IMPERIAL

Module Specification

Basic details

UID		Cohorts covered (Earliest cohort)	
Long title	Communications		
New code	ELEC50002	New short title	
Brief description of module *(approx. 600 chars.)*	This module takes you through the idea of transmitting information from one point to another in the presence of noise. The module will introduce you to both analogue and digital transmission, show how the two are connected, and explain the differences (e.g. signal-to-noise ratio vs. bit error rate). You will also be introduced to information theory, and the fundamental theoretical limits of compression and channel coding it identifies.		
Available as a standalone module/ short course?	N		

Statutory details

	ECTS	CATS	Non-credit	
Credit value	7.5	15	N	HECOS codes
FHEQ level	Level 5			

Allocation of study hours

	Hours	
Lectures	16	
Group teaching	8	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	12	
Other scheduled		*Incl. project supervision, fieldwork, external visits.*
Independent study	151.5	*Incl. wider reading/ practice, follow-up work, completion of assess*
Placement		*Incl. work-based learning and study that occurs overseas.*
Total hours	187.5	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed?	No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 2	Other	

Ownership

Primary department	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		Deniz	Gunduz

Learning and teaching

Module description

Learning outcomes	Upon successful completion of this module, you will be able to: 1. Model noise in wireless communication systems 2. Understand the performance measures for analog and digital communication systems, and compare the performance of different modulation techniques 3. Explain the fundamental limits information theory sets on the performance of communication systems; 4. Calculate the entropy of a random variable, and design the Huffman code for a given information source 5. Design, implement and characterise hardware/software implementation using the NI USRP software defined radio platform 6. Understand the role physical layer plays within larger communication networks
Module content	Modulation/demodulation. Interpretation and understanding of signals in different domains (time, frequency, spectrum ...). Effects of noise in communication systems. Digital communication systems. Introduction to information theory. Introduction to codes for compression and error correction coding.
Learning and Teaching Approach	You will be taught through in a large lecture theatre to the whole year group using PowerPoint presentation and interactive teaching technology supported question and answer sessions. These lectures will be recorded. Exercise classes consist of thirty-sixty students will focus on applying the techniques covered in lectures to a variety of problems ranging from the easy to the difficult, with the chance to ask questions and get one-to-one help. These classes will involve both individual as well as group work. In tutorial groups of 3-4 students you will have the opportunity to solve a selection of problems with your personal tutor. Laboratory exercises will link the topics taught directly to their applications. Simulations will be part of the learning in applied settings.
Assessment Strategy	There will be a computer-based test during midterm week. The laboratory work is a part of the module assessment. This assessment will be based on an oral exam that evaluates your understanding of the concepts and your ability to explain and build the experimental set-up. The final exam will cover all the topics in the module.

Feedback	Feedback will be given in the exercise classes. Computer-based tests will generate automatic feedback. Feedback on the oral laboratory exam will be given after the assessments. Feedback on the exams will be given after re-assessments have been given. This feedback will come in the form of annotated example answers. The annotations will highlight where the student cohort did well and where general problems in understanding were observed.
Reading list	
Required equipment/ software	NA

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	July 2025
Module leader	Deniz Gunduz
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version

Assessment details

Grading method	Numeric	Pass mark	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination				
Practical	laboratory practicals	30%	40%	N
Examination	Spring term mid-term computer based test	10%	40%	N
Examination	exam at start of summer term	60%	40%	N
		100%		