MAS315: Waves **Type B/M**
Lecturer: Professor Robert von Fáy-Siebenbürgen

Semester: 1
Credits: 10

Pre-requisites: MAS122
Co-requisites: none
Cannot be taken with: none

Description

Studying wave phenomena has had a great impact on Applied Mathematics. This module looks at some important wave motions with a view to understanding them and to developing from first principles the key mathematical tools. We begin with waves on strings (e.g. a piano or violin), developing the concept of standing and propagating waves, and normal modes. We use Fourier series to solve some problems and indicate developments to waves on membranes and the use of Fourier integrals. Next we consider sound waves in the atmosphere (e.g. organ, clarinet) and stress the mathematical similarities with waves on strings. Water waves are interesting in that they are not governed by a wave equation, yet can be described by similar mathematics to waves on strings. In this context, the concepts of dispersion and group velocity are introduced. The course concludes with consideration of "traffic waves" as the simplest example of nonlinear waves.

Aims:

1. To introduce wave propagation.
2. To derive important mathematical tools to deal with problems of wave theory.
3. To consider simple examples of linear waves on strings, sound waves and water waves.
4. To give you one of simplest examples of nonlinear waves.

Outline Syllabus:

1. Waves on strings. D'Alembert solution. Standing and propagating waves. Normal modes.
2. Use of Fourier series for solving one-dimensional wave problems.
3. Sound waves. Plane, cylindrical and spherical sound waves.
4. Water waves. Wave dispersion. Group velocity.
5. Traffic waves.

Module Format:

Lectures 20	Tutorials 0	Practicals 0

Books (A=Core text, B=Secondary text, C=Background reading):

B See list at: "http://www.robertus.sta_.shef.ac.uk/ama349/info.html"

Assessment: Two-hour written examination. Format: 4 out of 5 questions.