# MATH0008 Applied Mathematics

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| *Year:* | 2024–2025 |
| *Code:* | MATH0008 |
| *Level:* | 4 (UG) |
| *Normal student group(s):* | UG: Year 1 Mathematics degrees |
| *Value:* | 15 credits (= 7.5 ECTS credits) |
| *Term:* | 1 |
| *Assessment:* | The final weighted mark for the module is given by: 75% examination, 15% coursework, 10% mid-sessional exam. In order to pass the module you must have at least 40% for both the examination mark and the final weighted mark. |
| *Normal Pre-requisites:* | A* in A-level Mathematics and Further Mathematics |
| *Lecturer:* | Professor H Wilson |

*Course Description*

The course provides an introduction to methods and tools used in applied mathematics to develop simple models of mechanical, biological and other systems of interest. The main tools introduced are qualitative and analytic approaches to differential equations, stability, waves and oscillations. A brief introduction to discrete dynamical systems will also be given.

*Recommended Texts*

M Tenenbaum and H Pollard, *Ordinary Differential Equations - An Elementary Textbook for Students of Mathematics, Engineering and the Sciences* (Dover); P Smith and R C Smith, *Mechanics* (Wiley); P Blanchard, R L Devaney and G R Hall, *Differential Equations* (Brooks/Cole); N J Higham et al., *The Princeton Companion to Applied Mathematics* (Princeton University Press).

*Detailed Syllabus*

**Elementary mathematical modelling:** Applications including the pendulum, population models, predator-prey equations, wave motion and other models of interest.

**Newton's laws:** motion in one dimension, energy and momentum, simple harmonic motion, particle collisions (covered in some years).

**Waves and oscillations:** oscillators with damping, resonance, examples of Fourier series.

**Qualitative methods:** phase plane analysis, bifurcations, stability.