

PX350-7.5 The Weather and the Environment

20/21

Department

Physics

Level

Undergraduate Level 3

Module leader

Rebecca Milot

Credit value

7.5

Module duration

5 weeks

Assessment

100% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

The diffusion, convection, chemical reactions and the interaction with living organisms, which take place in or at the boundaries of the atmosphere, determine the weather patterns we observe. The module looks at some of these processes. The module also treats the phenomenon of cloud-formation and the role of the earth's rotation in determining flow patterns in the atmosphere.

[Module web page](#)

Module aims

To show how the troposphere "works". By the end, a student should appreciate how, with only very simple ideas from mechanics and thermodynamics, it is possible to explain most of what we call 'weather'.

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. Description of the atmosphere. Permanent and variable gases; layer profile, troposphere, stratosphere (ozone layer), mesosphere and beyond; atmospheric energy balance: surface temperature, albedo and greenhouse effect; origin of the earth's atmosphere and the role of life in determining past and future climates
2. Vertical motion and role of water. Atmospheric stability, dry and saturated adiabatic lapse rates; water vapour, relative humidity, evaporation and condensation; cloud formation, condensation nuclei, growth by diffusion and accretion; precipitation: warm rain, the three-stage process; atmospheric electricity: lightning
3. Flow Patterns - wind and weather. Pressure gradients and their origins, sea breezes; mechanics in a rotating frame, Coriolis force, geostrophic wind; circulation on a global scale: prevailing winds, jet streams; synoptic scale motion: air masses, fronts, cyclones and accompanying weather patterns; mesoscale and microscope motion, planetary boundary layer; influence of the oceans:, el Niño, Gulf Stream

Learning outcomes

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

- Describe the structure and composition of the earth's atmosphere and how it developed
- Explain how motion in the troposphere is driven by the (differential) heating of the earth by the sun
- Explain how heat and matter are transported by convection-generated flows in the troposphere and the effect on these flows of the earth's rotation
- Describe the mechanisms that lead to precipitation
- Explain the effect of human activity on the atmosphere and climate

Indicative reading list

JFR McIlveen, Fundamentals of Weather and Climate, Chapman & Hall, 1992.

[View reading list on Talis Aspire](#)

Interdisciplinary

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

Subject specific skills

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

Transferable skills

Analytical, communication, problem-solving, self-study

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (20%)
Private study	60 hours (80%)
Total	75 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

	Weighting	Study time	Eligible for self-certification
Assessment component			
Online Examination	100%		No
Answer 2 questions out of 3			

- Online examination: No Answerbook required

Reassessment component is the same

Feedback on assessment

Personal tutor, group feedback

Availability

Courses

This module is Option list A for:

- Year 3 of UPXA-F300 Undergraduate Physics (BSc)
- Year 3 of UPXA-F303 Undergraduate Physics (MPhys)
- Year 4 of UPXA-F301 Undergraduate Physics (with Intercalated Year)

This module is Option list B for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
 - Year 3 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)
- UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
 - Year 3 of G106 Mathematics (MMath) with Study in Europe
 - Year 4 of G106 Mathematics (MMath) with Study in Europe
- Year 3 of UPXA-FG33 Undergraduate Mathematics and Physics (BSc MMathPhys)
- 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)