DESG E7002: DSP Systems Design

Full Title:	DSP Systems Design
Module Code:	DESG E7002
Credits:	5
Valid From:	Semester 1 - 2009/10 (September 2009)
Module Delivered in	1 programme(s)
Module Description:	Digital Signal Processing has been an expanding area of design and research over the last decade and a bridge between software and hardware design engineers. Advances in technology have seen an exponential growth in DSP applications (telecommunications, speech, imaging, sonar, control). This modules provides a solid introduction to this very important topic.

Learning Outcomes:

On successful completion of this module the learner should be able to

1. Describe the basic building blocks of a DSP system as well as the advantages and disadvantages.
2. Apply Fourier Series to the anlysis of continuous signals
3. Calculate the output of a discrete system using convolution.
4. Analyse the operation of chosen DSP algorithms suce as Digital Filters and DFT(Discrete Fourier Transform).
5. Develop Matlab models for some common DSP algorithms.

Module Content & Assessment

Indicative Content
Matlab Introduction to use of MAtlab. Matlab online resources. Some simple programs to illustrate capabilities of MAtlab.
Fourier Series Review of Fourier Series. Synthesising signals using Matlab and based on Fourier Series theory.
Discrete Signals Sampling. Aliasing. Building blocks of a DSP system. Reconstruction. Continuous, discrete and digital signals.
Convolution of Discrete Signals Theory of Convolution. Using Java applets to illustrate convolution. Linear systems. Causal systems. Real-time systems. Time-Invariance. Stability. Operations required for convolution.Impulse and Unit Sequences. Impulse response.
Z Transforms The Z transform from first principles. Using the Z transform tables. Using the Inverse Z transform tables. The Transfer function. Partial fractions and long division in conjunction with inverse Z transform tables. Convolution in the Z domain. Stability and poles and zeros on the Z plane.
Digital Filters Operation of filters. General types of filters (low pass, high pass etc) and their ideal responses. Anit-aliasing analog filter and smoothing analog filter. Digital filters. FIR and IIR filters.Determine the frequency response of a digital filter from its transfer function in the Z domain.Stability of filters. A digital oscillator.
Discrete Fourier Transform(DFT) Introduction to the DFT
Correlation Introduction to Correlation

Assessment Breakdown	%
Course Work	30.00%
End of Module Formal Examination	70.00%

Full Time

Course Work

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Marks Out Of*	*Pass Marks*	*Assessment Date*	*Duration*
Performance Evaluation	A series of 4 Tutorials on various topics that students complete individually but with group help. These can be mathematical in nature and are submiited in handwritten form for formative and summative feedback.	1,2,3,4	8.00	0	0	n/a	0
Written Report	Assignemnet 1 is an introduction to Matlab and analysis of continuous signals using complex numbers.	2,5	5.50	0	0	Week 3	0
Written Report	Assignment 2 looks at using Matlab to analyse discrete signals.	1,5	5.50	0	0	Week 6	0
Written Report	Assignment 3 uses Matlab to build an understanding of the operation of Digital Filters	1,4,5	5.50	0	0	Week 9	0
Written Report	Assignment 4 analyses the frequency of digital filters using MAtlab	4,5	5.50	0	0	Week 12	0

No Project

No Practical

End of Module Formal Examination							
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Marks Out Of*	*Pass Marks*	*Assessment Date*	*Duration*
Formal Exam	End-of-Semester Final Examination	1,2,3,4	70.00	0	0	End-of-Semester	120

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

DKIT reserves the right to alter the nature and timings of assessment

Module Workload & Resources

Workload: Full Time

Workload Type	Workload Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	No Description	1.00	Every Week	1.00
Practical	USing Matlab or equivalent to understand DSP theory and algorithms	2.00	Every Week	2.00
Tutorial	Hand written exercises	1.00	Every Week	1.00
Independent Study	No Description	2.00	Every Week	2.00
Directed Reading	No Description	2.00	Every Week	2.00
			Total Weekly Learner Workload	8.00
			Total Weekly Contact Hours	4.00

This course has no Part Time workload.

Resources

Recommended Book Resources

R.Lyons, *Understanding DSP*, Addison Wesley

Steven W Smith, *Digital Signal Processing, A Practical Guide for Engineers and Scientists*

S.Mitra, *DSP A Computer Based Approach*, McGraw Hill

J.McClellan, *DSP First*, Prentice Hall

D.Grover, *DSP and the Microcontroller*, Prentice Hall

This module does not have any article/paper resources

Other Resources

Website: *n/a*, John Hopkins University
http://www.jhu.edu/~signals/

Website: *n/a*, DSP Guru
http://www.dspguru.com/

Website: *n/a*, DSP Related
http://www.dsprelated.com/

Website: Steven W Smith*n/a*
http://www.dspguide.com/

Module Delivered in

Programme Code	Programme	Semester	Delivery
DK_EELES_7	Bachelor of Engineering in Electrical and Electronic Systems	5	Group Elective 1