**COURSE DETAILS**

**Course Code:** F18XH  
**Full Course Title:** Mathematics for Engineers and Scientists 4  
**SCQF Level:** 8  
**SCAF Credits:** 15  
**Available as Elective:** No

### DELIVERY LEVEL

<table>
<thead>
<tr>
<th>Undergraduate:</th>
<th>Yes</th>
<th>Postgraduate Taught:</th>
<th>No</th>
<th>Postgraduate Research:</th>
<th>No</th>
</tr>
</thead>
</table>

**Additional Information:**

### COURSE AIMS

This aims to provide a fundamental course in the basic methods of mathematical modelling with emphasis on linear algebra. It will give an introduction to MATLAB as a programming language, which will be used for solving various mathematical problems related to science and engineering.

### LEARNING OUTCOMES – SUBJECT MASTERY

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 transforms, solve DEs.

### LEARNING OUTCOMES – PERSONAL ABILITIES

- Demonstrate the ability to learn independently  
- Demonstrate knowledge of an area of mathematics.  
- Manage time, work to deadlines and prioritise workloads

### SYLLABUS
F18XH Mathematics for Engineers and Scientists 4

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


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.

Note: 2nd year direct entry – A-Level/ AH in Mathematics Grade C or better or equivalent

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F17XE</td>
<td>7</td>
<td>Mathematics for Engineers and Scientists 1</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
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<tr>
<td>F17XF</td>
<td>7</td>
<td>Mathematics for Engineers and Scientists 2</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
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<thead>
<tr>
<th>LOCATION AND ASSESSMENT METHODS</th>
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<tbody>
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