Syllabus

ANSC 7560 – Mathematical Modeling of Agricultural Systems

(Winter 2021)

Faculty of Agricultural and Food Sciences

University of Manitoba

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COURSE DETAILS

Course Title & Number:	ANSC 7560 – Mathematical Modeling of Agricultural Systems
Number of Credit Hours:	3.0
Class Times & Days of Week:	Thursday 2:30-5:15 pm
Location for classes/labs/tutorials:	WebEx Meetings
Pre-Requisites:	MATH 1500 or MATH 1520 or Equivalent or Consent of Instructor

Instructor Contact Information

Instructor(s) Name & Preferred Form of Address:	Marcos Cordeiro
Office Location:	232 Animal Science Building
Office Hours or Availability:	Generally, open door policy from 9:00 am to 4:00 pm but best to schedule an appointment by email
Office Phone No.	(204) 474-6112
Email:	Marcos.Cordeiro@umanitoba.ca All email communication must conform to the Communicating with Students university policy.
Contact:	Students are encouraged to contact the instructor in person, by phone or email during the time outlined above.

Course Description

Agricultural models are becoming increasingly important as tools for assessment of agro-ecosystems as they provide synthesis and quantification of the effects of varying management practices and climate on the agronomic, economic, and environmental performance of agricultural landscapes at varying temporal and spatial scales. In this course, students will review and discuss literature relating to current challenges and recent developments in agricultural modelling.

Through lectures, assigned readings, literature reviews, group discussions, seminars and modelling exercises, students will critique different aspects of modelling, from input data screening to model output uncertainty assessment. This course may use freely available modelling pakcages developed by United States Department of Agriculture (USDA), Agriculture and Agri-Food Canada (AAFC), Univesity of Saskatchewan, and University of Idaho, as well as open-source geographical information systems (GIS) packages such as QGIS. The R programming language may also be used.

Course Goals

Through reviewing and disussing relevant material, students will (1) increase the understanding of how to apply agricultural models, datasets, and pre-processing tools to address different agricultural issues, (2) learn how to integrate agricultural models to turn information into knowledge that aids higher-level decision-mking processes, and (3) contrast mismatches between models and current science, which should guide future model development.

Course Learning Objectives

At the end of the course, students will be able to:

1. Discuss recent developments and limitations in data availability, including synthetic data and webservices;
2. Contrast complex vs. simpliefied model representations and their impact on data requirements and spatio-temporal resolutions;
3. Explain current science developments relating to agricultural modelling and how modelling efforts lag to incorporate 'new science';
4. Describe how recent IT developments have impacted data science and agricultural modelling;
5. Justify why current modelling exercises are based on an uncertainty framework.

Textbook, Readings, and Course Materials

There are no required texts for the course. However, supplementary readings (e.g., journal articles) will be assigned according to the topic being addressed by the students.

Using Copyrighted Material

Please respect copyright. For more information, see the University's Copyright Office website at http://umanitoba.ca/copyright/ or contact um_copyright@umanitoba.ca.

Course Technology

Different modelling packages (e.g., Soil and Water Assessment Tool), GIS packages (e.g., QGIS) and programming language open-source software (e.g., R and R Studio) may be used in this course. Students should have administratve rights in the computers they will be using during the lectures in order to install different software packages.

Due to the COVID-19 pandemic and the measures adopted by UM to prevent its spread, lectures will take place online through Webex meetings. Student should refrain from behaviour that is distracting to other students.

Expectations: I Expect You To

a) Attend class on time so we start on time;
b) Ask for help when you need assistance;
c) Submit your own work for individual assignments and to work together in a team for group assigned projects;
d) To act in a civil, respectful, and responsible manner toward all members of the U of M community. See Respectful Work and Learning Environment Policy.

Class Communication:
Students are required to obtain and use your University of Manitoba email account for all communication between yourself and the university. All communication must comply with the Electronic Communication

with Student Policy: http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html;

Academic Integrity:
Each student in this course is expected to abide by the University of Manitoba Academic Integrity principles. Always remember to reference the work of others that you have used. Also be advised that you are required to complete your assignments independently unless otherwise specified. If you are encouraged to work in a team, ensure that your project complies with the academic integrity regulations. You must do your own work during exams. Inappropriate collaborative behavior and violation of other Academic Integrity principles, will lead to the serious disciplinary action. Visit the Academic Calendar, Student Advocacy, and Academic Integrity web pages for more information and support.

Refer to specific course requirements for academic integrity for individual and group work such as:

I. Group projects are subject to the rules of academic dishonesty;
II. Group members must ensure that a group project adheres to the principles of academic integrity;
III. Students should also be made aware of any specific instructions concerning study groups and individual assignments;
IV. The limits of collaboration on assignments should be defined as explicitly as possible; and
V. All work should be completed independently unless otherwise specified.

Recording Class Lectures:
Cordeiro 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. Course materials (both paper and digital) are for the participant's private study and research.

Student Accessibility Services:
The University of Manitoba is committed to providing an accessible academic community. Students Accessibility Services (SAS) offers 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
520 University Centre
Phone: (204) 474-7423
Email: Student_accessibility@umanitoba.ca

Expectations: You Can Expect Me To

a) To be available prior to and after the class time to discuss any questions or comments you may have;
b) To provide feedback on assignments and exams.

CLASS SCHEDULE AND COURSE EVALUATION

The course assessment consists of 10 weekly assigments, participation in class discussions, and a 5,000-word paper at the end of the term. Given the substantial emphasis on discussions among the students

and instructors for the course, all students are expected to prepare themselves well for each topic and to contribute informed opinion to each discussion session. Students will be graded according to the following:

Assessment*	Fraction of the final grade
Weekely assignments	50%
Class discussion	20%
First draft of the review paper	15%
Revised version of the review paper	15%

* Late penalty: 25% for each 24 h period unless otherwise noted.

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 ROASS.

Item	Class Content & Teaching Strategies	Type of Assessment	Due Date
Jan. 21	Introduction, Course Outline, Schedules. **Discussion**: the modelling process	Assignment 1 – data gap filling	Topic definition for term paper
Jan. 28	**Discussion**: papers 1 and 2 (data gap filling) **SWAT Tutorial**: model overview	Assignment 2 – syntethic data	Assignment 1
Feb. 4	**Discussion**: papers 3 and 4 (syntethic data) **SWAT Tutorial**: input data	Assignment 3 – model representation	Assignment 2
Feb. 11	**Discussion**: papers 5 and 6 (model representation) **SWAT Tutorial**: WS delineation/HRU definition	Assignment 4 – threshold-mediated processes	Assingment 3
Feb. 18	**No class**	**Winter term break**	
Feb. 25	**Discussion**: papers 7 and 8 (threshold-mediated processes) **SWAT Tutorial**: Model parameterization	Assignment 5 – new science	Assignment 4
Mar. 4	**Discussion**: papers 9 and 10 (new science) **SWAT Tutorial**: model calibration	Assignment 6 – Ungauged basins	Assignment 5
Mar. 11	**Discussion**: papers 11 and 12 (Ungauged basins) **SWAT Tutorial**: Model assessment	Assignment 7 – Uncertianty	Assignment 6
Mar. 18	**Discussion**: papers 15 and 16 (Uncertainty) **SWAT Tutorial**: Climate change	Assignment 8 – Scenario assessment	Assignment 7
Mar. 25	**Discussion**: papers 17 and 18 (Scenario assessment) **SWAT Tutorial**: Scenario assessment	Assignment 9 – IT paradigms	Assignment 8
Apr. 1	**Discussion**: papers 13 and 14 (IT paradigms) **SWAT Tutorial**:	Assignment 10 – Deep learning	Assignment 9

Apr. 8	**Discussion**: Book chapter (Deep learning) **Deep Learning Tutorial**: image classification		Assignment 10
Apr. 15	No class – term paper preparation		
Apr. 22	Term assignment		Presentation

Grading

Indicate your grading scale. A sample is given below that you can adjust to your course expectations.

Letter Grade	Percentage out of 100	Final Grade Point
A+	92-100	4.5
A	80-91	4.0
B+	75-79	3.5
B	70-74	3.0
C+	65-69	2.5
C	60-64	2.0
D	50-59	1.0
F	Less than 50	0

Important Dates

January 29	Last day to drop classes without penalty
February 1	Last day to register for winter term and spanned courses
February 17	Tuition deadline
March 31	Voluntary withdrawal (VW) deadline for fall classes
April 16	Last day of classes
April 19/May 1	Winter term final exam period

Referencing Style

Assignments should use the APA reference style as outlined in the text: American Psychological Association. (2009). Publication manual of the American Psychological Association (6th ed.). Washington, DC: Author.

Assignment Feedback

Feedback on assignments, outlines, drafts, and analysis will be within a reasonable amount of time following submission.

Assignment Extension and Late Submission Policy

Extensions will be granted in special cases under instructor discretion.

UNIVERSITY SUPPORT OFFICES & POLICIES

Schedule "A"

Section (a) sample re: 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 205 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) sample: re: 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
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) sample: re: 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) sample: re: 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