Course Syllabus

ANSC 7520: Special Topics in Animal Improvement – Mathematical Modeling of Metabolic Systems

Fall 2020

UM | Faculty of Agricultural and Food Sciences

TABLE OF CONTENTS

COURSE DETAILS

Course Title & Number:	Special Topics in Animal Improvement-Mathematical Modeling of Metabolic Systems – ANSC 7520 PART A: Mathematical Modeling Online Course – Virginia Tech PART B: Practical component: Modeling management strategies for beef cow-calf operations
Number of Credit Hours:	3
Class Times & Days of Week:	The class includes a series of online videos and assignments to be completed with weekly or biweekly group meetings.
Pre-Requisites:	Intermediate level of understanding of biological systems, mathematics and statistics.

Instructor Contact Information

Instructor(s) Name & Preferred	Dr. Robin White Dr. Getahun Gizaw
Form of Address:	
Office Location:	Department of Animal and Poultry Sciences 101 Food Science and Technology Hall (0306) 360 Duck Pond Drive, Virginia Tech Blacksburg, Virginia 24061 Research and Development Specialist – Livestock Research Intelligence, Policy Branch Manitoba Agriculture and Resource Development
Office Hours or Availability:	Availability through emails and teleconference
Office Phone No.	(540) 231-7384

(204) 823-0744

Email: rrwhite@vt.edu

Getahun.Gizaw@gov.mb.ca

All email communication must conform to the Communicating with Students university policy.

Contact: University email, and by phone are all acceptable forms of communication.

Course Description

This course provides a rigorous and hands-on training for students interested in applying mathematical models to biological systems. Specifically, Part A focuses on metabolic modeling approaches and will cover applications including growth models, pharmacokinetics, and isotope dilution, among others. Throughout the course, students will engage in online discussion, complete problem sets, and test knowledge with quizzes.

Part B focuses on the use of the modeling program Holos R to simulate greenhouse gas emissions from modeled beef farms. Altering management strategies on these farms will allow for the comparison of emissions between models with the end goal of discovering the more efficient management practices for beef cow-calf production systems.

Course Goals

The goal of the course is to garner an understanding of mathematical modeling systems.
To examine data sets and gain experience, manipulating and modeling data.
To gain experience in data interpretation, which will be used to understand implications regarding policy objectives or proposed alternative approaches.

Course Learning Objectives

Part A: After taking this course, students should be able to handle data using common utilities in R statistical software, understand fundamental concepts and assumptions in mathematical modeling, and derive linear and non-linear empirical and mechanistic models.

Part B: After taking this course, students should:

1. Gain experience using the Holos Research software
2. Develop a detailed understanding of how changes in farm management can affect whole-farm greenhouse gas emissions

Textbook, Readings, and Course Materials

Required textbooks – none required.

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

This is an online course, therefore students will require the use of a computer with various programs installed, including R and an internet connection.

Expectations: I expect you to

Be respectful to the instructors and fellow classmates

Class Communication:
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.

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 behaviour and violation of other Academic Integrity principles will lead to 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:
Not applicable to this course.

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

Be respectful of your questions and make every reasonable effort to answer them as well as to provide feedback in a fair, equitable and prompt fashion.

CLASS SCHEDULE AND COURSE EVALUATION

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students. There are no formal due dates to complete chapters.

PART A:

Lesson	Lesson Objective	Lesson Materials	Evaluation		
			Type of Assessment	Value of Grade	% of Final Grade
Lesson 1: Course Overview	In this lesson, you will be expected to gain experience with the course workspace and develop an understanding of the course expectations.	Watch the online videos introducing the course instructors, the course environment, and the syllabus and course goals.	1. Scavenger Hunt 2. Syllabus Quiz	/10 /20	3.33% 6.67%
Lesson 2: Installing and Using R	In this lesson, you will download and install R and learn the basics of the R environment.	Watch the video on installing R. Watch the R environment video. Read the handout on the basics of the R programming language. Watch the video on installing R packages and install the following packages in your version of R. Watch the video on data import and handling and review the data handling handout. Read the handout on visualizing data.	Lesson 2 Problem Set Lesson 2 Quiz	/10 /20	3.33% 6.67%
Lesson 3: Principles of Modeling	In this lesson, you will review modeling principles, the modeling process, and the types of	Watch the Introduction to Mathematical Modeling presentation. Watch the presentation on the Model Development Process.	Lesson 3 Problem Set 1	/5 /5	1.67% 1.67%

	models one can use to support and extend experimental work and to predict outcomes given a set of inputs.	Watch the presentation on Model Types. Watch the presentation on Visual Representations of models and systems.	Lesson 3 Problem Set 2 Lesson 3 Quiz	/20	6.67%
Lesson 4: Linear Regression	In this lesson, you will review the theory behind linear regression and learn how to use R to conduct simple linear regressions.	Watch the Linear Regression Theory video. Watch the video on conducting linear regressions in R using the lm function. Watch a follow up video explaining more lm function utilities.	Lesson 4 Problem Set Lesson 4 Quiz	/10 /20	3.33% 6.67%
Lesson 5: Non-Linear Regression	In this lesson, you will review the theory behind non-linear regression and learn how to use R to conduct simple non-linear regressions.	Watch the Non-Linear Regression Theory video and review assumptions inherent in non-linear regression. Watch the video on conducting non-linear regressions in R using the nls function. Watch a follow up video explaining more strategies for fitting non-linear models in R.	Lesson 5 Problem Set Lesson 5 Quiz	/10 /20	3.33% 6.67%
			TOTAL:	150 points	50%

PART B: Practical modeling component - Comparison of management strategies				
Course Component	**Lesson Objective**	**Lesson Materials**	**Type of assessment**	**% of Final Grade**
1. Changing management strategies: reproductive rate	Increase or decrease the reproductive rate and therefore number of calves weaned in our lifecycle assessment (LCA) Examine:	Edit the herd dynamics of the current LCA to reflect the change in calf numbers Use the Holos Research model to change the herd numbers to reflect this		**20**

	- 75% reproductive rate - 90% reproductive rate Similar to Beauchemin et al. (2011).	chosen reproductive rate		
2. Changing forage yield and quality	Conduct a sensitivity analysis to reflect changes in crop yield and quality on GHG emissions.	Use the Holos Research model to examine emission changes in yield and quality of forage		**20**
3. Powerpoint presentation	Presentation of modeling results	Compile emission results into figures and graphs to present relevant results and information	Powerpoint presentation	**10**
			TOTAL:	50%

FINAL GRADE:

Part A: /50

Part B: /50

Total: /100

Course evaluation method

The grades associated with each assignment will be available online upon the completion of the task.

Grading

Letter Grade	Percentage out of 100
A	90-100
B	80-89
C	70-79
D	60-69
F	<60

Voluntary Withdrawal

The last day to drop the class and receive a 100% refund is November 13th, 2019. The last day to withdraw with no refund is December 20, 2019. Any student dropping the course after the deadline will be assigned a final grade. Course withdrawals will be recorded on official transcripts. Refer to the Registrar's Office web page for more information.

Referencing Style

The Canadian Journal of Animal Science referencing style should be used.

Assignment Feedback

Feedback on assignments outlines drafts and analysis will be within one week of the due date as per the schedule above.

Assignment Extension and Late Submission Policy

Late work will not be accepted in this course. The instructors reserve the right to award 0 points for any assignments turned in late.

UNIVERSITY SUPPORT OFFICES & POLICIES

Schedule "A"

Section (a)

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) :

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):

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):

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