

MATH0039 Differential and Integral Calculus

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| <i>Year:</i> | 2021–2022 |
| <i>Code:</i> | MATH0039 |
| <i>Level:</i> | 4 (UG) |
| <i>Normal student group(s):</i> | UG: Students outside Mathematics |
| <i>Value:</i> | 15 credits (= 7.5 ECTS credits) |
| <i>Term:</i> | 1 |
| <i>Assessment:</i> | 85% examination, 15% coursework |
| <i>Normal Pre-requisites:</i> | A-level Maths or strong GCSE |
| <i>Lecturer:</i> | TBC |

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.**

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