<table>
<tr><td colspan="2">Module title Computational Methods</td><td colspan="2"></td></tr>
<tr><td colspan="2">Name of module convenor/leader/coordinator
Kath Tipping</td><td colspan="2"></td></tr>
<tr><td>(a) class contact hours 30</td><td>(b) private study hours 70</td><td>(c) Total notional hours (i.e. the sum of (a) and (b) 100</td><td>Credit rating 10</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Assessment method Exam (100%)</td><td colspan="2">Compulsory</td></tr>
<tr><td colspan="2">Prerequisites None</td><td colspan="2"></td></tr>
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Aim

The module aims to emphasise the importance of linear systems in engineering situations and to provide a variety of computational methods for solving linear systems of equations and eigenvalue problems.

Syllabus/curriculum

Matrices and types of linear systems, Direct elimination methods, Solution to tridiagonal Systems, Conditioning and stability of solutions, Iterative methods and convergence Criteria, Eigenvalue and eigenvector problems

Intended learning outcomes

On completion of this module the student will be able to:

- Understand and apply matrix algebra, linear dependence and independence.
- Choose an appropriate method for solving a particular linear system of equations.
- Demonstrate an awareness of difficulties such as ill-conditioning, and be able to suggest ways of minimising the problems.
- Understand the concept of eigenvalues and eigenvectors and their importance.
- Apply several techniques for finding eigenvalues and eigenvectors in practical problems.
- Use MATLAB to solve some practical problems.

Module title **Digital Signal Processing**			
Name of module convenor/leader/coordinator **Prof Leonid Gelman**			
(a) class contact hours 30	(b) private study hours 70	(c) Total notional hours (i.e. the sum of (a) and (b) 100	Credit rating 10
Assessment method **Exam (70%), Assignment (30%)**	Compulsory		
Prerequisites **Signal Analysis**			

Aim

Digital signal processing, a major technology in almost all modern hi-tech applications and products, is at the heart of mobile phones, communications and vibro-acoustical condition Monitoring. The aim of this course is to provide an industry oriented course covering not only the theoretical aspects of classical and advanced time-frequency DSP but also the solid implementation aspects of the subject for students wishing to pursue a career in such areas as communications, speech recognition, bio-medical engineering, acoustics, vibrations, radar and sonar systems and multimedia.

Syllabus/curriculum

Discrete-time signals and systems, The correlation of discrete-time signals, The discrete Fourier transform, The power spectral density, The short time Fourier transform, The wavelet transform, The Wigner distribution, Classical and adaptive digital filtering

Intended learning outcomes

On completion of this module the student will be able to:

- Understand the concepts of discrete time signals and systems and correlation of discrete time signals
- Understand the concept, properties and application of the classical discrete Fourier transform
- Understand the concepts, properties and application of the non-parametric and parametric estimates of the classical power spectral density
- Understand the fundamental principles of advanced time-frequency signal processing
- Understand the concept, properties and application of the advanced time-frequency technique, the short time Fourier transform
- Understand the concept, properties and application of the advanced time-frequency technique, the wavelet transform
- Understand the concept, properties and application of the advanced time-frequency technique, the Wigner distribution
- Understand the concept, properties and application of digital filtering, including adaptive inverse and Kalman filters

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<tr><td colspan="2">Prerequisites None</td><td colspan="2"></td></tr>
<tr><td colspan="4"><u>Aim</u>

The aim of this module is to provide students with the necessary mathematical basis and skills for the study of Digital Signal and Image Processing.</td></tr>
<tr><td colspan="4"><u>Syllabus/curriculum</u>

Revision of complex algebra, Important generalised functions, Series representation of period signals, Fourier analysis and the Fourier transforms, Convolution and correlation, The Sampling theorem, The Z transform, Probability and statistics: discrete, continuous and special distributions, sampling and estimation , significant tests.</td></tr>
<tr><td colspan="4"><u>Intended learning outcomes</u>
On completion of this module the student will be able to:

Be confident in the use of complex algebra
Understand the concept of generalised functions, in particular the Dirac Delta function, and the Sampling property as the means for identifying their behaviour.
Understand the concept of Fourier analysis and be able to calculate the Fourier series representing a periodic function.
Know how to calculate the Fourier transform of a continuous function.
Understand the ideas of Convolution and Correlation and the associated theorems.
Be able to apply the Z transform for causal functions.
Be familiar with the basic elements of probability and statistics, as necessary for the analysis of signals and images.
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