F18XH Mathematics for Engineers and Scientists 4

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
Undergraduate: Yes  Postgraduate Taught: No  Postgraduate Research: No
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

### COURSE RELATIONSHIPS

<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>
</tr>
<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>
</tr>
</tbody>
</table>

### LOCATION AND ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Edi</th>
<th>SBC</th>
<th>Ork</th>
<th>Dub</th>
<th>Malay</th>
<th>IDL</th>
<th>COLL</th>
<th>ALP</th>
<th>OTH</th>
<th>Method</th>
<th>Weight</th>
<th>Exam Mins</th>
<th>Type</th>
<th>Diet</th>
<th>Synoptic Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coursework</td>
<td>100</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page | 2 of 2