Aims

The course aims to provide the necessary mathematical tools from Linear Algebra, Laplace Transform theory, Analytic Geometry and the use of MATLAB computer program for second-year science and engineering courses. It builds on the previous Mathematics for Engineers and Scientists 1-3 courses.

Syllabus

Laplace Transform: Laplace Transforms, Inverse Laplace Transforms, Solving Differential Equations (DEs) and Systems of DEs with Laplace Transforms.  
(8 lectures)

(7 lectures)

Linear Algebra: Systems of Linear Equations, Gaussian Elimination, Vectors and Matrices, Matrix Algebra, Inverse Matrices, Determinants, Eigenvectors and Eigenvalues, Applications to Differential Equations, Diagonalization of Matrices.  
(16 lectures)

Teaching and Assessment

Contact Hours:  3 lectures and 1 tutorial per week
Assessment:  15% by class tests or other continuous assessment
             85% by end of course 2-hour exam
Resit Type:  exam
By the end of the course, students should be able to:

- understand the basic terminology of linear algebra, Laplace transforms and analytic geometry.
- solve systems of linear equations by the method of Gaussian elimination.
- invert a matrix both by using Gaussian elimination and by computing cofactors.
- compute determinants, solve eigenvalue problems.
- understand how eigenvalue problems may arise in practical applications.
- diagonalize matrices.
- perform Laplace transforms and inverse Laplace transforms for most common functions.
- apply Laplace transforms to solve DEs and systems of DEs.
- perform basic vector operations.
- write equations of lines and planes and find angles between lines and planes.
- compute partial and directional derivatives of scalar and vector functions.
- write equations for piecewise approximation of curves and equations of tangent planes.
- apply Grad, Div and Curl operators.
- use MATLAB to: perform matrix and vector operations, solves systems of linear equations,
  find eigenvalues and eigenvectors of matrices, perform Laplace and inverse Laplace trans-
  forms, solve DEs.

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