PX160-10 Tutorial (Maths/Physics)

23/24

Department
Physics
Level
Undergraduate Level 1
Module leader
Nicholas d'Ambrumenil
Credit value
10
Module duration
25 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The tutor's mark is made up from marks for answers to the assessed weekly problems (50%) and from work associated with five worksheets (50%). The worksheets cover some background mathematical material assumed by other modules.

[Module web page](#)

Module aims

To cover some background mathematical material assumed by other modules, to give students experience of learning by self-study.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Worksheets

Vectors:
Vectors have magnitude and direction. Addition and subtraction, the null vector. Geometry of simple figures written in vector notation, equation of lines and planes, equation for centroid of a

triangle. The dot product, the normal to a plane and alternative form for equations of planes, perpendiculars from points of a triangle to opposite sides meet at a point. Cross-product and the notion of an area in three dimensions as a vector. Equation of line of intersection of two planes. Triple scalar product, associative law, relation to volume of parallelopiped. Triple vector product

Matrices:
Motivation and definition. The 2 x 2 case: operations on vectors. Eigenvalues and eigenvectors. Diagonalizing matrices. Exponential of a diagonalizable matrix. Mention of the 3 x 3 and N x N cases.

Maths for Waves:
Notation for partial derivatives. Examples of equations admitting wave-like solutions: wave equation, advection equation, traffic flow. Linear operators, principle of superposition. Boundary conditions, reflection and transmission coefficients. Plane waves, exponential form. Energy in waves. Wave groups, group velocity.

Probability:
Definition of probability spaces and axioms. Discrete and continuous probability spaces. Common probability distributions, including binomial, Poisson, normal and Boltzmann distributions. Expectation and variance. Joint, conditional and marginal probabilities. Bayes' theorem.

Statistics:
Random variables and central limit theorem. Visualising and quantifying data. Uncertainty, errors and confidence intervals. Fitting, including least squares and maximum likelihood. Entropy and Shannon information.

Weekly Problem Sheets:
You will be asked to hand in written answers to designated problems from the problem sheets and attempt designated problems from the Mastering Physics package.

Learning outcomes

By the end of the module, students should be able to:

- Work with vectors, wave-functions, probability theory and statistics at a level necessary to cope with all first year physics modules and some second year maths modules.
- Analyse a simple problem and decide on an approach to its solution

Subject specific skills

Mathematical techniques, physics problem-solving

Transferable skills

Communication, group working, problem-solving, self-study

Study

Study time

Type	Required
Seminars	25 sessions of 1 hour (25%)
Tutorials	25 sessions of 1 hour (25%)
Private study	50 hours (50%)
Total	100 hours

Private study description

Studying material on worksheets, answering associated questions. Working on weekly problem sheets and computer problems

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time
Coursework	100%	
Worksheets and examples sheets		

Feedback on assessment

Personal tutorials and examples classes

Availability

Courses

This module is Core for:

- UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
  - Year 1 of GF13 Mathematics and Physics
  - Year 1 of GF13 Mathematics and Physics

- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
  - Year 1 of FG31 Mathematics and Physics (MMathPhys)
  - Year 1 of FG31 Mathematics and Physics (MMathPhys)