Module Specification

Module Summary Information

1	**Module Title**	Applied Digital Signal Processing
2	**Module Credits**	20
3	**Module Level**	7
4	**Module Code**	ENG7154

5	**Module Overview**

Digital Signal Processing is an emerging field in electronic engineering which has been rapidly growing over the last few decades. In DSP data is converted from the continuous domain into the discrete domain and processed as scalar dimensionless values. This when compared to Analogue (continuous time) processing Digital (discrete time) processing has a number of tangible benefits including but not limited to, repeatability, cost, response which is a closer approximation to ideal characteristics. DSP has applications in wide range of disciplines ranging from biomedical electronics and media.

In this module you will learn about analytical techniques used to create realisable digital filters which can be applied for numerous applications. There is combination of theoretical and practical aspect to this module which culminates with a demonstration and viva for a real time realisable digital filter implementation.

6	**Indicative Content**

Session 1: Discussion on Digital Signal Processors including architecture, comparison between general purpose microprocessors and fixed point verses floating point.
Laboratory 1
Introduce and get started with the DSP development board.

Seminar 2: Simple low pass, high pass, band pass and band stop digital filter design.
Laboratory 2
Implement a real time digital filter using Matlab.

Seminar 3: Discussion on IIR Filter design and realisation.
Laboratory 3
Implement a real time digital filter using Matlab

Seminar 4: Discussion FIR Filter design and realisation.
Laboratory 4
Implement a real time digital filter using Matlab

Seminar 5: Determine the filter coefficients for digital filter from the transfer function.
Laboratory 5
Implement a real time digital filter using Matlab

Seminar 6: Discussion on the necessity of applying the Window function for filter realisation. Most frequently used window functions will be discussed including Rectangular, Hanning, Hamming and Blackman.
Laboratory 6
Discussion on Assignment which will be released.

Seminar 7: Discussion on Linear phase response filter using a causal symmetrical impulse response.
Laboratory 7
Implement a real time digital filter using Matlab
Seminar 8: Digital filter design for audio applications
Laboratory 8
Implement a real time digital filter using Matlab

Seminar 9: Digital filter design for biomedical applications
Laboratory 9
Implement a real time digital filter using Matlab

Seminar 10: Filter design using Bi Linear transform
Laboratory 10
Implement a real time digital filter using Matlab

Seminar 11: Multidimensional filters for image processing.
Laboratory 11
Implement a real time digital filter using hardware.

Seminar 12: introduction to Spectroscopy and its applications biomedical applications
Laboratory 12
Implement a real time digital filter using hardware.

7	**Module Learning Outcomes** **On successful completion of the module, students will be able to:**	
	1	Compute and determine the required digital filter parameters in order to produce the specified magnitude, phase and frequency response.
	2	Analyse various windowing techniques to apply the most appropriate to meet the specific hardware realisable filter requirements.
	3	Identify the contrasting features of a digital signal processor versus a general purpose microprocessor recognising applications of DSP in audio, image and medical processing.
	4	Implement a fully functional real time digital filter using the hardware provided.

8	**Module Assessment**		
Learning Outcome			
	Coursework	**Exam**	**In-Person**
1-4	**X**		**X**

9	Breakdown Learning and Teaching Activities
Learning Activities	**Hours**
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	36
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	N/A
Private Study (PS) includes preparation for exams	164
Total Study Hours:	200