PX129-12 Tutorial

20/21

Department
Physics
Level
Undergraduate Level 1
Module leader
Michael Pounds
Credit value
12
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. The material covered includes complex numbers, vectors, matrices, multiple integration and integration over surfaces and along contours.

Module web page

Module aims

To cover some background mathematical material assumed by other modules, to give students experience of learning by self-study, to develop the habit of keeping up with the problem sheets handed out in physics modules

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

Complex Numbers:
Their construction from the reals; norm, argument, real and imaginary parts; addition, subtraction, multiplication and division; the Argand diagram and geometric view of complex numbers. de Moivre's theorem, exponential representation of a complex number in terms of its norm and its argument.

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.

Multiple Integration:
Integration of functions of more than one variable. The domain of integration and changing the order of integration. Computing the mass of an object with variable density. Changing variables and the Jacobian with particular reference to the transformation cartesian to polar coordinates

Integration over Lines, Surfaces and Volumes:
Notation for integration of both scalar and vector quantities over lines, surfaces and volumes. Integration along lines using parameterised curves, circulation around a contour. Infinitesimal surface element as a vector in 3D, use to compute flux across a surface. Volume integrals and revision of the Jacobian.
You should answer the questions on each of the worksheets and hand in your answers to your personal tutors as directed.

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, partial differentiation, multiple integration and integration over lines, surfaces and volumes at a level necessary to cope with all first year physics modules and to start the second year core module.
- 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 (21%)
Tutorials	25 sessions of 1 hour (21%)
Private study	70 hours (58%)
Total	120 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	Eligible for self-certification
Assessment component			
Coursework Worksheets and examples sheets	100%		No
Reassessment component			
Assessment of understanding			No

	Weighting	Study time	Eligible for self-certification
Designed as appropriate			

Feedback on assessment

Personal tutorials and examples classes

Availability

Courses

This module is Core for:

- Year 1 of UPXA-FG33 Undergraduate Mathematics and Physics (BSc MMathPhys)
- Year 1 of UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
    - Year 1 of GF13 Mathematics and Physics
    - Year 1 of FG31 Mathematics and Physics (MMathPhys)