

## **ACCESS TO ENGINEERING - MATHEMATICS 2**

### **ADEDEX428**

#### **SEMESTER 2 2014/2015**

DR. ANTHONY BROWN

The objective of this course is to build on Mathematics I and to expose you to various mathematical techniques that you may need if you decide to study a degree. It will develop your knowledge of calculus obtained in Semester 1 and will also introduce topics such as matrices, vectors, complex numbers and probability.

#### **Lecture notes**

Lecture notes, exercises and assignments will be available to download as the course progresses from Blackboard, which can be accessed through UCD Connect. It can also be useful to bookmark the direct login which can be found at <https://elearning.ucd.ie/webapps/login/> since this sometimes works even if UCD Connect is down. I will also upload the materials to <http://www.ucd.ie/msc/access/adedex428materials/>

#### **Textbooks**

There is no need to buy a book to study this course but if you would like an extra reference, then a good one is 'Mathematics for engineers: a modern interactive approach' by Anthony Croft and Robert Davison. This can be found in the library and in the Maths Support Centre (see below).

#### **Classes**

These will be held in Room H2.38 in the Science Hub and will run at the following dates and times:

Monday January 26th : 20.00-21.30

Wednesday January 28th : 20.00-21.30

Saturday January 31st : 10.00-13.00

Monday February 2nd : 20.00-21.30

Wednesday February 4th : 20.00-21.30

Monday February 9th : 20.00-21.30

Wednesday February 11th : 20.00-21.00

Wednesday February 18th : 19.30-21.00

Monday February 23rd : 20.00-21.30

Wednesday February 25th : 18.00-21.00

Monday March 2nd : 20.00-21.30  
Monday March 23rd : 20.30-21.30  
Saturday March 28th : 10.00-13.00  
Monday March 30th : 19.30-21.30  
Wednesday April 1st : 18.00-20.30  
Wednesday April 15th : 18.00-20.30  
Saturday April 18th : 10.00-13.00

### **Continuous Assessment**

This will consist of four assignments during the semester.

### **Exam**

There will be a three hour exam in the early part of May.

### **Grading Policy**

The continuous assessment will count for 25% of the final mark and the exam will count for the other 75%.

### **Contact details**

If you wish to contact me outside class times then my contact details are as follows.

- My e-mail address is [anthony.brown@ucd.ie](mailto:anthony.brown@ucd.ie)
- My office phone number is 01-7165755 and my mobile number is 087-9947027.
- My office is Room G.21 on the ground floor of Science North. However it is vital to e-mail or phone me beforehand to make sure I will be there, and also since you need a swipe card to even get to outside the office.
- It will probably be more convenient for you to meet me in the Maths Support Centre.

### **Maths Support Centre**

The Maths Support Centre provides a free service to all students of UCD who want to improve their mathematics. It is very much intended for students of all abilities. It is just as much for a student who wants to move from an A to an A+ as it is for a student who wants to move from an E to an D. Students from all years attend, right up to Ph.D. level. It is situated in the James Joyce Library Building in Belfield. You will find it just to the left after you enter the library through the turnstiles.

You are welcome to visit either when I am there or when I am not there. This service is completely confidential: if you visit at a time when I am not there, although I will be able to see a list of the subjects covered, I will not be able to see the names or student numbers of anyone who attends. Note that my ordinary hours in the Maths Support Centre are from 10.00-13.00 and 14.00-16.00 on Mondays (but

please also see below about the special sessions). Details of the opening hours of the Maths Support Centre will be posted on the website. It will be open for drop-in visits for limited hours from Week 2 of term (i.e., the week beginning January 26th) and will be open for drop-in visits for full hours from Week 3 of term (i.e., the week beginning February 2nd).

As well as the regular opening hours, myself and Catherine Jeffares will be running special sessions specifically for Access Students. These will run from 16.00-17.30 on Mondays (by me) and Wednesdays (by Catherine) starting on January 28th. I would strongly recommend that you attend these sessions if at all possible. It is my experience that they really do make a substantial difference to your final grade. The idea is that you will work together and do problems in groups. Myself or Catherine will be there to help you out if you get stuck.

### **Syllabus**

- (1) Matrices and Vectors.
  - Mechanics of matrix algebra.
  - Systems of linear equations.
  - Gaussian elimination.
  - Inverses.
  - Determinants.
  - The dot product and angles.
  - The cross product.
  - Eigenvalues and eigenvectors.
- (2) Complex numbers.
  - Algebra of complex numbers.
  - Polar form and De Moivre's formula.
  - Roots of complex numbers.
- (3) Differential calculus
  - Product and quotient rules.
  - Composite functions and the chain rule.
  - Critical points.
  - Global and local maxima and minima.
  - The second derivative test.
  - The Newton-Raphson method.
- (4) Integral calculus.
  - Integration by substitution.
  - Integration by parts.
  - Partial fractions.
  - Finding areas and volumes.
- (5) Probability.
  - Introduction to probability.
  - Addition and multiplication rules.
  - Probability distributions: binomial, Poisson and normal.
  - Markov chains.