



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

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COURSE DETAILS

Course Title & Number:	GEOG 4330 Concepts in Atmospheric Modelling
Number of Credit Hours:	3
Class Times & Days of Week:	Mondays 12:30 – 1:20 PM
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. John Hanesiak
Office Location:	468 Wallace
Office Hours or Availability:	Make an appointment via email
Office Phone No.	474-7049 (will not be there much)
Email:	John.hanesiak@umanitoba.ca All emails will be replied to within 48 hrs
Contact:	email

General Course Information & Goals

This course will primarily focus on numerical modeling applications and techniques of the Earth's atmosphere with an emphasis on weather prediction. This includes understanding basic modeling terminology, numerical schemes, structure of models, types of models, what is required to run a model, and an introduction to data assimilation and ensemble techniques to weather prediction.

Much of the course material is online (https://www.meted.ucar.edu/training_detail.php) (select "Numerical Modeling (NWP)" from the drop down menu in the "Topics" on the main page.

Be sure to add my email to your MetEd account profile so your quiz scores come to me.

The course structure is as follows.

1. **Module 1:** Model fundamentals – Version 2 (web page above)
2. **Module 2:** NWP Essentials: structure & dynamics (web page above)
3. **Module 3:** NWP Essentials: precipitation and clouds (web page above)
4. **Module 4:** NWP Essentials: model physics (web page above)
5. **Module 5:**
 - (a) How mesoscale models work (web page above)
 - (b) Limitations of High-Resolution NWP Models (web page above)
6. **Module 6:** NWP Essentials: Data Assimilation (web page above)
7. **Module 7:** Introduction to EPS Theory (use web page above)

This course is important (but not required) for careers in operational meteorology (weather forecasting), atmospheric and climate sciences.

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 instructor 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) Stull, R. B., *Practical Meteorology: An Algebra-based Survey of Atmospheric Science*; version 1.02b. Univ. of British Columbia. 940 pages. isbn 978-0-88865-283-6 (found here for free: https://www.eoas.ubc.ca/books/Practical_Meteorology/index.html)
- (2) *Fundamentals of atmospheric modeling* by Mark Z. Jacobson, University Press, 1999.
- (3) *Atmospheric Modeling, data assimilation and predictability* by E. Kalnay, Cambridge Press, 2003.

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). 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](#)).

Be sure to add my email to your MetEd account profile so your quiz scores come to me.

(https://www.meted.ucar.edu/training_detail.php) select "Numerical Modeling (NWP)" from the drop down menu in the "Topics" on the main page.

1. **Module 1:** Model fundamentals – Version 2 (web page above)
2. **Module 2:** NWP Essentials: structure & dynamics (web page above)
3. **Module 3:** NWP Essentials: precipitation and clouds (web page above)
4. **Module 4:** NWP Essentials: model physics (web page above)
5. **Module 5:**
 - (a) How mesoscale models work (web page above)
 - (b) Limitations of High-Resolution NWP Models (web page above)

6. **Module 6:** NWP Essentials: Data Assimilation (web page above)
7. **Module 7:** Introduction to EPS Theory (use web page above)

Schedule

Date(s)	Class Content	Required Readings or Pre-class Preparation	Evaluation
Jan 8 onward	Introduction and ongoing material from Stull text	Material on UM Learn	
Jan 29 onward	Modules 1-7	Material on UM Learn and MetEd site	Online Quiz's
Apr 8	Assignment/Project write-up Due		
Apr 8	In-Class presentations		

Course Evaluation Methods

We will be using a combination of quiz's, one assignment (undergrads)/additional project write-up (grad students) and a presentation for evaluation purposes. **No final exam is used.**

Refer to the Assignment/Presentation/Quiz Descriptions on the next page of the syllabus for details of what is expected.

Undergraduate Students

Date:	Assessment Tool	Value of Final Grade
Anytime between Jan 29 - Apr 8	8 Online Quiz's Each worth 8.75%	70%
Apr 8	Assignment Write-Up due	15% of final grade
Apr 8	Student Presentations for Assignment	15% of final grade

Graduate Students

Date:	Assessment Tool	Value of Final Grade
Anytime between Jan 24 - Apr 8	8 Online Quiz's Each worth 8.75%	70%

Apr 8	Assignment Write-Up due	10% of final grade
Apr 8	Additional Paper Write-Up Due	10% of final grade
Apr 8	Student Presentations for Assignment	10% of final grade

Grading

It will be important to attend the first few lectures and interact with the instructors and other students. Students will not be permitted to write make-up quiz's or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed assignments, quiz's 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 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/Quiz Descriptions

There will be one assignment/project and an accompanying presentation and eight online quiz's that students will have to complete for the course. Graduate students will also have to complete an additional written paper (similar in length and scope as the assignment) on a topic of their choice, in consultation with the course instructor. The quiz's are embedded at the end of each online COMET module and the marks from those quiz's will be automatically emailed to the instructor for record/grade keeping. No Final Exam will be done. Details of the assignment/project and presentation requirements are provided below.

Each student will write a 4-page (maximum) double-spaced 12 pt font summary (**due Apr. 8**) of a journal article on a topic of interest to them (relevant to the course content) and will also present this summary to the class (**Apr. 8**) with a 10-12 minute powerpoint-type talk. Topics may include, but not limited to: convection schemes/parameterizations, microphysical

schemes/parameterizations, land surface schemes used in NWP, data assimilation (theory or application), ensembles (theory or applications), or coupled surface-atmosphere applications (e.g. atmospheric controls on hydrological modelling) – other topics will also be considered but must be verified by the instructor prior to one being selected.

Write-Up Guidelines

4 page (maximum) double-spaced 12 pt font summary of a journal article on a topic of interest to them (relevant to the course content – see above for examples):

- The summary write-up should be 4 doubled-spaced pages long (including figures) but **at least 2.5 pages of text are required**.
- Figures can appear within the main text but could also appear after the main text with references/citations at the very end (figures before references).
- You are encouraged to include your own critical review of the article (e.g. main drawbacks and limitations, and how you may approach the analysis differently).
- The summary write-up should include a brief introduction (why the topic is important scientifically and to people and society) followed by the main body of the summary (the main body should be well organized and include sub-sections where appropriate).
- You should summarize the data and methods used for the study, the main points of the results, and any limitations/errors that the authors suggest or ones that you think of (more marks given for your own critical thoughts!).
- All figures/tables you choose to use should have captions and should be numbered and ***explicitly referred to in your paper!***
- All references should be at the end of the report in alphabetical order according to the lead author name.
- You should use RECENT publications (within the last 5 years). Failure to do so will impact your mark.

The paper will be graded on overall organization, clarity, understanding of the subject, your own critique, grammar, completeness, neatness and using up-to-date more recent references.

Presentation Guidelines

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

- The talk should not be longer than 10-12 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 article you used for your talk.

- Organize your talk so the flow is logical, similar to the article.
- 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 visibly clear to the eye, appropriate and effective in supporting your discussions?
- Speak clearly and loud enough when delivering your talk.
- Last slide should include references.

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

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
Journal of Advances in Modeling Earth Systems
Earth Interactions
Boundary Layer Meteorology
Agricultural and Forest Meteorology
Arctic

Assignment Grading Times

See the Class Schedule Tables.

Assignment Extension and Late Submission Policy

Students will not be permitted to write make-up quiz's or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed assignments 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 and are encouraged to talk with instructors before a decision to withdraw is made.

Schedule "A"

Section (a): A list of academic supports available to Students, such as the Academic

Learning Centre, Libraries, and other supports as may be appropriate:

Writing and Learning Support

The Academic Learning Centre (ALC) offers services that may be helpful to you throughout your academic program. Through the ALC, you can meet with a learning specialist to discuss concerns such as time management, learning strategies, and test-taking strategies. The ALC also offers peer supported study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In these study groups, students have opportunities to ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

You can also meet one-to-one with a writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. If you are interested in meeting with a writing tutor, reserve your appointment two to three days in advance of the time you would like to meet. Also, plan to meet with a writing tutor a few days before your paper is due so that you have time to work with the tutor's feedback.

These Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at:

<http://umanitoba.ca/student/academiclearning/>

You can also contact the Academic Learning Centre by calling 204-480-1481 or

by visiting 201 Tier Building.

University of Manitoba Libraries (UML)

As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about managing citations, or locating appropriate resources, and will address any other concerns you may have, regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you in-person. A complete list of liaison librarians can be found by subject: <http://bit.ly/WcEbA1> or name: <http://bit.ly/1tJ0bB4>. In addition, general library assistance is provided in person at 19 University Libraries, located on both the Fort Garry and Bannatyne campuses, as well as in many Winnipeg hospitals. For a listing of all libraries, please consult the following: <http://bit.ly/1sXe6RA>. When working remotely, students can also receive help online, via the Ask-a-Librarian chat found on the Libraries' homepage: www.umanitoba.ca/libraries.

Section (b): A statement regarding mental health that includes referral information:

For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. *Student Counselling Centre:*

<http://umanitoba.ca/student/counselling/index.html>

474 University Centre or S207 Medical Services

(204) 474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

Student Support Intake Assistant <http://umanitoba.ca/student/case-manager/index.html>

520 University Centre

(204) 474-7423

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.

University Health Service <http://umanitoba.ca/student/health/>

104 University Centre, Fort Garry Campus

(204) 474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact our Health and Wellness Educator if you are interested in information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.

Health and Wellness Educator <http://umanitoba.ca/student/health->

[wellness/welcome.html](http://umanitoba.ca/student/health-wellness/welcome.html)

Katie.Kutryk@umanitoba.ca

469 University Centre

(204) 295-9032

Live Well @ UofM

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site:

<http://umanitoba.ca/student/livewell/index.html>

Section (c): A notice with respect to copyright:

All students are required to respect copyright as per Canada's *Copyright Act*.

Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community.

Visit <http://umanitoba.ca/copyright> for more information.

Section (d): A statement directing the student to University and Unit policies, procedures, and supplemental information available on-line:

Your rights and responsibilities

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the

policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The [Academic Calendar](#)

<http://umanitoba.ca/student/records/academiccalendar.html> is one important source of information. View the sections *University Policies and Procedures* and *General Academic Regulations*.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final **grade appeals**. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form <http://umanitoba.ca/registrar/>
- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the **Academic Integrity** regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/> View the **Student Academic Misconduct** procedure for more information.
- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

Respectful Work and Learning Environment

http://umanitoba.ca/admin/governance/governing_documents/community/230.html

Student Discipline

http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html and,

Violent or Threatening Behaviour

http://umanitoba.ca/admin/governance/governing_documents/community/669.html

- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The **Sexual Assault** policy may be found at: http://umanitoba.ca/admin/governance/governing_documents/community/230.html More information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>
- For information about rights and responsibilities regarding **Intellectual Property** view the policy http://umanitoba.ca/admin/governance/media/Intellectual_Property_Policy_-_2013_10_01.pdf

For information on regulations that are specific to your academic program, read

the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations <http://umanitoba.ca/academic-advisors/>

Student Advocacy

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

student_advocacy@umanitoba.ca