CAPILANO UNIVERSITY COURSE OUTLINES		
TERM: FALL 2016	**COURSE NO: GEOGRAPHY 214**	
INSTRUCTOR:	**COURSE NAME: WEATHER AND CLIMATE II**	
OFFICE: LOCAL: **E-MAIL:**	**SECTION NO(S):**	**CREDITS: 4**

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 as a pre- or co-requisite.

NOTES: This is an approved Quantitative/Analytical course for baccalaureate degrees.

COURSE DESCRIPTION:

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.

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.

STUDENT LEARNING OUTCOMES:

After completing this course students should be able to

- apply laws of physics to understand atmospheric processes,
- understand how interactions between energy, moisture, and momentum in the atmosphere produce the weather we observe everyday,
- interpret weather maps and thermodynamic diagrams,
- appreciate the complexity of weather forecasting, and
- explain the causes of anthropogenic climate change.

REQUIRED TEXT:

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

COURSE CONTENT:

Week 1 **Dimensions, Units, Conversions, and Graphs**

Composition of the Atmosphere

Week 2 **Behaviour of the Atmosphere, Weather Charts, Upper Air Soundings**

Week 3 **Energy: Heat, Radiation, Solar Radiation, Terrestrial Radiation, Greenhouse Effect**

Week 4 **Energy Balance: Planetary Energy Balance, Surface Energy Balance**

Week 5 **Energy Balance, cont**.

Atmospheric Water Vapour: Saturation, Representation of Atmospheric Water Vapour, Measurement of Atmospheric Water Vapour

QUIZ

Week 6 **Atmospheric Water Vapour, cont.**

Week 7 **Atmospheric Stability: Thermodynamic Diagrams, Types of Stability**

MIDTERM EXAM

Week 8 **Atmospheric Stability, cont.**

Precipitation: Microphysical Processes in Clouds

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

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

Week 11 **Midlatitude Cyclones**

Week 12 **Midlatitude Cyclones, cont.**

Week 13 **Midlatitude Cyclones, cont.**

LAB EXAM

Weeks 14 and 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: To be announced.

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.