

CAPILANO UNIVERSITY COURSE OUTLINES			
<b>TERM:</b>	<b>FALL 2014</b>	<b>COURSE NO:</b>	<b>GEOGRAPHY 214</b>
<b>INSTRUCTOR:</b>		<b>COURSE NAME:</b>	<b>OUR ATMOSPHERIC ENVIRONMENT</b>
<b>OFFICE:</b>	<b>LOCAL:</b>	<b>SECTION NO(S):</b>	<b>CREDITS: 4</b>
<b>E-MAIL:</b>			

**COURSE FORMAT:**

Three instructional hours plus two lab hours, and an additional hour delivered through other activities, per week for a 15-week semester, which includes two weeks for final exams.

**COURSE PREREQUISITES:**

Geography 114 OR Physics 114 OR Physics 111  
(Physics 111 can be done as a co-requisite.)

**COURSE OBJECTIVES:**

Geography 214 is a course about Earth's atmosphere and how it produces our weather and climate. The basic concepts to be explored are energy, moisture, and motion in the atmosphere. Scientific laws are applied throughout the course.

We will explain the *behaviour of the atmosphere* using two of these laws: the Ideal Gas Law and the Law of Hydrostatic Balance. To understand *energy* in the Earth/Atmosphere system we will study heat transfer and the Radiation Laws. In addition, we will see that the Law of Conservation of Energy is fundamental to the concept of the *energy balance* - a concept that we will consider at a variety of scales. For example, using the *planetary* energy balance we will investigate the human impact on Earth's climate.

*Atmospheric water vapour* is important to both weather and climate; we will explore a variety of ways to express the amount of water vapour in the atmosphere. These are useful in describing the degree of saturation of the air, and thus whether or not condensation might occur. Condensation produces dew, fog, and clouds. Clouds are most often the result of vertical motion. Since *atmospheric stability* influences such vertical motions, it can influence the occurrence and type of cloud. Not all clouds produce *precipitation*; we will explain this observation by examining the microphysical processes that operate in clouds and ultimately lead to the growth of cloud droplets into raindrops.

Horizontal motions in the atmosphere are *winds* and winds, like any motion, result from the action of forces. Newton's Laws of Motion are helpful in explaining how certain forces act to produce the winds that we observe near Earth's surface and in the upper air. Further, the uneven heating of Earth - combined with its rotation - help us to explain the large-scale wind and pressure patterns that comprise Earth's *general circulation*.

We will conclude the course with the study of *mid-latitude cyclones*. The development of these important weather producers of the mid-latitudes will be described using the Polar Front Theory but, as we will see, there is much more to these storms than this relatively simple theory might suggest.

**Course objectives – continued**

The labs are an important part of the course as they allow students to *apply* much of the course content. They involve computations and graphing. In addition, students will learn how to interpret weather maps and thermodynamic diagrams. Both of which are indispensable tools of meteorology.

**REQUIRED TEXT:**

Ahrens, C. Donald, Peter L. Jackson, and Christine E. J. Jackson. Meteorology Today. 1<sup>st</sup> Canadian Ed. Nelson Education Ltd, 2012.

**COURSE CONTENT:**

Please note: All readings are from the textbook. Check the page numbers carefully as you do not always need to read the whole chapter. It is expected that you have read the assigned readings and done the assigned questions *before* class. It is particularly important to read ahead to review concepts from Geography 114 that it will be assumed you know.

- Week 1      **Dimensions, Units, Conversions, and Graphs**  
                   Read: Appendix A
- Composition of the Atmosphere**  
                   Read: Chapter 1, pp. 4 - 12  
                   Do: Questions for Review (p. 29): 2 - 9
- Week 2      **Behaviour of the Atmosphere, Weather Charts, Upper Air Soundings**  
                   Read: Chapter 1, pp. 12 - 19  
                   The Radiosonde, p. 18  
                   Do: Questions for Review (p. 29): 10 - 17, 19, 22, 23, 24, 26  
                   Read: Chapter 8, pp. 226 - 238  
                   The Atmosphere Obeys the Gas Law, p. 228 - 229  
                   Flying on a Constant Pressure Surface..., p. 237  
                   The Hydrostatic Equation and Hypsometric Equations, p. 250 - 251  
                   Do: Questions for Review (pp. 253 - 254): 1, 2, 5, 6, 8
- Week 3      **Energy: Heat, Radiation, Solar Radiation, Terrestrial Radiation, Greenhouse Effect**  
                   Read: Chapter 2, pp. 34 - 61  
                   Blue Skies, Red Suns, and White Clouds, p. 48  
                   Daily Radiation and Energy Budgets at Earth's Surface, p. 56 - 57  
                   Do: Questions for Review (pp. 61 - 62): 1 - 20  
                   (Some reading from Chapter 3 may also be assigned.)
- Week 4      **Energy Balance: Planetary Energy Balance, Surface Energy Balance**  
                   Read: See Jan. 21 - 25.  
                   Chapter 16, pp. 497 - 521  
                   Radiative Forcing, p. 510  
                   Do: Questions for Review (pp. 521 - 522): 5, 8, 9, 11 - 1

**Course content** – continuedWeek 5      **Energy Balance, cont.****Atmospheric Water Vapour: Saturation, Representation of Atmospheric Water Vapour, Measurement of Atmospheric Water Vapour**

Read: Chapter 4, pp. 100 - 121  
 All boxes in this chapter.  
 Fog That Forms by Mixing, p. 138 - 139  
 Appendix D  
 Do: Questions for Review (p. 121): 2 - 23

**QUIZ**Week 6      **Atmospheric Water Vapour, cont.**Week 7      **Atmospheric Stability: Thermodynamic Diagrams, Types of Stability**

Read: Chapter 6, pp. 166 - 187  
 All boxes in this chapter.  
 Do: Questions for Review (pp. 187): 1 - 17, 19 - 21

**MIDTERM EXAM**Week 8      **Atmospheric Stability, cont.****Precipitation: Microphysical Processes in Clouds**

Read: Chapter 7, pp. 192 - 214  
 Chapter 5, pp. 128 - 129  
 Do: Questions for Review (p. 221 -222): 1 - 9, 11, 19

Week 9      **Winds: Laws of Motion, Forces, Resultant Winds (Geostrophic, Gradient, Surface), Thermal Winds**

Read: Chapter 8, pp. 226 - 253  
 A Mathematical Look at the Geostrophic Wind, p. 244  
 Do: Questions for Review (pp. 253 - 254): 7, 9 - 23

Week 10      **Earth's General Circulation: Vorticity, Polar Front Jet Stream, Rossby Waves**

Read: Chapter 10, pp. 294 - 300  
 The Dishpan Experiment, p. 302  
 Do: Questions for Review (p. 319): 1 - 9

Week 11      **Midlatitude Cyclones**

Read: Chapter 11, pp. 335 - 347  
 Do: Questions for Review (p. 347 - 348): 12, 13, 15, 1  
 Read: Chapter 12, pp. 352 - 377  
 A Closer Look at Convergence and Divergence, p. 359  
 Jet Streaks and Storms, p. 364  
 Vorticity and Longwaves, p. 371  
 Pineapple Express, p. 375  
 Do: Questions for Review (p. 377): 1, 2, 4, 5, 6, 9, 11, 12, 15, 16, 17, 18  
 Read: Chapter 13, pp. 382 - 411  
 The Thickness Chart - A Forecasting Tool, p. 390 - 391

**Course content** – continued

Week 12 **Midlatitude Cyclones, cont.**

Week 13 **Midlatitude Cyclones, cont.**

**LAB EXAM**

Week 14/15 **FINAL EXAM PERIOD**

**EVALUATION PROFILE:**

Weekly Labs (Fourth Hour) .....	10%
Term Project .....	10%
Quiz .....	10%
Midterm Exam.....	25%
Lab Exam .....	20%
Final Exam .....	25%
	100%

**The lab portion of the course includes the weekly labs, the quiz, and the lab exam. A passing grade (50% or more) is required on the lab portion of the course for the student to obtain a passing grade for the entire course.**

**GRADING PROFILE:**

A+ = 90 - 100%	B+ = 77 - 79%	C+ = 67 - 69%	D = 50 - 59%
A = 85 - 89	B = 73 - 76	C = 63 - 66	F = 0 - 49
A- = 80 - 84	B- = 70 - 72	C- = 60 - 62	

**OPERATIONAL DETAILS:**

*Capilano University has policies on Academic Appeals (including appeal of final grades), Student Conduct, Cheating and Plagiarism, Academic Probation and other educational issues. These and other policies are available on the University website.*

Office Hours:

Fourth Hour:

Fourth hour exercises will be assigned roughly once a week.

Materials needed for class:

- pencil
- eraser
- coloured pencils
- 12"/30 cm ruler
- calculator

Attendance:

Regular attendance is highly recommended.

Late Assignments:

For every day that an assignment is late 10% of the total possible points will be deducted.

## Operational details – continued

### Responsibility for Material covered during a missed class:

When students are absent from class, they are still responsible for the material covered during their absence, including announcements, assigned readings, hand-outs, and labs. Some of the lab assignments will require the use of equipment which will not be available outside the scheduled lab hours.

### Missed Exams:

Students who are unable to write the exams must have an acceptable excuse and are expected to contact the instructor before the exam. The exam must be completed as soon as possible after returning to class.

### Study Time:

**Because this course has a two-hour lab component, the amount of required study time will be greater than a regular three-credit course. Additional study time may be also required if a student's background in math and science needs to be reviewed or upgraded. Help is available through the Math Learning Centre (BR 289).**

### Incomplete Grades:

Grades of Incomplete "I" will be granted only if there is a valid reason for extending the evaluation deadline and if the student has a reasonable chance of improving their grade to pass the course.

### English Usage:

All written work submitted must use good academic English and follow the guidelines provided in the "*Capilano University Guide to Writing Assignments*" (available from the University Bookstore).

### Cheating/Plagiarism:

Plagiarism is the presentation of another person's work or ideas as if they were one's own. Plagiarism is both dishonest and a rejection of the principles of scholarship. Information about how to avoid plagiarism by proper documentation of sources is available from the Library and the Writing Centre. All students should familiarize themselves with the *University Policy on Cheating and Plagiarism* (See the *University Website*) as such behaviour can result in suspension from the University.

### Electronic Devices:

During all classes, turn off cell phones and remove them from the desk. No personal electronic devices (cell phones, calculators, electronic dictionaries, etc.) may be used during an examination without prior approval from the instructor.

### Emergency Procedures:

Please familiarise yourself with the emergency procedures posted on the wall of your classroom.