Faculty of Engineering and the Built Environment

Department of Electrical Engineering

2020 Course Handout: EEE4114F

Course Name:	DIGITAL SIGNAL PROCESSING
SAQA Credits:	16
Pre-requisites:	EEE3092F (Signals and Systems II) or EEE3094S (Control Systems Engineering)
Co-requisites:	None

Course convenor:	A/Prof. Fred Nicolls
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Office location:	Menzies 4.38
Consultation hours:	By arrangement
Course lecturer:	Fred Nicolls, Jarryd Son
Teaching assistant:	Yaaseen Martin

Lecture venue:	Chemical Engineering seminar room
Lecture days and time:	Mon, Wed (period 6-7)
Laboratory venue	MCB LT2
Laboratory days and times	Thu (period 8-9) (Optional)

Course objectives

This course aims to develop an advanced understanding of digital signal processing. Topics include: discrete time signals and systems; the discrete Fourier transform properties and fast algorithms; the z-transform; frequency response from z-plane; FIR and IIR filter design and structures for digital filters. The course includes a specialist component in an applied or advanced signal processing application area.

Learning outcomes

Students successfully completing this course will have the following:	Exit level	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO10	LO11
A. Knowledge (Information plus Understanding)												
Representation of discrete-time signals and systems, both in time and frequency domains						8						
Discrete-time Fourier transformers, Z-transforms, wavelet and other joint time-frequency transforms, and their applications						8						
How to convert between continuous-time and discrete-time domains						8						
Using digital signal processing for filtering applications			8									
B. Skills (Application of Knowledge)												
Be able to calculate responses (in various different ways) of discrete-time systems to given signals		8										
Classify discrete-time systems according to their properties			8									
Convert between different but equivalent representations of linear time- variant systems			8									
Design and implement FIR filters for specific applications				8								
C. Values and Attitudes												
Appreciate the value of fundamental mathematical sciences to the procedural design of complex digital signal processing			8									
Develop an understanding and application of the design / synthesis procedure				8								
See advanced applications of digital signal processing and transform theory			8									

Detailed course content

Upon completion of the course students will be able to calculate responses (in various different ways) of discrete-time systems to given signals; classify discrete-time systems according to their properties (eg. stability); derive frequency responses for given digital filters; design FIR and IIR filters for desired frequency and phase responses; be able to select best filter architecture for a specific implementation, and use appropriate windows in spectrum estimation. They will also have basic familiarity with methods in selected areas where signal processing is applied.

TEST DATES: 11 March (4-6pm), 22 April (4-6pm) (to be confirmed)

Knowledge areas

Maths Sciences	Natural Sciences	Eng Sciences	Design & Synthesis	Complm Studies
		75	25	

Learning environment

Lectures and optional tutorials, computer assignments, problem sets, project.

Suggested time allocation

Learning Activity	**No./ week**	**Time in hours**	**Contact time Multiplier**	**Total no of hours**
Number of lectures ***per week***	**4**	**0.75**	**2**	**72**
Number of tutorials ***per week***				
Total practical/lab periods				
Total other contact periods				
Total assignment non-contact ***hours***	**---**	**72**	**---**	**72**
Assessment hours (Tests, Exam)	**---**	**4**	**4**	**16**
Number of weeks the course lasts		**---**	**---**	**---**
Total hours	**---**	**---**	**---**	**160**

General assessment strategy

Assessment Task	**%**	**The following DP rules apply:**
Assignments	5	None.
Tutorials		
Labs		
Project	15	
Tests	20	
Exam	60	
Total	**100**	

Books/Reading Materials/Notes

Recommended text: Oppenheim and Schafer, Discrete-Time Signal Processing

Comprehensive set of notes given out during course.

Absence: The continuous assessment marks will be adjusted to allow for absence only on the following grounds:

- A medical certificate for absence of 3 or more consecutive days or any day with a class test or exam
- Death of an immediate family member (parent or sibling)
- Pre-arranged absence to represent a University, provincial or national team.

Academic dishonesty: Plagiarism is a very serious offence and usually leads to disciplinary action that could include expulsion from the university. Therefore, recognise the work of others in any submission. Details of referencing methods are widely available on the Web. A non-plagiarism declaration must be submitted with all work submitted for marking.