementation of the experiment. - Academic member in charge: specific points on any experiment may need to be answered by the academic in charge of that experiment. An introductory session will introduce students to the laboratory space and available equipment (computers/software). They will also receive a document containing the laboratory assignments. More than 50% of the activities are conducted in groups.
Assessment Strategy	For each experiment the students are expected to keep a logbook. This is an adequate time-record (diary) of the student's work, so that several weeks later both the student and the demonstrator can understand the experimental work and be able to check the results that have been obtained. Brief notes on the relevant theory may also be included in the logbook. Each experiment should conclude with an informal assessment and a discussion of the results. Logbooks should be submitted to the demonstrator for examination within one week of completing the experiment. The student must submit two formal reports for two out of the five experiments. The logbook should serve as the primary source of results for the formal reports. A formal report should be written in the style of a scientific journal paper. It should introduce the topic concisely, avoiding excessive historical background or redundant textbook content. Reference to relevant theory and background should be given. A discussion of the results, a summary and conclusions should also be included. A self-reflection on both individual contributions and overall team performance will also be assessed in a written report. You will need to describe team organisation, your role within the team, effectiveness of own contribution and reflection on team working skills acquired.
Feedback	Log books are assessed by lab demonstrators, then returned to students with feedback and a Pass/Fail mark. Formal reports are assessed online. Students received comments in PDF and a grade.
Reading list	

Quality assurance

Date of first approval	
Date of last revision	April 2025
Date of this approval	
Module leader	Cong Ling
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version

Assessment details

Grading method		Pass mark
Grading method	Pass/Fail	100%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Coursework	Logbook 1	0%	50%	N
Coursework	Logbook 2	0%	50%	N
Coursework	Logbook 3	0%	50%	N
Coursework	Logbook 4	0%	50%	N
Coursework	Logbook 5	0%	50%	N
Coursework	Formal report 1	50%	50%	N
Coursework	Formal report 2	50%	50%	N
Coursework	Self-reflection on individual performance as part of the team	0%	50%	Y