

## ATM2022 Large-Scale Weather and Climate

### Information Sheet

**Lecturers:** Dr Simon Clarke, Room 447, Mathematics Building, phone 9905 4421,  
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<b>Lectures:</b>	Monday	1.00pm	S15
	Wednesday	10:00am	S13
	Thursday	9.00am	S15

### Outline

ATM2022 *Large-scale weather and climate* deals with the large-scale structure and evolution of the atmosphere, and includes the problems of forecasting the day-to-day weather and the climate. The phenomena discussed include: greenhouse climate change, the Antarctic ozone hole, El Nino, radiative-convective equilibrium, atmospheric thermodynamics, hydrostatic balance, global wind distribution, Hadley circulation, jet streams, global heat and momentum balance, monsoon circulations, geostrophic wind, thermal wind, and extratropical cyclones and anticyclones.

### Aims

- To describe the lower atmosphere (particularly the troposphere) and its behaviour, and to outline the physical mechanisms involved.
- To develop simple models of some important physical mechanisms in the atmosphere, and to use these models to help understand the larger-scale weather and climate behaviour of the lower atmosphere.
- To understand the physical basis of weather prediction, climate change, and other environmental problems.

### Web page

The course handouts will be available from [www.maths.monash.edu.au/atm2022/](http://www.maths.monash.edu.au/atm2022/)

### Recommended text

McIlveen, R., *Fundamentals of Weather and Climate*, Chapman-Hall, 1992

### Other reading

*Atmospheric Science: An Introductory Survey* by J.M. Wallace and P.V. Hobbs, Academic, 1977, Hargrave Library 551.5 W191A.

*The Physics of Atmospheres* by J.T. Houghton, 1986, Hargrave Library 551.51 H838P2.

*The Weather and Climate of Australia and New Zealand* by A.P. Sturman and N. J. Tapper.  
Oxford University Press. 1996, Hargrave Library 551.50994 S936W.

## Syllabus

Topic	Number of lectures	McIlveen
<b>Introduction:</b> Origin, composition and mean structure of the atmosphere	3	Chapter 1, Sections 3.1 & 3.7
<b>Atmospheric radiation:</b> solar radiation, long wave radiation, absorption and emission, simple radiative balance, greenhouse effect, greenhouse climate change, observed climate change, future climate projections	8	Sections 8.1-8.6, Sections 3.3-3.6, Sections 4.8-4.10
<b>Atmospheric thermodynamics:</b> perfect gas law, hydrostatic balance, geopotential height, potential temperature, static stability, temperature lapse rates	6	Sections 4.1-4.5, Sections 5.1-5.3, 5.6-5.10, 5.12-5.13
<b>Atmospheric dynamics:</b> air masses, geostrophic wind, extratropical cyclones and anticyclones, thermal wind	6	Chapter 7
<b>General circulation:</b> radiation and global climate, global wind distribution, Hadley circulation, jet streams, global heat and momentum balance, standing waves, transient weather systems, Rossby waves	6	Section 4.7, Section 8.7-8.14, Section 11.6
<b>Atmospheric modelling:</b> numerical weather prediction, global climate modelling	2	
<b>Climate variability and climate change:</b> El Niño-Southern Oscillation, stratospheric ozone, UV radiation, ozone depletion	5	Section 12.5, Section 3.3

## Assessment

Examination (3 hours): 50% • Laboratory work: 25% • Continuous assessment: 25%.

Non-alphanumeric calculators only may be used in the final examination.

The continuous assessment will include an assignment (5%), an essay (10%) and a mid-semester test (10%) on 5 September.

### Laboratory sessions and tutorials

There will be a series of 5 laboratory sessions and 5 tutorials. The lab sessions will alternate from week to week with the tutorials, but they will be held in the same rooms. The tutorials will last for one hour while the lab sessions will be for two hours. The first tutorial is in the week beginning 5<sup>th</sup> August, and the first lab session the week after.

The times for the lab sessions are: **Wednesday 11:00-1:00pm in computing lab G12.**

### Tutorial and Lab Calendar

Week	Starting	Activity
1	22 July	
2	29 July	
3	5 August	Tutorial
4	12 August	Lab session
5	19 August	Tutorial
6	27 August	Lab session
7	2 September	Tutorial (Test on 5 Sept.)
8	9 September	Lab session
9	16 September	Tutorial
10	23 September	Lab session
11	30 September	Mid-semester break
12	7 October	Lab session
13	14 October	Tutorial
14	21 October	
15	28 October	Exams start