# F17XB Mathematics for Engineers and Scientists 2

## COURSE DETAILS

<table>
<thead>
<tr>
<th>Course Code: F17XB</th>
<th>Full Course Title: Mathematics for Engineers and Scientists 2</th>
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<tbody>
<tr>
<td>SCQF Level: 7</td>
<td>SCAF Credits: 15</td>
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<tr>
<td>Available as Elective: Yes</td>
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## DELIVERY LEVEL

<table>
<thead>
<tr>
<th>Undergraduate: Yes</th>
<th>Postgraduate Taught: No</th>
<th>Postgraduate Research: No</th>
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Additional Information:
Course being delivered at the specified campus(es) and also by collaborative partner Xidian University.

## COURSE AIMS

To provide a sound basis in mathematical topics of relevance to science and engineering and other numerate disciplines.

## LEARNING OUTCOMES – SUBJECT MASTERY

By the end of the course, students should be able to:

- calculate Maclaurin and Taylor series in one variable
- calculate integrals by using a substitution
- calculate integrals by using integration by parts
- calculate integrals of rational functions by using partial fractions
- solve first order ODEs of variable separable type
- approximate integrals using the Trapezoidal rule
- define complex numbers
- perform addition, subtraction and multiplication of complex numbers
- perform division of complex numbers
- solve quadratic equations in terms of complex numbers
- understand the Argand diagram
- determine the modulus and argument of a complex number
- understand and compute the polar form of a complex number
- define the exponential function and know its properties
- understand Euler's formula
- find the exponential form of a complex number
- know De Moivre's Theorem
- use De Moivre's Theorem to find powers of complex numbers
- understand and use matrix notation
- add, subtract and multiply matrices
- find the transpose of a matrix
- know and use basic properties of matrix algebra
- evaluate determinants (2x2, 3x3)
- find the inverse of a 2x2 matrix
- solve systems of linear equations using row eliminations

## 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

All of the mathematical topics considered in this module are presented in the context of applications in either engineering or science. The topics covered are:

**Advanced Differentiation:** Revision of differentiation; Maclaurin and Taylor series.

**Applications of Differentiation:** Optimisation, Differential equations.

**Advanced Integration:** Revision of integration; Integration by substitution; Integration by parts; Integration using partial fractions.

**Applications of Integration:** Area under and between curves; Average value; Curvelength; Separation of variables for 1st order ODEs; Approximate integration (Trapezoidal rule).

**Complex Numbers:** Definition; Real and imaginary parts; Arithmetic of complex numbers; Solving quadratic equations; The Argand diagram; Modulus and argument; the polar form of a complex number; The exponential form; De Moivre’s theorem.

**Matrices:** Definition and notation for matrices; Null (zero) matrix; Identity matrix; Trans-pose matrix; Addition and subtraction; Multiplication by a scalar; Matrix multiplication; The 2x2 and 3x3 determinant; The inverse of a 2x2 matrix; Solving systems of linear equations; formulating problems in matrix form.

Pre-requisite: Preferably Higher Mathematics at level "C" or equivalent

**COURSE RELATIONSHIPS**

<table>
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<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
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<td>7</td>
<td>Mathematics for Engineers and Scientists 1</td>
<td>School of Math and Comp Sci.</td>
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**LOCATION AND ASSESSMENT METHODS**

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<tr>
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