MATH0039 (Differential and Integral Calculus)

Year:	2019–2020
Code:	MATH0039
Old code:	MATH6103
Level:	4 (UG)
Normal student group(s):	UG: Students outside Mathematics
Value:	15 credits (= 7.5 ECTS credits)
Term:	1
Structure:	3 hours and 1 hours of problem class per week. Weekly assessed coursework.
Assessment:	90% examination, 10% coursework
Normal Pre-requisites:	A-level Maths or strong GCSE
Lecturer:	Ms E Doman
Problem class teacher:	Ms C Carbrera Arnau

Course Description and Objectives

This course provides a fairly rapid introduction to calculus. Calculus underlies almost all areas of mathematics and a great deal of science and engineering. The aim of the course will be to provide a solid grounding in this fundamental branch of mathematics for students who have a limited mathematical background.

Most of the course material occurs in A-level mathematics: the treatment here will be slightly more advanced. The course is suitable for students with good GCSE mathematics (or a weak A-level pass).

Recommended Texts

Croft, Davison and Hargreaves, *Introduction to Engineering Mathematics* (Addison-Wesley)

Detailed Syllabus

1. **Functions and graphs.**

   (a) Polynomials.

   (b) Indices and algebraic functions.

   (c) Trigonometric functions. Revision of basic trigonometry. Quadrants. Angles of any size. Graphs of $\sin\theta$, $\cos\theta$.

   (d) Circular Measure. Radians. Small angles.

   (e) Coordinates. Cartesian, polar.

2. **Differentiation:** Rates of change. Gradients.

   (a) Differentiation of x^n from first principles.

   (b) Rules for differentiation. Chain rule. Product rule. Quotient rule.

   (c) Differentiation of trigonometric functions.

   (d) 2nd differentials. Velocity, acceleration. Stationary points. Maxima. Minima.

3. **Exponential functions:** Growth and decay.

4. **Logarithmic functions:** Rules for logarithms.

5. **Integration**

    (a) Opposite of differentiation.

    (b) As an area.

    (c) As a summation. Standard forms. Methods of changing integrals into standard form.

6. **Approximate or numerical integration.** Trapezoidal approximation.

7. **Simple differential equations and applications.**