

Faculty of Engineering and Physical Sciences
Module Specification Form

Code	EG21005			
Title	Mathematics for Engineers 2A			
Faculty	Engineering & Physical Sciences			
Credit rating	Level	2	Volume	20 Scotcat points
Aims	The module continues the development of the basic mathematics most relevant to engineers and covers material required for accreditation of degree programmes in engineering.			
Intended learning outcomes	<p>By the end of the module students will be expected to demonstrate knowledge of:</p> <ul style="list-style-type: none"> • Statistics including data displays and summaries, probability, the normal distribution. • The basic properties of vectors including scalar and vector products, and applications to mechanics and three-dimensional geometry of lines and planes. • Determining sums of simple finite sequences and limits of certain sequences and series. • Algebraic properties of complex numbers including the Argand diagram, de Moivre's theorem and properties of e^z. • First order separable differential equations, and first and second order linear differential equations with constant coefficients. • Functions of one variable including trigonometric, exponential and hyperbolic functions and their inverses, stationary points and points of inflection. • Curve sketching (including conic sections) and equations of asymptotes, tangents, normals and circles of curvature. • Taylor polynomials, Taylor series and Maclaurin series, l'Hopital's rules. • Integration with applications to arc length, area, volume and surface area of solids of revolution. 			
Indicative content	<p>Statistics Data displays and summaries, including histograms, dot plots, mean and standard deviation (including variance); median, quartiles and the range; box and whisker plots. Probability including events, $P(A)$ notation, addition and multiplication rules; the normal distribution.</p> <p>Vectors Revision of basic properties, scalar and vector products. Applications to polygon of forces, motion of particles, work, moments and three-dimensional geometry of lines and planes</p> <p>Algebra Sequences and series, summation of finite series, including arithmetic and geometric series. Limits of sequences; infinite series; telescoping series.</p> <p>Complex numbers Definition, arithmetic, modulus-argument form. Argand diagram. De Moivre's theorem. Roots of polynomial equations. Properties of e^z.</p> <p>Differential Equations Review of rules of differentiation. Revision of elementary integration to include applications to the solution of first order separable ordinary differential equations. Solution of first and second order linear ordinary differential equations with constant coefficients (including general solutions and solutions satisfying initial conditions and boundary conditions).</p>			

	<p>Functions of One Variable Functions of a single variable, definition and notation. Standard functions and their inverses (including hyperbolic and inverse hyperbolic functions). Limits, including limits involving infinity. Asymptotes. Continuous and discontinuous functions. Curve sketching involving rational functions (illustrating maxima, minima and points of inflection) and conic sections (including translation of axes). Normals. Curvature. Taylor polynomials and Taylor's theorem. L'Hopital's rules.</p> <p>Integration Further examples of the standard methods of integration. Applications of integration to arc length, areas, volumes and surfaces of revolution.</p>			
Assessment	Coursework (%)	40	Exam (%)	60
	No. & duration of exam(s)	One Degree Examination of 2 hours.		
Teaching & learning	<p>The Module will consist of two Sections running in parallel, one covering complex numbers, differential equations and functions of one variable, and the other covering statistics, vectors, algebra and integration. Two one-hour workshops will be held each week, one for each Section. Following on from the workshops, students will be required to hand in homework exercises, which will be marked and returned to give feedback. There will be two mid-semester class tests (one for each Section) which form the assessed coursework, and an examination at the December Degree Examination Diet.</p>			
When taught	Semester 1			
Modes of delivery & student participation	<p>The principal modes of delivery are lectures and workshops. You will be given the opportunity to complete a questionnaire regarding the content and presentation of the Module.</p>			
Pre-requisites or entry requirements	<p><i>Either</i> Science & Engineering Mathematics 1[A] (EG11003) and 1[B] (EG12003) <i>or</i> Mathematics 1[A] (MA11001) and 1[B] (MA12001).</p>			
Accessibility for students with disability	<p>Students with disabilities are supported on this module/programme through the University's Disability Support Services at http://www.dundee.ac.uk/disabilitysupport/ and will be given appropriate aid and guidance consistent with their disability.</p>			
Corequisites	None			
Antirequisites	Mathematics 2[A] (MA21001) or 2[B] (MA22001).			

Staff contact details

This module will be delivered in two parallel Sections as indicated in the following table, where the number in brackets denotes the approximate number of lecture classes for a topic.

<i>Section I</i>	<i>Section II</i>
Complex Numbers (4)	Statistics (8)
Differential Equations (6)	Vectors (5)
Functions of One Variable (12)	Algebra (4)
	Integration (5)

The lecturers for the two Sections are as follows. If you wish to discuss any aspect of this module please contact one of the lecturers. Dr Davidson is the module leader.

<i>Section</i>	<i>Lecturer</i>	<i>Maths Building Room</i>	<i>email</i>
I	Dr Fordyce Davidson	23/2/4	fdavidso@maths.dundee.ac.uk
II	Dr Giles Thomas Dr Dodds	23/1/5 23/2/11	gethomas@maths.dundee.ac.uk ndodds@maths.dundee.ac.uk

Module specific information

Lectures and Workshops

Each of Sections I and II will comprise two lectures and one workshop per week. Section I will have lectures at 9 am on Monday and Wednesday and a workshop at 9am on Thursday. Section II will have lectures at 9 am on Tuesday and Friday and a workshop at 1 pm on Friday. Lectures will be held in the Accountancy Lecture Theatre. For the workshops the class will be divided into two groups which will be assigned rooms.

For each Section the problem sheet for the week will be made available on Blackboard early in the week for you to download. You should work through these problems during the week and complete them in the workshop, where you can ask questions on any of the problems, or on any other aspects of the work of the module.

For each lecture you should record the material of the lecture and ensure that you thoroughly understand it before the next lecture of the Section.

Solutions to the workshop problems and homework exercises on each sheet will be made available on Blackboard. These solutions are for guidance and may not be the only correct way to solve the problems. It is important that you attempt to solve the problems yourself and seek guidance when you have difficulties before looking at the provided solutions.

Attendance

You are expected to attend all lectures and workshops. A record of your attendance will be kept. In addition, there will be a record kept of the marks you gain for the weekly homework. **If you are unable to attend an element of assessment** (such as a Class Test or an examination held in the Degree Examination Diet) because of illness, **you must supply a medical certificate** covering the relevant period to your Faculty Office (Engineering and Physical Sciences situated on the ground floor of the Ewing Building or Arts and Social Sciences situated on the ground floor of the Tower Building). If illness prevents you from attending other meetings of the class, you must keep your Faculty Office informed of the reasons for your absence.

Recommended Book

Further information on most of the material of the module can be obtained from "Modern Engineering Mathematics, by Glynn James (2nd Edition, Addison Wesley, ISBN 0 210 87761 9) , (3rd Edition Prentice Hall, ISBN 0130183199). You may be able to borrow a copy of this book from the University Library for short periods. Necessary statistics tables will be provided.

Maths Base

You will be able to obtain extra help with any mathematics problem by dropping into Maths Base where you will be able to consult a member of staff. Maths Base, located in room 21-2-2 on the second floor of 21 Perth Road, takes place between 2 pm and 4 pm on Wednesday and Thursday afternoons, beginning in week 2.

Calculators

You will need to supply yourself with a scientific calculator.

You will not be allowed to use a graphics calculator or a calculator that is capable of doing computer algebra (i.e. symbolic manipulation) during a Class Test or an examination held during a Degree Examination Diet.

You may use any calculator, for example a graphics calculator, in connection with your workshop or homework problems.

Withdrawal from the Module

You are reminded that when a student's attendance or work in the Module has not been satisfactory to the Head of the Mathematics Division, permission for the student to sit the degree examination for the Module may be withdrawn.

Work Habits

In addition to the six weekly class hours, you are expected to spend at least seven hours per week on mathematics. You should spend this additional time reading your lecture notes, referring to the text book and working on solutions to problems. Doing mathematics is the best way to learn mathematics. We recommend that you work consistently, starting in week one of the semester.

Feedback

You will be given the opportunity to complete a questionnaire regarding the content and presentation of the Module.

Staff-Student Committee

One member of the class will be elected to serve on the Mathematics Staff-Student Committee, which normally meets on the third Thursday of each semester.

Assessment

Overall assessment is by means of a degree examination to be held in week 12 or 13 of the semester, which has weight 60%, and assessed coursework as outlined above, which has weight 40%.

To pass the module in December, you must gain an overall average of at least 40% and at least 30% in both the degree examination and the assessed coursework.

If you do not pass in December, you may take the resit examination in August. In order to pass the module in August you must normally score at least 40% in the August examination; your mark for assessed coursework does not carry forward to the resit examination, but may be taken into account for borderline situations.

Examinations

One examination (duration: 2 hours) at the December Degree Examination Diet.

One resit examination (duration: 2 hours) at the August Degree Examination Diet.