



University of Manitoba
Faculty of Environment, Earth and Resources
Department of Environment and Geography

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COURSE DETAILS

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|--|--|
| Course Title & Number: | GEOG 2300 Atmospheric Thermodynamics, Clouds and Precipitation |
| Number of Credit Hours: | 3 |
| Class Times & Days of Week: | T/Th 11:30 am - 12:45 pm |
| Location for Classes: | 243 Wallace |
| Pre-Requisites: | GEOG 1290 or GEOG 1291 (053.129) (C), or GEOG 1200 or GEOG 1201 (053.120) (C), and (MATH 1500 or MATH 1501 (136.150) (C), or MATH 1510 (136.151) (C), or MATH 1520 (136.152) (C), or MATH 1530 (136.153) (C)). |

Instructor Contact Information

| | |
|--------------------------------------|---|
| Instructor(s) Name: | Dr. John Hanesiak Dr. Ron Stewart |
| Office Location: | 468 Wallace (Hanesiak); 470 Wallace (Stewart) |
| Office Hours or Availability: | Make an appointment via in person during class or email during regular daytime hours (8am – 4pm) |
| Office Phone No. | 474-7049 (Hanesiak); 480 1052 (Stewart) |
| Email: | John.hanesiak@umanitoba.ca Ronald.stewart@umanitoba.ca All emails will be replied to within 48 hrs |
| Contact: | Feel free to set up an after-class meeting in person in class or via email during regular daytime hours (8am – 4pm) |

General Course Information & Goals

Critical thermodynamic processes are discussed that are associated with the Earth's atmosphere including dry and moist processes, phases of water, stability, cloud development and precipitation processes.

The science of meteorology is founded upon the observation, description, and explanation of the physical properties of the Earth's atmosphere. The goal of this science is to explain and predict the weather and various critical atmospheric elements (e.g temperature, precipitation, wind, humidity and clouds). The purpose of the course is to provide students with an understanding of thermodynamic meteorological processes over synoptic and meso scales that contribute to cloud development, instability, precipitation, energy for cyclonic systems, fronts and meso-scale convective storms. This will include Chapters 1-8 in the course text (Stull) as well as powerpoint notes and handouts that will cover all topics in greater detail than the text. Reference to Canadian weather (atmosphere and surface) will be made throughout the course. Students should be prepared for mathematical/physical concepts to be treated in the course.

This course is required for careers in operational meteorology (weather forecasting), atmospheric and climate sciences. It can also serve as a solid foundation for basic atmospheric processes understanding for other physical sciences careers (e.g. environmental services/science).

Using Copyrighted Material

Please respect copyright. We will use some copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the *Copyright Act* applies or written permission has been confirmed. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact um_copyright@umanitoba.ca.

Recording Class Lectures

The instructors (Hanesiak and Stewart) and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of the instructors. Course materials (both paper and digital) are for the participant's private study and research.

Textbook, Readings, Materials

Required textbook:

Stull, Roland B., *Meteorology for Scientists and Engineers*. 3rd ed., c2015.
(found here for free: http://www.eos.ubc.ca/books/Practical_Meteorology/)

Can also use (but better to use 3rd edition)

Stull, R. B., *Meteorology for Scientists and Engineers*. 2nd ed. Pacific Grove, CA: Brooks/Cole, c2000.

Used copies of the 2nd edition can be purchased in the UM Bookstore or online.

Supplementary Readings (not required) (can be found in UM library system or purchased online):

- Tsonis, A.A., *An introduction to atmospheric thermodynamics*, 2nd ed. Cambridge University Press, 2007.
- Rogers, R.R. and M.K. Yau, *A short course in cloud physics*, 3rd ed., Butterworth-Heinemann, 1996.
- Salby, Murray L., *Fundamentals of atmospheric physics*, Academic Press, 1996.
- Jacobson, Mark Z., *Fundamentals of atmospheric modeling*, University Press, 1999.

Tools:

All students should ensure they have non-programmable scientific calculators.

Course Lectures/Materials:

All lecture powerpoints and other digital content will be provided to students via UM Learn System. Be sure to familiarize yourself with the UM Learn System.

Course Technology

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by instructor and/or the University of Manitoba Disability Services. Student should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g. Facebook) online and offline “gaming” during scheduled class time. If student is on call (emergency) the student should switch his/her cell phone on vibrate mode and leave the classroom before using it. (©[S Kondrashov](#). Used with permission)

Class Communication

The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit:

[http://umanitoba.ca/admin/governance/media/Electronic Communication with Students Policy - 2014 06 05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

Please note that all communication between myself and you as a student must comply with the electronic communication with student policy

([http://umanitoba.ca/admin/governance/governing_documents/community/electronic communication with students policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

Expectations: Instructors Expect You To

The instructors will be in class for 5-10 minutes prior to and after the class time. We will treat you with respect and would appreciate the same courtesy in return. See [Respectful Work and Learning Environment Policy](#).

Academic Integrity:

Please see the PDF file called "Schedule-A-ROASS.pdf" in the UM Learn course folder that contained Schedule "A" (Policies and Resources) that outlines academic integrity policies and student resources. Students should acquaint themselves with the University's policy on cheating and examination impersonation (see Section 7.0 of the University of Manitoba General Calendar). **Plagiarism and cheating in general, is a serious academic offence.**

All work/assignments submitted by each student is to be completed independently unless otherwise specified.

Students Accessibility Services

Student Accessibility Services

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services <http://umanitoba.ca/student/saa/accessibility/>

520 University Centre

204 474 7423

Student_accessibility@umanitoba.ca

Expectations: You Can Expect Instructors To

We value each student's viewpoint and input to each class. Therefore, we encourage students to interact with us in class by asking questions and answering questions posed by instructors and other students in the class. We expect students to respond the best they can, however, we do not expect perfection!

Class Schedule

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the – [ROASS-Procedure](#)).

Hanesiak Schedule

| Date(s) | Class Content | Required Readings or Pre-class Preparation | Evaluation |
|--|--|--|--------------------|
| Sept. 8 | Introduction | | |
| Approx. Sept. 13 - 22 | Energy and Temperature | Chapters 1 and 3 (Stull 3 rd ed.) | |
| Approx. Sept. 27 – Oct. 11 (Oct. 6-10 holiday) | Moisture and Stability | Chapters 4 and 5 (Stull 3 rd ed.) | |
| Approx. Oct. 13 – 20 | Thermodynamic Diagrams | Powerpoints & other materials on UM Learn | |
| Oct. 4 | Assignment #1 Due (expect marks back in 1 week max) | | 10% of final grade |
| Oct. 6 | Quiz (take-home) Due (expect marks back in 1 week max) | | 10% of final grade |
| Oct. 20 | Assignment #2 Due (expect marks back in 1 week max) | | 10% of final grade |
| Oct. 25 | mid-term test (expect marks back in 1.5 weeks max) | One side 8.5" x 11" cheat sheet allowed | 20% of final grade |

Stewart Schedule

| Date(s) | Class Content | Required Readings or Pre-class Preparation | Evaluation |
|----------------------|---|--|--------------------|
| Oct. 27 | Introduction | Material on UM Learn | |
| Approx. Nov. 1 - 3 | General features of clouds | Material on UM Learn | |
| Approx. Nov. 8 - 17 | Nucleation of liquid particles | Material on UM Learn | |
| Nov 15 | Assignment #1 (Part 2 of course) Due (expect marks back prior to the test) | | 10% of final grade |
| Nov 22 | Quiz (in class) (expect marks back in 1 week) | | 10% of final grade |
| Approx. Nov. 24 - 29 | Condensation and collision processes in precipitation formation | Material on UM Learn | |
| Approx. Dec 1 | Ice particle growth | Material on UM Learn | |
| Dec. 1 | Assignment #2 (Part 2 of course) Due (expect marks back in 1 week) | | 10% of final grade |
| Approx. Dec 6 | Precipitation characteristics | Material on UM Learn | |
| Dec. 8 | Final test (Part 2 of course) | | 20% of final grade |

Course Evaluation Methods

We will be using a combination of quizzes, assignments and tests for evaluation purposes. **No final exam is used.**

Refer to the Assignment Description on the following page of the syllabus for details of assignment answer formatting.

| Due Date: | Assessment Tool | Value of Final Grade |
|--|---|----------------------|
| Oct 4, 2016 (submit at the start of the class) | Assignment #1 (expect marks back in 1 week max) | 10% |
| Oct 6, 2016 (submit at the start of the class) | Quiz (take-home) (expect marks back in 1 week max) | 10% |
| Oct 20, 2016 (submit at the start of the class) | Assignment #2 (expect marks back in 1 week max) | 10% |

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|--------------------------------------|--|-----|
| Oct 25, 2016 (conducted in class) | mid-term test (expect marks back in 1.5 weeks max) | 20% |
| Nov 15, 2016 | Assignment #1 (Part 2 of course) Due (expect marks back prior to the quiz) | 10% |
| Nov 22, 2016 | Quiz (in class) | 10% |
| Dec 1, 2016 | Assignment #2 (Part 2 of course) Due (expect marks back prior to the final test) | 10% |
| Dec 8, 2016 | Final test (marks back in 1 week) | 20% |

Grading

It will be important to attend the lectures and interact with the instructors and other students. Students will not be permitted to write make-up tests or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed assignments, tests and quizzes. Late assignments will be penalized 10% per day (including weekends and holidays). Students may have access to their marks prior to the voluntary withdrawal date (November 18, 2016) and are encouraged to talk with instructors before a decision to withdraw is made.

| Letter Grade | Percentage out of 100 | Grade Point Range | Final Grade Point |
|--------------|-----------------------|-------------------|-------------------|
| A+ | 90-100 | 4.25-4.5 | 4.5 |
| A | 80-89 | 3.75-4.24 | 4.0 |
| B+ | 75-79 | 3.25-3.74 | 3.5 |
| B | 70-74 | 2.75-3.24 | 3.0 |
| C+ | 65-69 | 2.25-2.74 | 2.5 |
| C | 60-64 | 2.0-2.24 | 2.0 |
| D | 50-59 | Less than 2.0 | 1.0 |
| F | Less than 50 | | 0 |

Assignment Descriptions

See "Assignment Format.pdf" on UM Learn course directory.

Assignment Grading Times

See the Class Schedule Tables.

Assignment Extension and Late Submission Policy

Students will not be permitted to write make-up tests or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed

assignments, tests and quizzes. Late assignments will be penalized 10% per day (including weekends and holidays). Students may have access to their marks prior to the voluntary withdrawal date (November 18, 2016) and are encouraged to talk with instructors before a decision to withdraw is made.