PX399-15 The Earth and its Atmosphere

26/27

Department
Physics
Level
Undergraduate Level 3
Module leader
Wing Ying Chow
Credit value
15
Module duration
10 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module describes the behaviour of the solid Earth and its atmosphere. We will look at the models of the Earth's outer structure and its core as well as how they are probed using seismic activity, magnetic and heat signatures. We will also investigate how the composition and physical properties of the Earth's atmosphere influence both local weather events and global climate trends.

Module web page

Module aims

To present an understanding of the Earth and its atmosphere in terms of simple physical principles. By the end of the module, students should appreciate how, with simple ideas from electromagnetism, mechanics and thermodynamics, it is possible to explain most of what we call 'weather' and to understand the motion and structure of the solid Earth.

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.

1. Introduction: The basic characteristics of Earth, its formation during the early Solar System and the measurement of geological time using radiometric dating.
2. Earth's geometry: Spherical co-ordinates, consequences of spherical geometry, gravity measurements and anomalies due to variations in density. The different models of isostasy and the consequences for mountain heights.
3. Seismology: Types of seismic waves, earthquake location and magnitudes and the determination of Earth's interior.
4. Plate tectonics: Plate movement on flat earth, rotation poles, past and present plate motions and the role of Earth's magnetic field.
5. Heat: Overview of the Earth's heat budget, heat flow in its interior, convection in the mantle, thermal structure of the core and the origin of Earth's magnetic field.
6. Description of the atmosphere: layer profile; atmospheric energy balance; origin of the earth's atmosphere and the role of life in determining past and future climates; pressure and temperature profiles
7. Vertical motion and role of water: Atmospheric stability; evaporation and condensation; precipitation; atmospheric electricity
8. Global circulation patterns: Pressure gradients and their origins; the Coriolis force; synoptic scale motion; global climates; influence of the oceans

Learning outcomes

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

- Discuss the physical principles governing the Earth's radioactivity, gravity, waves, heat and magnetism
- Give an overview of the structure of the Earth and of the experimental and observational techniques used to probe them
- Describe the structure and composition of the earth's atmosphere and how it developed
- Describe the dynamic processes in the atmosphere from precipitation to global air circulation
- Explain the effect of human activity on the Earth and its Atmosphere

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Interdisciplinary

Physics has provided techniques and principles which are valuable to other sciences including geology and meteorology. This module shows how electromagnetism, gravity, mechanics and thermodynamics account for the structure of the solid Earth and drive most of what we call the weather.

Subject specific skills

Knowledge of mathematics and physics. Skills in modelling, reasoning, thinking

Transferable skills

Analytical, communication, problem-solving, self-study

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Private study	118 hours (80%)
Total	148 hours

Private study description

Working through lecture notes, solving problems, wider reading, discussing with others taking the module, revising for exam, practising on past exam papers

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group B1

Assessment component	Weighting	Study time	Eligible for self-certification
Centrally-timetabled examination (On-campus)	100%		No

	Weighting	Study time	Eligible for self-certification
Answer 4 questions			

- Answerbook Pink (12 page)
- Students may use a calculator

Reassessment component is the same

Feedback on assessment

Personal tutor, group feedback

Past exam papers for PX399

Availability

Courses

This module is Option list A for:

- Year 3 of UPXA-F300 Undergraduate Physics (BSc)
- UPXA-F303 Undergraduate Physics (MPhys)
  - Year 3 of F300 Physics
  - Year 3 of F303 Physics (MPhys)
- Year 3 of UPXA-F3F5 Undergraduate Physics with Astrophysics (BSc)
- UPXA-F3FA Undergraduate Physics with Astrophysics (MPhys)
  - Year 3 of F3F5 Physics with Astrophysics
  - Year 3 of F3FA Physics with Astrophysics

This module is Option list B for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
  - Year 4 of G105 Mathematics (MMath) with Intercalated Year
  - Year 5 of G105 Mathematics (MMath) with Intercalated Year
- Year 3 of UMAA-G100 Undergraduate Mathematics (BSc)
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 3 of G100 Mathematics
  - Year 3 of G103 Mathematics (MMath)
  - Year 4 of G103 Mathematics (MMath)
- Year 4 of UMAA-G107 Undergraduate Mathematics (MMath) with Study Abroad
- Year 4 of UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe

- Year 3 of UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
    - Year 3 of GF13 Mathematics and Physics
    - Year 3 of FG31 Mathematics and Physics (MMathPhys)
- Year 4 of UPXA-GF14 Undergraduate Mathematics and Physics (with Intercalated Year)
- Year 4 of UMAA-G101 Undergraduate Mathematics with Intercalated Year
- Year 3 of UPXA-F303 Undergraduate Physics (MPhys)