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

TABLE OF CONTENTS

COURSE DETAILS

Course Title & Number:	**GEOG 4780 Storms – Mesoscale Meteorology**
Number of Credit Hours: 3	
Class Times & Days of Week:	**T/Th 1300 – 1415**
Location for Classes:	**243 Wallace**
Pre-Requisites:	GEOG 3310 (there are several pre-req's for GEOG 3310)

Instructor Contact Information

Instructor(s) Name:	**Dr. Ron Stewart** **Dr. John Hanesiak**
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

This course focuses on a range of storms and mesoscale phenomena in the summer or winter. These include thunderstorms, tornadoes, squall lines, lightning, low level jets, gust fronts, blizzards, freezing rain, orographic storm, and polar lows. The emphasis is on the physical mechanisms leading to these events and it also examines how they may change in our changing climate.

This course is concerned with storms and mesoscale meteorology. These are critical aspects of atmospheric science and they bridge the temporal/spatial scales between the microscale (< 1 km) and synoptic scales (> 500 km). Mesoscale phenomena can also be embedded within larger

scale weather systems. Mesoscale meteorology is particularly important now that atmospheric computer models are able to resolve these scales. Examples of mesoscale atmospheric phenomena include, but are not limited to, severe convective storms of all kinds, hurricanes, polar lows, lake effect storms, land/lake breezes, tornadogenesis, and heavy rainfall/snowfall events. Students will gain an appreciation of the fundamental factors associated with a range of storms and mesoscale phenomena through up-to-date material from textbooks and the current literature.

This course is important (but not 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.

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

Reference textbooks (but not required):

(1) *Mesoscale Meteorology in Midlatitudes* by P. Markowski and Y. Richardson (2010), Wiley Blackwell, 407 pp.
(2) *Mesoscale Meteorology and Forecasting* by P. Ray (ed.) (1986), Amer. Meteor. Soc., 793 pp.
(3) *Mesoscale Meteorological Modeling* by R.A. Pielke (1984), Academic Press, 612 pp.
(4) *Cloud Dynamics* by R. Houze, Jr. (1993), Academic Press, 573 pp.
(5) *Atmospheric Convection* by K.A. Emanuel (1994), Oxford Press, 580 pp.
(6) *Severe Convective Storms*: C.A. Doswell III, ed. (2001), Meteor. Monograph, 28, 50, 1-26.
(7) *Mountain Weather Research and Forecasting: Recent Progress and Current Challenges* by F.K. Chow, S.F.J. De Wekker and B.J. Snyder (eds.) (2012), Springer, 750 pp.

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

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). 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).

Stewart Schedule

Date(s)	Class Content	Required Readings or Pre-class Preparation	Evaluation
Sept 8	Introduction and fundamentals	Material on UM Learn	
Approx.	Winter storms	Material on UM Learn	

Sept 13-20			
Approx. Sept 22-27	Transition regions	Material on UM Learn	
Approx. Sept 29	Surface weather conditions	Material on UM Learn	
Sept 29	Assignment #1 due (Part 1 of course) and marks back 1 week later		15% of final grade
Approx. Oct 4-6	Storms and orography	Material on UM Learn	
Oct 4-20	Student Presentations (Part 1 of course) embedded in lectures with similar topics (expect marks back within 1 week)		15% of final grade
Approx. Oct 11	Lightning	Material on UM Learn	
Approx. Oct 13	Lake effect storms	Material on UM Learn	
Approx. Oct 18	Polar lows	Material on UM Learn	
Approx. Oct 20	Monsoons and future extremes	Material on UM Learn	
Oct 25	Final Test (Part 1 of course)		20% of final grade

Hanesiak Schedule

Date(s)	Class Content	Required Readings or Pre-class Preparation	Evaluation
Oct. 27	Introduction & mesoscale scale analysis	Material on UM Learn	
Approx. Nov. 1 - 10	Supercells and Tornadoes	Material on UM Learn	
Approx. Nov. 15 – 17	Non-Mesocyclone Tornadoes (NMTs)	Material on UM Learn	
Approx. Nov. 22 – 24	Planetary Boundary Layer (PBL) and Low Level Jets (LLJs)	Material on UM Learn	
Approx.	CAPE/DCAPE & downbursts	Material on UM Learn	

Nov. 29			
Dec. 1 & 6	Student Presentations (Part 2 of course) (expect marks back in 1 week max)		15% of final grade
Dec. 1	Assignment #1 (Part 2 of course) Due (expect marks back prior to the test)		15% of final grade
Dec. 8	Final test (Part 2 of course)		20% of final grade

Course Evaluation Methods

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

Refer to the Presentation Description on the following page of the syllabus for details of what is expected for the presentations.

Date:	Assessment Tool	Value of Final Grade
Sept 29	Assignment #1 due (Part 1 of course) and marks back 1 week later	15% of final grade
Oct 4-20	Student Presentations (Part 1 of course) embedded in lectures with similar topics (expect marks back within 1 week)	15% of final grade
Oct 25	Final Test (Part 1 of course)	20% of final grade
Dec. 1 & 6	Student Presentations (Part 2 of course) (expect marks back in 1 week max)	15% of final grade
Dec. 1	Assignment #1 (Part 2 of course) Due (expect marks back prior to the test)	15% of final grade
Dec. 8	Final Test (Part 2 of course)	20% of final grade

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 presentations. 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/Presentation/Test Descriptions

There will be two assignments, two presentations and two in-class tests that students will have to complete for the course (one assignment, one presentation and one test per instructor). No Final Exam will be done. The assignment questions and details will be provided in each assignment but will focus on the topics covered in class. The final tests will cover class material as well as major points within student presentations – questions will involve short-answer type questions. Details of the presentation requirements is provided below.

You may select a topic from the list below to be the focus of your presentation. Other topics may be acceptable, however, be sure to verify this with the instructor first.

The following aspects should be considered when preparing/delivering your presentation:

- The talk should not be longer than 10 minutes. Be sure to practice it beforehand!
- Title page should reflect the main focus topic of the presentation.
- 1-2 slides should be used for an Introduction to your topic – this includes “motherhood stuff” such as why the topic is important to society. The Intro should also include relevant background to the topic.
- The introduction should also clearly state the purpose and/or motivation of the paper(s) you used for your talk.
- Organize your talk so the flow is logical.
- Discuss the topic in such a way so that other students can learn from your presentation – i.e. be sure to take more time when discussing more detailed or complex ideas.
- Are figures appropriate and effective in supporting your discussions?
- Figures should have citations - from where it was used.
- Speak clearly and loud enough when delivering your talk.
- Last slide should include all references.

You will be graded according to the points above, as well as, **overall organization, clarity, understanding of the subject, and using up-to-date more recent references.**

Example Topics:

Low-level jets	Tornadogenesis
Drylines	Squall Lines / Derecho's / MCCs
Boundary layer rolls	Downslope windstorms and/or terrain-induced rotors
Land or sea breezes	Hurricanes
Land/vegetation influence	Polar Lows and Arctic Extreme Weather
on cloud/storm initiation	Rainbands
Valley flows	Orographic precipitation
Mountain waves	Fog
Gravity waves	Non-mesocyclone tornadoes (NMT's)
Density Currents	Convection Initiation processes
micro or macrobursts	

Some common journals in the library system (online or hardcopy) include:

American Meteorological Society (many journals)
Atmosphere-Ocean (Canadian Meteorological and Oceanographic Society)
Electronic Journal of Severe Storms Meteorology (EJSSM)
Atmospheric Research
Quarterly Journal of the Royal Meteorological Society (QJRMS)
Tellus
Journal of Geophysical Research - atmospheres
Earth Interactions
Boundary Layer Meteorology
Agricultural and Forest Meteorology
Arctic

Books (do not use books older than 2004)

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.