

Aims of course

The course aims to introduce the basic concepts required for a mathematical description of oscillations and waves, and to provide the expertise for solving differential equations which arise in simple mathematical models for oscillations and waves.

Syllabus

Oscillations and Energy: Hooke's law, simple harmonic motion, conservation of energy (3 lectures)

Damped and forced oscillations: Revision of second order differential equations with constant coefficients: method of undetermined coefficients for inhomogeneous equations; application to equation of oscillating spring with damping and driving term; resonance. (5 lectures)

Coupled oscillators: Normal modes, investigation of general solution using Maple. (3 lectures)

Waves: The wave equation in one dimension, standing waves on string, normal modes, travelling waves, harmonic waves, dispersion relation, superposition principle, pulses of arbitrary shape. (4 lectures)

Fourier series: Full-range and half-range series (3 lectures)

Tutorials and assessment

There will be weekly sheets with problems which you should try to solve in your own time **before** they are discussed during the tutorial sessions. The **continuous assessment** consists of two midterm tests. The continuous assessment counts for **15 %** of the overall assessment, with 7.5 % coming from each of the tests. The final written examination counts for **85 %** of the overall assessment.

Useful textbooks

1) A P French, *Vibrations and waves*, MIT press 1971.

2) F S Crawford, *Berkeley Physics Course Volume 3: waves*, Mc Graw Hill 1973.

More information about the module can be found on Vision and the web page

<http://www.ma.hw.ac.uk/maths/ug/courses/F12MS3/>

which can be reached from the Department of Mathematics home page → Teaching → Information for students → Modules taken mainly by Mathematics and AMS students.