

# COURSE OUTLINE: GEOG 2310A WEATHER AND CLIMATE

**Lecture:** B&GS 0165 Tues, Thurs 12:30 – 1:30

**Labs:** SSC 2333 Tu 2:30 – 4:30, Wed 4:30-6:30, Th 10:30-12:30,

**Instructor:** James Voogt, SSC 2401 Phone: 661-2111 Ext. 85018 email: javoogt@uwo.ca  
Office hours (Fall term 2013): 2-3 pm Tuesdays or by appointment (please arrange by email)

## Course Description and Objectives:

This course provides an introduction to the physical processes underlying weather and climate on time and space scales ranging upwards from the local to the global, with a particular emphasis on the formation of mid-latitude cyclones. Laboratories include use of meteorological data, maps, charts, simple instrumentation, graphical tools and numerical computation.

## Evaluation:

The material covered in lectures and labs will be evaluated in a quiz and a final exam. Selected laboratory assignments and questions will be marked. In accordance with university policy, missed exams cannot be made up except on written medical grounds and notification prior to exam date.

Marked Laboratory Assignments	40 % <sup>1</sup>
Pre-lab Quiz	5 % <sup>2</sup>
Midterm	15 %
Final exam	40 %

## Notes:

1. No late labs will be accepted after the due date. Exceptions can be made for medical and other significant reasons beyond your control. Arrangements must be made, if possible, with your teaching assistant BEFORE the due date. Any more than 1 late lab for medical reasons requires official documentation and submission of that documentation to the appropriate Faculty office. See the Policy on Accommodation for Medical Illness: <https://studentservices.uwo.ca/secure/index.cfm>
2. Pre-lab quizzes are very short quizzes (~5 min) administered at the start of selected lab periods to ensure students have read and are prepared for the lab.
3. Marks as posted by the course instructor are considered provisional until approved by the Department Chair. Final marks are received from the Registrar; errors may be corrected through use of a Marks Revision Form.

## Format:

Instruction is through two one hour lectures and one two-hour laboratory per week.

## Course Prerequisites:

The official course prerequisite is 1.0 course from Geography 1100, 1300A/B, 1400F/G, 1500F/G, 2131A/B, 2153A/B (taken after September 2012), or the former Geography 020E; or 0.5 course from Mathematics, Applied Mathematics, Calculus, Environmental Science or Physics at 1000-1999 level; or enrollment in the Major in Physical Geography or in an Honors Earth Science Program for Professional Registration.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

**Course Texts and Laboratory Manual:**

Ross, S.L. 2013. *Weather and Climate: An Introduction*. Oxford University Press, Don Mills ON.

The laboratory manual contains the laboratory exercises and additional reading material. Its availability will be described at the first lecture.

**Other Suitable Texts:**

There are many other books that can serve as adequate texts in support of the course. These three have all served as texts for Geog 2310a at some point in the past. They are all still suitable for use – students will just need to consult the table of contents / index for content that relates to this course.

Ackerman, S.A. and Knox, J.A. 2007. *Meteorology: Understanding the Atmosphere* (2<sup>nd</sup> edition) Thomson Brooks/Cole, Pacific Grove, CA. \*

Aguado, E. and Burt, J.E. 2013. *Understanding Weather and Climate 6<sup>th</sup> Edition*; or earlier editions

Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. 2012. *Meteorology Today: An Introduction to Weather, Climate, and the Environment* 1<sup>st</sup> Canadian Edition, Nelson Education, Toronto. \*

For Science students, the following are also useful alternative (or reference) texts:

McIlveen, R. 2010. *Fundamentals of Weather and Climate* 2<sup>nd</sup> Edition (or earlier editions), Oxford University Press.

Stull, R.B. 2000. *Meteorology for Scientists and Engineers* 2<sup>nd</sup> edition. Brooks/Cole Pacific Grove CA.

Wallace, J.M. and Hobbs, P.V., 2006. *Atmospheric Science: An Introductory Survey*, 2<sup>nd</sup> Edition. Academic Press, Inc. Orlando, FL.

**Statement on Use of Electronic Devices:**

The final exam will require a calculator – the midterm will not.

**Penalties:**

*Exams:* In accordance with university policy, missed exams cannot be made up except on written medical grounds and notification prior to exam date.

*Labs:* Late labs have a penalty of 10% per day. Labs submitted more than 1 week late will not be accepted. Exceptions can be made for documented medical and other significant reasons beyond your control (see subsequent sections).

**Non-medical Absences:**

Non-medical absence from the midterm requires prior approval of the instructor or approval by the Dean's office (appropriate documentation will be required by the Faculty Dean's Office for approval if it is not obtained prior to the midterm). Non-medical absences from laboratory sessions require approval of the instructor.

**Medical Absences:**

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth **10% or more** of their final grade must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.

For UWO Policy on Accommodation for Medical Illness and a downloadable SMC see:

[http://www.uwo.ca/univsec/handbook/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf)

Downloadable Student Medical Certificate (SMC): <https://studentservices.uwo.ca> under the Medical Documentation heading

When medical illness affects work worth **less than 10%** of the total course grade (i.e. a lab assignment), please contact the course instructor for academic accommodation (documentation not required).

### **University Statement on Academic Offences**

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: [http://www.uwo.ca/univsec/handbook/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf).”

“Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.”

### **Course Website:**

Additional course information will be provided on the web. Use <http://owl.uwo.ca> and then log in to Sakai using your uwo username and password. Your log in will require that you be officially enrolled in the course. This site will provide lecture materials, and other documents that may assist with course components.

### **Western's Commitment to Accessibility:**

The University of Western Ontario is committed to achieving barrier free accessibility for persons studying, visiting and working at Western.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

### **Support Services:**

Registrarial Services: <http://www3.registrar.uwo.ca/index.cfm>

Student Development Services: <http://www.sdc.uwo.ca/>

Emotional/Mental Health: Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

### **Fire Drills:**

Students are required to evacuate the building when the fire alarm is activated.

## COURSE OUTLINE

The following topics will be covered in the course, as time permits.

1. Introduction:
  - Course overview.
  - Components of the atmosphere, temporal and spatial scales of the atmosphere.
2. Radiant Energy:
  - Electromagnetic spectrum, radiation laws, short- and long-wave radiation, radiation balance at local and global scales.
  - Atmospheric Optics- fundamentals and clear sky phenomena.
3. Energy Balance and Temperature:
  - CO<sub>2</sub> and the "Greenhouse" effect, global warming, atmospheric temperature profile, heating/cooling, inversions, measurement of temperature.
  - Energy budgets at global and local scales.
  - The urban heat island.
4. Atmospheric Thermodynamics and Humidity:
  - Equation of State, Hydrostatic Equation, First Law of Thermodynamics.
  - Latent heat, measures of humidity, adiabatic processes, lapse rates.
  - Stability (classic local static stability, non-local stability).
  - Tephigrams and vertical analysis of the atmosphere.
5. Clouds and Precipitation:
  - CCN, Condensation, fog, cloud formation and appearance, cloud microphysics, precipitation mechanisms.
6. Atmospheric Dynamics:
  - Atmospheric pressure, pressure charts and height charts.
  - Equation of motion, forces, geostrophic winds, gradient winds, geostrophic frictional effects.
  - Large scale circulations (El Niño and La Niña), surface effects and local winds (sea and land breezes).
7. Air Masses and Fronts
  - Air mass characteristics and source regions.
  - Fronts: stationary, cold, warm, occluded, characteristics and identification.
8. Mid-latitude Cyclones and Weather Forecasting
  - Polar front theory, cyclogenesis, cyclones and the jet stream, upper level waves, vorticity, conveyor belt model.
  - Approaches to forecasting, limits of forecasts.
9. Severe Weather: Thunderstorms, Tornadoes and Hurricanes
  - Classification, formation, impacts, identification and forecasting.
10. Local Scale Weather: Lake Effect Snow
  - Lake Effect Snow – formation and identification from weather imagery

## Lecture / Laboratory Timetable

Select labs and/or questions will be marked. All lab material may be tested.

Wk	Date	Lecture Topic	Text Readings	Laboratory
1	Sep. 10	Introduction	Chp. 1	
1	Sep. 12	The Atmosphere	Chp. 2	
2	Sep. 17	Shortwave Radiation	Chp. 5	Weather and Climate Data
2	Sep. 19	Longwave Radiation	Chp. 5	
3	Sep. 24	Energy Balance	Chp. 6	Global Scale Radiation Balance
3	Sep. 26	Atmospheric Thermodynamics	Chp. 3: 3.1 – 3.6: Chp. 4	
4	Oct. 1	Humidity	Chp. 7	Local Scale Radiation Balance
4	Oct. 3	Humidity	Chp. 7	
5	Oct. 8	Soundings	Chp. 8	Atmospheric Humidity Forecast Analysis: Introduction
5	Oct. 10	Static Stability	Chp. 8; 17.1.2	
6	Oct. 15	Non-local Stability Destabilizing factors	Chp. 8	Atmospheric Soundings: Tephigrams
6	Oct. 17	MIDTERM		
7	Oct. 22	Fog and Cloud Formation	Chp. 9	Atmospheric Soundings: Indices and Forecasting Severe Weather
7	Oct. 24	Precipitation Formation	Chp. 10	
8	Oct. 29	Atmospheric Dynamics	Chp. 11; Chp 3: 3.4- 3.6	<i>No labs: study break begins Thurs.</i>
8	Oct. 31	<i>Fall Study Break</i>		
9	Nov. 5	Atmospheric Dynamics	Chp. 11	Atmospheric Stability
9	Nov. 7	Large Scale Flows	Chp. 12	
10	Nov. 12	Air Masses and Fronts	Chp. 13	Winds
10	Nov. 14	Mid-latitude Cyclones	Chp. 14.1 – 14.2	
11	Nov. 19	Mid-latitude Cyclones	Chp. 14.1 – 14.2	Surface Weather Analysis
11	Nov. 21	Weather Forecasting	Chp. 15	
12	Nov. 26	Weather Forecasting	Chp. 15	Sfc Weather Analysis (cont.)
12	Nov. 28	Thunderstorms	Chp. 14: 14.4	
13	Dec. 3	Hurricanes	Chp. 14: 14.3 + supplemental reading	Review
13	Dec. 5	Lake Effect Snow	Chp. 13: 13.3	

### Notes

Each lab will provide a set of specific readings that can assist with the lab material.