IMPERIAL

Module Specification

Basic details

			Earliest cohort	Latest c
UID		Cohorts covered		

Long title: Analogue Signal Processing

New code	ELEC70004	New short title	

Brief description of module
(approx. 600 chars.)

This module aims to introduce analogue signal processing techniques that can be used to perform computation in the analogue front end prior to back end processing and/or communication, with the aim to increase signal integrity as well as reduce the power consumption of the system as whole. This is particularly beneficial for biomedical systems and portable battery operated systems such as mobile handhelds whereby high dynamic range, computational bandwidth and power consumption is crucial.

494 characters

Available as a standalone module/ short course? No

Statutory details

	ECTS	CATS	Non-credit
Credit value	5	10	N

FHEQ level: L7

HECOS codes:

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 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? 0

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 2	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		Pantelis	Georgiou
		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 successful completion of this module, you will be able to:
1. Explain the different analogue processing domains and analyse the analogue/digital trade off
2. Design and analyse fundamental circuits using Current mode Techniques (Translinear Synthesis, Current mode computation, Log-domain filtering, current conveyors)
3. Design and analyse fundamental circuits using Voltage mode Techniques (V-I, I-V converters, Wide range Transconductance amplifiers, Trigonometric Circuits (Tanh, Sinh, exponential) Comparators, Peak Detection)
4. Design and analyse fundamental circuits using Switch Capacitor Techniques (Integrators, Differentiators, Memory Cells, Correlated Double Sampling and Chopper Stabilization)
5. Design and analyse fundamental circuits using Spike domain coding (Integrate and Fire Neurons, Cortical computation)
6. Discuss a Case Study in Biomedical Electronics.

Module content:

Introduction to domains and the analogue/digital trade off;
Current mode Techniques (Translinear Synthesis, Current mode computation, Log-domain filtering, current conveyors);
Voltage mode Techniques (V-I, I-V converters, Wide range Transconductance amplifiers, Trigonometric Circuits (Tanh, Sinh, exponential) Comparators, Peak Detection);
Switch Capacitor Techniques (Integrators, Differentiators, Memory Cells, Correlated Double Sampling and Chopper Stabilization);
Spike domain circuits (Integrate and Fire Neurons, Cortical computation);
Case Study in Biomedical Electronics.

Learning and Teaching Approach	This module is taught through lectures. These focus on the analogue/digital trade off; current mode techniques, voltage mode techniques, switch capaciator techniques, and spike domain circuits. The module's lectures conclude by looking at case study in biomedical electronics focussed around cochlear implants. The techniques you will be introduced to are extremely important for future integtrated circuit design especially in the wireless industry.
Assessment Strategy	An exam will test your knowledge on the material covered in this module. The format of the exam is a 3-hours, closed book, written examination.
Feedback	Formative feedback will be provided on an ongoing basis in the classroom (as general comments). Feedback on the exam will be provided in the form of annotated model solutions after resit exams have taken place.
Reading list	1) Toumazou, C.: Analogue IC CDesign: the current-mode approach, IET Press, 1993. 2) Razavi, B: Design of Analog CMOS Integrated Circuits, Mc-Graw Hill, 2003. 3) Sarpeshkar, R.: Ultra Low Power Bioelectronics, Cambridge University Press, 2010

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	July 2025
Module leader	Prof Pantelis Georgiou
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

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	100%	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
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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%		