

Basic details

UID		Cohorts covered	Earliest cohort	Latest c
Long title	Wireless Communications and Optimisation			
New code	ELEC70081	New short title		
Brief description of module (approx. 600 chars.)	The module 'wireless communications' is an advanced module on wireless communication and communication theory that details the fundamentals of wireless communications from a 4G and beyond perspective. MIMO (often combined with OFDM) has become an essential part of any wireless communication system and has been adopted in various systems as IEEE 802.11n (WiFi), IEEE802.16e and m (WiMAX), 3GPP LTE and LTE-Advanced. MIMO forms the essential technology of 4G and future 5G communication systems. The module will be valuable if you are pursuing either a PhD in communication or a career in a high-tech telecom company (research centres, R&D branches of telecom manufacturers and operators)			
Available as a standalone module/ short course? No 691 characters				

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	10	<i>Incl. seminars, tutorials, problem classes.</i>
Lab/ practical	0	
Other scheduled	0	<i>Incl. project supervision, fieldwork, external visits.</i>
Independent study	95	<i>Incl. wider reading/ practice, follow-up work, completion of assessments</i>
Placement	0	<i>Incl. work-based learning and study that occurs overseas.</i>
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed?

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Spring	Other	

Ownership

Primary department	Department of Electrical and Electronic Engineering
Additional teaching	0

departments

Delivery campus

South Kensington

Collaborative delivery

Collaborative delivery?

No

External institution

External department

External campus

Associated staff

Role	CID	Given name	Surname
Module Leader		Bruno	Clerckx
		0	0
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		0	0
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Learning and teaching

Module description

Learning outcomes

After successful completion of this module, you will be able to:

- 1) mathematically model and analyze wireless communications systems
- 2) design the fundamental building blocks (transmitters and receivers) of multi-cell multi-user multi-antenna communication systems
- 3) optimize wireless communication systems
- 4) evaluate the performance of modern (5G and beyond) communications systems

Module content

- 1) Basics of Wireless: wireless channel, fading and diversity, capacity of wireless channels
- 2) MIMO systems: basics of MIMO, MIMO channel, capacity of MIMO wireless channels, transmission and reception strategies
- 3) Multiuser communications: capacity of downlink and uplink multiuser (SISO and MIMO) channels, scheduling, precoding, massive MIMO, multiuser multicell communications
- 4) Optimization of wireless communications using convex and Lagrangian optimization

Learning and Teaching Approach

The course is made of 2 parts: lectures covering the main and theoretical concepts and classes where practical examples will be discussed and demonstrated. The ratio is 2 to 1 with 20h of lectures and 10h of classes.

Assessment Strategy

The assessment is 100% coursework based (three courseworks). All courseworks are MATLAB based projects.

Feedback

You will be provided with written feedback within two weeks after each coursework submission.

Reading list

Tse, D., & Viswanath, P: Fundamentals of Wireless Communication, Cambridge University Press, 2005.
Clerckx, B., & Oestges, C: MIMO Wireless Networks: channels, techniques and standards for multi-antenna, multi-user and multi-cell systems, Academic Press Elsevier, 2013.
Some other recent papers and tutorials.

Quality assurance

Date of first approval February 2022
Date of last revision March 2023
Date of this approval

Module leader Prof Bruno Clerckx

Notes/ comments

Office use only

QA Lead
Department staff
Date of collection

Date exported
Date imported

Assessment details

Grading method	Numerical
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Pass mark

50%

Assessments

[illegible]

100%