



**UM** | Faculty of Agricultural  
and Food Sciences

## Syllabus

# FOOD 4150 Food Microbiology

(Fall 2021)



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## COURSE DETAILS

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<b>Course Title &amp; Number:</b>	Food Microbiology 4150
<b>Number of Credit Hours:</b>	3
<b>Class Times &amp; Days of Week:</b>	MWF 9:30 am – 10:20 am
<b>Location for classes/labs/tutorials:</b>	This course will be delivered primarily remotely, combining synchronous-asynchronous course design. For the lab portion, the course will have in-person labs.
<b>Pre-Requisites:</b>	No course pre-requisite is necessary. However, an introductory course in microbiology is strongly recommended since several topics to be covered will assume prior knowledge of specific microbiological terms and concepts. Some independent reviews of microbiology may be needed by some students to bring them to the average initial awareness level of students in the class.

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## Instructor Contact Information

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<b>Instructor(s) Name &amp; Preferred Form of Address:</b>	Claudia Narvaez-Bravo, please address me by Dr. Narvaez or Professor Narvaez
<b>Office Location:</b>	238 Ellis building
<b>Office Hours or Availability:</b>	By appointment. I am generally in my office, 238 Ellis Building, from 8:30 a.m. - 4:30 p.m. daily, and I'm readily available with a prior arrangement. To make an appointment, please use the UML email system.
<b>Office Phone No.</b>	204-474-6658
<b>Email:</b>	Claudia.narvaezbravo@ad.umanitoba.ca <i>Note:</i> All email communication must conform to the <a href="#">Communicating with Students</a> university policy.
<b>Contact:</b>	By email/Webex.

**Teaching Assistant (TA) and Markers**

Bill Nan (Teaching Assistant)  
Nancy Ansen (Teaching Assistant)  
Kavitha Koti (Marker)

**Email**

nany@myumanitoba.ca  
asennda@myumanitoba.ca  
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Haque, Md Mahamudul (Marker)

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**Contact**

By email, previous appointment

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## Course Description

### U of M Course Calendar Description

Relationships of microorganisms to processing and spoilage of food.

### General Course Description

FOOD4150 focuses on the significance of the presence and/or growth of microorganisms in foods and their importance in the production and safety of foods. Contents include the microbial ecology of food, beneficial microorganisms in food systems, pathogenic and spoilage microorganisms, toxins, characteristics of foodborne infection, food intoxication and the influence within the food system of the growth and survival of microorganisms and contaminants that may occur in a food-processing environment. Food preservation and food processing related to food microbiology are also discussed.

This course has a laboratory section that deals with conventional and rapid methods for testing food products, including microbial indicators and foodborne pathogens. Good manufacture practices (GMP), Standard Operating Procedures (SOP), and HACCP basics will be introduced. Food microbiology addresses the safety and quality of foods. Food microbiology is an essential discipline that connects with fields related to food production and processing (pre and post-harvest level). Microbes play a crucial role in food preservation, food safety, human health, and food biotechnology, and all of them are essential aspects of food production. You will have the opportunity to learn and have hands-on experience in different techniques (conventional and rapid) to enumerate and identify bacteria related to food in the laboratory. To support experiential learning FOOD4150 is also working with Riipen. Riipen helps to bring real industry and real-world industry projects into the classroom.

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## Course Goals

Food microbiology is an exciting field, technologically dynamic and fundamental for food development, food production, and public health; it assists us in answering questions arising from food production and food technology disciplines supporting a multibillion-dollar food industry. Food Microbiology not only assures the quality and shelf life of different food products but also ensures that food products are safe for the consumer. The production of food under food safety parameters and regulations is beyond the simple memorization of knowledge. It requires critical thinking, integration of knowledge, and innovative approaches to problem-solving. It will help students to foster these skills throughout, using a variety of teaching methods, including lecturing, group discussion, and other activities in the classroom. This course will combine classroom lectures with a laboratory environment on the fundamentals of food microbiology

and food safety. Additionally, the student's written skills will be improved through multiple writing assignments, including laboratory reports.

### **Course Learning Objectives**

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- Define microbial food spoilage, food quality, food safety and the factors affecting the growth and control of microorganisms in food
- Identify relevant beneficial, pathogenic and spoilage microorganisms in foods and the conditions under which they grow
- Articulate the use of hurdle technology and food preservation in the control of foodborne pathogens in food systems.
- Describe the conditions under which relevant pathogens are commonly destroyed or controlled in foods
- Discuss the principles of food preservations and to describe the different food preservation methods.
- Describe the role of beneficial microorganisms in food processing, preservation and safety, and their potential health benefits
- Explain the causes of foodborne microbial diseases and predict the pathogens that can grow in any given food during different stages of the food production system
- Explain the different factors that take place during food processing and how food can be contaminated in the food continuum (pre and post-harvest level)
- Identify potential hazards and food safety issues in specific foods
- Describe routes of physical, chemical, and biological contamination of foods
- Recognize and articulate the importance of SSOP, GMP and HACCP in the food industry
- Discuss methods for controlling physical, chemical, and biological hazards
- Apply laboratory techniques to identify microorganism in foods
- Apply rapid microbiology techniques to assess food safety and quality
- Demonstrate the use of appropriate lab techniques commonly used in the food microbiology laboratory
- Work effectively as a team in designing and using food microbiology laboratories and in-class activities

### **Foundational Knowledge Content Areas for Dietetic Education**

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This dietetic education program is an accredited program by the Partnership for Dietetic Education and Practice (PDEP) and prepares students for eligibility for registration with a provincial dietetics regulatory body.

*Highest level achieved: 1= demonstrate broad knowledge; 2= demonstrate comprehensions; 3= analyze, interpret and apply knowledge.*

Content Area	Foundational Knowledge	Cognitive Complexity Level
Communication	Strategies for effective written communication	3
	Strategies for effective interpersonal communication	3
Food	Physical properties and chemical composition of food	2
	Food preservation, storage, and packaging	1
	Foodborne illness	2
Food Service Systems	Quantity food production and distribution	2
	Hazard Analysis and Critical Control Points (HACCP)	2
Interprofessional Collaboration	Interprofessional communication	2
	Team functioning	1
	Collaborative leadership	1
Management	Organizational behaviour and development	1
Microbiology	Classification of microbes	1
	Microbes in food safety	2
	Host-vector spread of infection and risk management	2
	Microbes in food production including prebiotic and probiotics	1
Professional Practice in Dietetics	Ethical conduct	3
	Reflective practice	2
	Professional development	1
	Decision making	2

### Textbook, Readings, and Course Materials

**Required textbook:** Food Microbiology. An Introduction. Edited by Thomas J. Montville and Karl R. Mathews (2017). 2nd Ed. ASM Press.

*Note:* the textbook is available online, You can also use older editions that can be found at the university library.

[University of Manitoba Bookstore](#) and [University of Manitoba Libraries](#)

Available as digital (electronic resources) or physical printed at the University of Manitoba book store.

**FOOD4150 Laboratory Manual:** Available at UML under the content tab.

#### Supplementary readings

- A Guide to Writing in the Sciences. Gilpin, A.A., Patchet-Golubev, P. University of Toronto Press 2000.
- Lab Math: A Handbook of Measurements, Calculations, and Other Quantitative Skills for Use at the Bench By Dany Spencer Adams. <http://www.amazon.ca/Lab->

Math- Measurements-Calculations Quantitative/dp/0879696346

- Modern Food Microbiology, edited by Jay J.M., Loessner, M.J. and Golden, D.A. (2005), 7th ed. Springer, New York, NY.
- Food Microbiology: Fundamentals and Frontiers, edited by Doyle, M. P., and Beuchat, R. L. (2007) 3rd ed. ASM Press, Washington, DC.
- Compendium of Methods for the Microbial Examination of Foods. Edited by Downes, F.P. and Ito, K. (2001) 4th ed. American Public Health Assoc.

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## Using Copyrighted Material

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Please respect copyright. We will use 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 (videos, power point slides, etc), 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](mailto:um_copyright@umanitoba.ca).

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## Course Technology

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I will be using the iclicker student response system in class this Fall 2020 term. Please make sure you install iclicker reff in your smart/iphone phone. iClicker helps me to understand what you know and gives everyone a chance to participate in class. I will check for attendance using iclicker. You will also get bonus marks for your class participation using iClicker.

For the course management, I will be using UM Learn.

In addition, the use of other technology (i.e., tablets, cellphones, laptops, etc.) is allowed in the classroom. It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner.

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## Expectations: I Expect You To

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The student is expected to participate actively in the course. Active participation means: actively listening and responding to questions in class (I do not expect perfection!); staying on top of lecture material and assignments, and seeking help on course material that is not clear.

PowerPoint presentations summarise only a portion of the knowledge content that needs to be covered in class. For the rest of the contents, you are expected to read the required textbook.

Videos will be provided for the lab component, and please read your lab manual before you check the videos; that will facilitate learning.

I expect students to connect on time and to be prepared to learn.

If you experience connection issues and arrive late, I expect you to make sure that you mute yourself, that way you won't disrupt the class. I expect that you will appreciate the diversity of our campus and respect the rights of each member of the class.

Attendance and participation are essential elements to the student's success in this course. Attendance is not mandatory; however, you will not get credit for an in-class assignment if you are absent on the day it is given.

I will be connected for class at least 10 minutes before starting with the lecture content if you need to ask a quick question or talk to me about any issue related to the class. I will be connected 10 min after class (unless I have another meeting after class); if you have a question, you can ask, the rest of the students who are not interested or have other classes can leave the meeting. I will treat you with respect and will appreciate the same courtesy in return. For more information regarding a respectful work and learning environment, please visit the following link:

Please See [Respectful Work and Learning Environment Policy](#).

I expect you to follow these policies around Class Communication, Academic Integrity, and Recording Class Lectures.

### **Class Communication:**

You 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](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:**

Videos covering the laboratory sessions will be provided by the Instructor. The Instructor will also record the lectures. 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](mailto:Student_accessibility@umanitoba.ca)

### **Expectations: You Can Expect Me To**

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You can expect me to be on time and prepared for class.

You can expect me to be available for consultation regularly.

Email is my preferred method of communication; you can expect to receive a response to any email within 24 hours on **weekdays**.

If you have a question that cannot wait, you may send an email. I will be happy to answer it, however, make sure you are asking a relevant question (i.e. you could not find the answer or get an understanding of the material after reviewing the class notes, videos or textbook). I will be glad to offer brief advice about the class material or an assignment.

All assignments handed in on time will be graded and returned within two weeks of the due date; late assignments will be graded as my time permits.

You can expect me to treat all of your questions and comments with respect and to take your concerns seriously. If you are having a problem, don't hesitate to talk to me about it. Don't wait until the last moment to realize that you need some marks to pass the course! I won't be able to help you at this point.

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### **CLASS SCHEDULE AND COURSE EVALUATION**

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**Note:** *The lecture or laboratory schedule is subject to change, students will be notified in advance.*

#### Course Schedule

Date	Topics, Readings, Assignments
Sept 8	Introduction
Sept 10	Microbiology: basic review. <b>Mandatory reading: Montville, Section 2. Pages 15, 18, 19, 20, 21, 22, 23</b>
Sept 13	Microbiology: Sample Reception and preparation for microbiological analysis, enumeration. <b>Mandatory reading: Montville, Chapter 4: Detection and enumeration of microbes</b>

	in food.
Sept 15	Indicator microorganism. Standards, guideline and specifications
Sept 17	Methods to Detect Coliforms, faecal coliforms and <i>E. coli</i> . Mandatory reading: <i>Compendium of Methods for Microbial examination of foods</i> . 4th Ed. 6.4. Most Probable Number Techniques
Sept 20	Continuation ...Methods to Detect Coliforms, faecal coliforms and <i>E. coli</i> . Mandatory reading: <i>Compendium of Methods for Microbial examination of foods</i> . 4th Ed. 6.4. Most Probable Number Techniques
Sept 22	Yeast and molds
Sept 24	Hurdle Technology
Sept 27	Group activity 1: Hurdle Technology. Introduction/teamwork and critical thinking. Mandatory reading: Montville, Chapter 2. Microbial Growth, survival and death in foods.
Sept 29	Spoilage introduction, Meat, poultry and seafood. Book reading Montville: Chapter 21 Chapter 21. Page 299-306.
Oct 1	Meat, poultry and seafood/ Cross contamination (video)
Oct 6	Milk and Dairy Products/fruits and vegetables Book reading Montville: Chapter 21. Pages 309-322.
Oct 4	Control of microorganisms in foods: Chemical preservation/ Modified Atmosphere Package. Book reading Montville: Chapter 25. Pages 403-418
Oct 8	Midterm 1
Oct 11	<b>Thanksgiving</b>
Oct 13	Control of microorganisms in foods: Food Preservation: High-temperature processing, Low-temperature preservation. Book reading Montville: Chapter 27. Pages 432-445.
Oct 15	Bio-preservation Book reading Montville: Chapter 26. Pages 419-431.
Oct 18	Foodborne Intoxications and Toxico-Infections: <i>S. aureus</i> and <i>B. cereus</i>
Oct 20	Foodborne Intoxications and Toxico-Infections: <i>C. botulinum</i> and <i>C. perfringens</i>

Oct 22	Foodborne infections - <i>Salmonella</i> - <i>Listeria</i>
Oct 25	- <i>Campylobacter</i>
Oct 27	Foodborne infections: <i>E. coli</i>
Oct 29	Foodborne infections: - <i>Shigella</i> , <i>Yersinia</i> - <i>Vibrio parahaemolyticus</i> - Norovirus, Hepatitis A
Nov 1	Molecular methods for foodborne pathogens detection: Introduction to PCR
Nov 3	Biofilms in the Food Industry
Nov 5	Midterm 2
Nov 8-12	Remembrance day & Fall break
Nov 15	Cleaning and sanitation. <a href="#">Book reading Montville. Chapter 9. Page 471</a>
Nov 17	Sanitation and Standard Operating Procedures (SSOP). <a href="#">Book reading. Chapter 29. Page 474</a>
Nov 18	Sanitation and Standard Operating Procedures (SSOP). <a href="#">Book reading. Chapter 29. Page 474. Continues....</a>
Nov 22	Good Manufacture Practices. <a href="#">Book reading. Chapter 29. Page 466</a> <a href="#">Mandatory reading: Chapter 1 Prerequisites to HACCP (Posted UML)</a>
Nov 24	Good Manufacture Practices. Book reading. Chapter 29. Page 466 Mandatory reading: Chapter 1 Prerequisites to HACCP (Posted UML)...continues
Nov 26	Lecture: Food hygiene Monitoring
Nov 29	HACCP: Introduction, Hazard analysis and critical control points <a href="#">Book reading. Chapter 29. Page 474</a> <a href="#">Mandatory reading: Chapter 2. Hazard Analysis and Critical Control Points Principles and Application Guidelines (Posted UML)</a>
Dec 1	HACCP: Biological, chemical and physical hazards, Critical limits, Monitoring procedures, corrective actions

Dec 3	HACCP: Verification, record keeping and documentation procedures
Dec 6	HACCP Presentations
Dec 8	HACCP Presentations
Dec 10 (last day of classes)	<p><b>Invited lecturer:</b> "Foodborne Disease Surveillance and Outbreak Response in Canada"</p> <p>Celine Nadon, PhD. Chief, Enteric Diseases National Microbiology Laboratory Public Health Agency of Canada</p> <p><b>Note: Waiting for confirmation</b></p>
Final Exam	Venue and Time to be determined

### Food Microbiology Lab Reports Schedule.

Laboratory	Info and data on food samples will be posted no later than the following dates (likely earlier)	Lab Report Due Date
Lab# 1 Sample preparation and serial dilution		<u>No report is required for this lab</u>
Lab # 2 Petrifilm <ul style="list-style-type: none"> <li>• Standard Plate Count Method</li> <li>• Yeast and Mold</li> <li>• Coliform &amp; <i>E.coli</i></li> </ul>	Sept 8	Sept. 16
Lab # 3 Most Probable Method (MPN)	Sept 10	Sept 30
Lab # 4 Enterococci & <i>Staph aureus</i>	Sept 19	Oct 15
Lab # 5 <i>Bacillus cereus</i>	Sept 19	Oct.22
Fall break	Nov 8 - 12	
Lab # 6 <i>Salmonella</i>	Oct 15	Nov 16
Lab # 7 Molecular Rapid Detection Methods	Oct 28	Nov 26
Lab # 8 Hygiene monitoring: ATP testing system	Nov 10	Dec 6

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### Food Microbiology in-person Lab Schedule

Laboratory	In-person lab date	Session and Grouping
Lab 1. Sample preparation, serial dilution, spread plating, and bacteria enumeration	September 13	BO1 Group 1 and BO2 Group 1
	September 14	BO3 Group 1, BO4 Group 1, and BO5 Group1
	September 20	BO1 Group 2 and BO2 Group 2
	September 21	BO3 Group 2, BO4 Group 2, and BO5 Group2
Lab 2. Petrifilm (Aerobic count, Yeast and Mold, Coliform/E.coli, and Staph express count)	September 27	BO1 Group 1 and BO2 Group 1
	September 28	BO3 Group 1, BO4 Group 1, and BO5 Group1
	October 4	BO1 Group 2 and BO2 Group 2
	October 5	BO3 Group 2, BO4 Group 2, and BO5 Group2
Lab 3. Biochemistry test for pathogens IMViC test Slant test	October 18	BO1 Group 1 and BO2 Group 1
	October 19	BO3 Group 1, BO4 Group 1, and BO5 Group1
	October 25	BO1 Group 2 and BO2 Group 2
	October 26	BO3 Group 2, BO4 Group 2, and BO5 Group2
Lab 4. Hygiene monitoring: ATP testing system	November 1	BO1 Group 1 and BO2 Group 1
	November 2	BO3 Group 1, BO4 Group 1, and BO5 Group1
	November 15	BO1 Group 2 and BO2 Group 2
	November 16	BO3 Group 2, BO4 Group 2, and BO5 Group2
Lab exam	November 22	BO1 Group 1 and BO2 Group 1
	November 23	BO3 Group 1, BO4 Group 1, and BO5 Group1
	November 29	BO1 Group 2 and BO2 Group 2
	November 30	BO3 Group 2, BO4 Group 2, and BO5 Group2

NOTE: All students are required to follow Public Health Recommendations on COVID-19. See appendix section.

Normal lab procedures: All students must wear a lab coat or smock and closed-toed shoes at all times when working in the food microbiology laboratory.

## Evaluation

Type of Assessment	Due Date	Value of Final Grade
Mid-Term 1	9:30-10:20 am, Wednesday Oct 7, 2020	15%
Mid-Term 2	9:30-10:20 am, Friday Nov 6, 2020	15%
Lab Reports	For due dates, please see Food Microbiology lab schedule	20%
<b>Group Assignments</b>		
Assignment 1	Hurdle Technology (Group)	5%
Assignment 2	HACCP (Group)	10%
Practicum lab exam		10%
Final examination	TBD	25%
<b>Total marks</b>		<b>100%</b>

**Note: Midterm and final exams will be administered using UM Learn, under Respondus LockDown Browser.**

**Note: Students participating in Riipen projects are not required to take the final examination, instead the Riipen project will make up 35% total (10% Riipen report- first draft + 25% Riipen Final Report).**

### Lab Expectations

Due to the Covid-19 pandemic, we will not be able to run the lab sessions as usual. However, this Fall 2021, we will have in-person labs at reduced capacity during the term; the lab's sessions have been consolidated to meet covid-19 restrictions. Since the in-person lab schedule won't permit having the lab session at the normal pace, we decided to provide Laboratory videos for each lab to help students prepare better for the hands-on experience and allow students to write their lab reports. We will also be providing data (results) for each lab and other relevant information that you will be using to write your lab reports. **Be aware that lab videos will be delivered in asynchronous design. Asynchronous learning happens on your schedule; you can access and satisfy these requirements within a flexible time frame; therefore, you are expected to be responsible for checking the lab-videos to fulfill the course requirements.**

Once you are allowed to go into the lab, all students are expected to follow safety procedures and work observing aseptic techniques in the lab. All the students are required to wear lab coats or a smock and closed-toed shoes all times when working in the micro food lab.

### Grading Scale

**Note:** Grades will not be curved. To assign the letter grade, grades that end with a decimal point of 0.5 or above will be rounded to the next higher whole number, and grades that end with a decimal point below 0.5 will be rounded to the next lower whole number. For example, if a final percentage grade is 89.5 – 89.9, the grade should be rounded to 90, this is an A. If a final percentage grade is 70.4, the grade should be rounded to 70, and the letter grade is C+.

This rule applies to all students, no exceptions.

Letter Grade	Percentage out of 100	Grade Point Range	Final Grade Point
A+	95-100	4.25-4.5	4.5
A	86-94	3.75-4.24	4.0
B+	80-85	3.25-3.74	3.5
B	72-79	2.75-3.24	3.0
C+	65-71	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

## Voluntary Withdrawal

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Last date to drop Fall term and Fall/Winter term spanning courses with refunds: September 21, 2021

Voluntary Withdrawal (VW) deadline Fall term classes: November 23, 2021

Please refer to Ask the [Registrar's Office](#) web page for more information.

## Assignment Extension and Late Submission Policy

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### Laboratory Reports:

You will have a total of eight lab periods, in which you must hand in a total of seven laboratory reports. Lab reports 2-8 are mandatory, and must be handed in by ALL students:

- Lab.2. Petrifilm for indicator microorganisms (standard plate count, yeast and moulds and coliforms and *E. coli*)
  - Lab.3 Most Probable Number (MPN)
  - Lab 4 Enterococci & *Staphylococcus aureus*
  - Lab 5 *Bacillus cereus*
  - Lab.6 *Salmonella*
  - Lab 7. Molecular rapid detection methods
  - Lab 8. Hygiene monitoring: ATP testing system
- A portion of the laboratory will be evaluated in the midterm exams and a final examination. A practicum exam (10%) will take place at the end of the laboratory sessions. Please see in-person lab schedule.
  - Each student will write their report (not a group activity).
  - Each student must hand in their report using UML.
  - Only typed reports will be accepted.

Note: A detailed rubric for laboratory reports assessment is available at UML.

### Groups Activities

[Group activity 1. Hurdle technology: Intrinsic-Extrinsic factors.](#)

Assessment: Group activities, instructor evaluation and peer evaluation sheets.

Main topic: Intrinsic-Extrinsic factors affecting microbial growth/Hurdle technology. Content: Intrinsic-Extrinsic factors affecting microbial growth. Hurdle technology.

Purpose: to facilitate the understanding of hurdle technology and its importance in food preservation and food safety using active learning tools such as:

- The application of hurdle technologies to different types of food products.
- Knowledge sharing by students within their groups and among classmates regarding hurdle technology.
- Promote and learn how to work on teams and exercise critical thinking skills.

Procedure:

- a. This activity will be conducted during lecture time (see class scheduled)
- b. The class will be organized into different groups; this will be done through UM Learn at random. To find out who are your team members, please go to UM learn, communications, and click on groups. A food product will be assigned by the Instructor to each group, the information will be uploaded into the files in your UM Learn group. This will be done after the third week of classes.
- c. The Instructor will provide a short introduction, including the activity explanation and expectations.
- d. Using lecture time, students will review the intrinsic and extrinsic factor definitions and outline the components in each category: review hurdle technology definition and its importance. A textbook reading will be assigned, and students must read at home before the activity takes place. Students will describe the specific type of food product and its characteristics, for example ingredients, shelf-life, type of food processing technology (canned, pasteurized, etc.), preservatives, packaging type, storage type, and what groups of microorganisms, including pathogens, beneficial and spoilage are more likely to be present in that particular food.
- e. To gather relevant information, students are allowed to use iphones, ipads, computers, peer-review papers, textbooks and class notes.
- f. Sharing the information: Students will explain if a hurdle approach was applied to that specific food and what particular intrinsic/extrinsic factors were targeted and why. Some groups will present their findings to the class (time 5-8 min.). The Instructor will provide feedback, so students will have the opportunity to add/modified/correct their assignments before submission.
- g. Conclusion: At the end of this activity, the Instructor will briefly summarize the main points of the lecture and how it was linked to the group activity on PowerPoint.
- h. Assessment: All groups have to prepare a written summary – one per group- (Length 5,000 characters including 1.0 line spacing - about a 1 1/2 page) for the activity. Activity 1 summary will be submitted using the assignments function on



UM Learn within seven days after in-classroom activity. The due data will be 5 days after the in-class activity. All submissions will be through UM Learn assignments. Only one student member per group must submit the assignment.

- i. All students must fill the peer's evaluation sheets.

### Group Activity 2. HACCP program:

Assessment will consist of two portions: the group activity instructor evaluation and the peers' evaluation sheets.

- a. This activity will commence during student's arrangement time (perhaps you can use lab time since we will have shorter labs)
- b. The groups were already designated for the previous group activity: hurdle technology. The same product assigned to the groups for the hurdle technology activity will be used to develop the HACCP program. Each group must develop Hazard Analysis and Critical Control Point program for the provided food item.
- c. The Instructor will provide a short introduction, including the activity explanation and expectations as well as a rubric for the activity assessment.
- d. Groups will present their HACCP plan. Presentations time: 7 min. Please see class scheduled.
- e. If you have questions during the development of this activity, please make an appointment with the course instructor, the appointment can be remove or in-person.
- f. Activity Assessment: Students must prepare a written HACCP plan, maximum 15 pages 1.0-line spacing. Only one student per team should submit the assignment. Please use tables or flow diagrams when deemed appropriate.

All students must fill the peer's evaluation sheets

*This assignment will be worth eight marks.*

Important sites that might be useful to you:

HACCP guidelines:

<https://inspection.canada.ca/preventive-controls/preventive-control-plans/the-food-safety-enhancement-program/eng/1525869691902/1525869759693#a65>

<https://inspection.canada.ca/food-safety-for-industry/archived-food-guidance/safe-food-production-systems/haccp-generic-models-and-guidance-documents/generic-model-fresh-cut-vegetables/eng/1371034721098/1371034722410>

Models: [Model HACCP Plans | Center for Meat Process Validation \(wisc.edu\)](#)

Cleaning and Sanitation

<https://inspection.canada.ca/preventive-controls/cleaning-and-sanitation-program/eng/1511374381399/1528206247934>

<https://www.fsis.usda.gov/guidelines/2020-0009>

<https://extension.psu.edu/best-practices-for-fresh-produce-food-safety>

Current Good Manufacturing Practice (CGMP) Regulations

<https://inspection.canada.ca/food-safety-for-industry/archived-food-guidance/non-federally-registered/safe-food-production/guide/eng/1352824546303/1352824822033>

<https://www.fda.gov/food/guidance-regulation-food-and-dietary-supplements/current-good-manufacturing-practices-cgmps-food-and-dietary-supplements>

Code of Federal Regulations Title 21 (CFR 21) (US Department of Health and Human Services:

<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm>

**Note: The rubrics for assessments are available at UML.**

## Riipen – Project-Based Learning

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Riipen is an online marketplace that connects students with companies to work on real-life projects and earn course credit.

Project-based learning is a teaching method in which students gain knowledge, experience, and skills by studying and resolving authentic, exciting and complex issues, problems or challenges in close collaboration with business or non-profit partners.

Through meaningful collaboration with employers on projects, you have the opportunity to apply your knowledge and develop valuable skills through project work while creating lasting connections that could make all the difference at the end of your studies.

Students involved with Riipen will work in virtual group projects across food microbiology, food quality, and food safety.

Riipen participating students will be working with two businesses: a) AgriTech North and b) Local Grown Salads. The course instructor will also be available to provide guidance and to answer students' questions.

A maximum number of teams for each company: 3 groups, three members each. The total number of students that are welcome to participate: 18, no more than 20.

If you would like to participate, please get in touch with Dr. Narvaez.

### PROJECT SCOPE

**AgriTech North** is a start-up seeking to establish food packaging and quality control Standard Operating Procedures (SOPs), GMP, HACCP, which may include details around food packaging/labelling (plastic-free

food packaging), microbiological treatments to avoid spoilage, and quality control measures, to name a few. Our indoor farming operation primarily grows vegetables and herbs.

**Local Grown Salads:** We are creating an Indoor Vertical Farming system. We need to build a HACCP/SQF Software utility that is integrated with Fishbowl

- a) HACCP program for Philadelphia facility.
- c) Current Good Manufacture Program (CGMP)
- d) Sanitation Standard Operating Procedure (SSOP)
- c) Good handling Practices (GHP)
- d) Best Practices for Fresh Produce Food Safety
- e) Developing a harvesting program based on "Cut and Come Again" principles

Participation requirements for companies:

- Provide a dedicated contact person who is available for weekly/bi-weekly drop-ins to address students' questions as well as periodic messages throughout the project.
- Be available for at least 2 follow-up meetings with the students to monitor progress, clarify doubts, and answer questions.
- Provide an opportunity for students to present their work and receive feedback.
- Provide relevant information/data as needed for the project.

Assessments:

The final project deliverables might include:

A 10-15 minute presentation to the company of key findings and recommendations. Presentations will be scheduled according to the company and student team time, likely outside the scheduled lecture time. All of the students are welcome to attend these presentations.

Assessment strategies:

- A detailed report should include teams research, analysis, insights, and recommendations.
- Students are required to perform self-evaluation and group evaluation of the task performed
- A short essay reflecting on critical events that took place during the group experience
- A one-on-one oral assessment with the Instructor might be required.

Riipen report and oral presentation weight: 35% (10% Riipen report first draft + 25% Rippen Final Report+ oral presentation). No final examination is required for students participating in Riipen projects.

## Referencing Style

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All written assignments (group activities summary) and lab reports in this course shall include an in-text citation. Reference Style: International Journal Food Microbiology:

<https://www.elsevier.com/journals/international-journal-of-food-microbiology/0168-1605/guide-for-authors>

All publications cited in the text should be presented in a list of references following the text of the manuscript.

All citations in the text should refer to:

1. Single author: the author's name (without initials, unless there is ambiguity) and the year of publication;
2. Two authors: both authors' names and the year of publication;
3. Three or more authors: first author's name followed by 'et al.' and the year of publication.

Citations may be made directly (or parenthetically). Groups of references should be listed first alphabetically, then chronologically.

Examples: "as demonstrated (Allan, 1996a, 1996b, 1999; Allan and Jones, 1995). Kramer et al. (2000) have recently shown "

List: References should be arranged alphabetically by authors' names and should be as full as possible, listing all authors, the full title of articles and journals, publisher and year. Note that journal names are to be abbreviated. The manuscript should be carefully checked to ensure that the spelling of authors' names and dates are the same in the text as in the reference list.

Examples:

Reference to a journal publication:

Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T., 2015. Mortality data for Japanese oak wilt disease and surrounding forest compositions. Mendeley Data, v1. <http://dx.doi.org/10.17632/xwj98nb39r.1>

Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. *Int. J. Food Microbiol.* 47, 211-219.

Reference to a book:

Strunk Jr, W., White, E. B., 1979. *The Elements of Style*, third ed. Macmillan, New York. Reference to a chapter in an edited book:

Kramer, J.M., Gilbert, R.J., 1989. *Bacillus cereus*. In: Doyle, M.P. (Ed.), *Foodborne Bacterial Pathogens*. Marcel Dekker, New York, pp. 22-70.

Caddick, M.X., 1994. Nitrogen metabolite repression. In: Martinelli, S.D., Kinghorn, J.R. (Eds.), *Aspergillus: 50 Years on*, *Progress in Industrial Microbiology*, vol. 29. Elsevier Science, Amsterdam, pp. 323-353.

## Assignment Feedback

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Feedback on student's performance will be provided to students: formative (i.e., comments) and summative (i.e., grade) will be delivered electronically through UML.

## Assignment Extension and Late Submission Policy

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### 1. Late Assignments:

Assignments (electronic papers and hard copies) are considered late if they are not

submitted by the day they are due. For each day, the assignment is late (excluding weekends) a 10% deduction to the grade will be applied.

*2. Makeup exams or absence:*

Attendance is essential to student success in this course. Class roll will be taken each class and lab period. Makeup exams, assignments, or absence on required days will be given only with the professor's permission.

**Group Work Policies:** You are expected to complete group work in a professional fashion. You will be given an opportunity to provide a peer evaluation of group members at the end of each activity. Marks may be adjusted based on your classmates' feedback. Completion of the peer evaluation request should be done in a respectful, fair and reasonable fashion. It is unlikely that all group members warrant a perfect peer rating. However, if more than one member is failing another member (for example, in a group of 4 members, 3 members are failing (F) one member), the adjustment will be made on that member final mark accordingly (i.e. marks deduction 50 to 0 %).

**Group activities in the remote classroom (WebEx),** they are scheduled from the beginning of the semester, you will be asked to prepare ahead of time; therefore, students missing the activities will have deducted marks (50% out of the total), unless they have major reasons justifying their absence, such as health issues or compassionate reasons, in which cases written justification must be provided.

We will use some lecture time in the remote classroom for group discussions. Therefore, students must be there to add their contributions at that time and to excessive and acquire teamwork skills, and also to discuss strategies for further discussions, therefore attendance is mandatory.

**Important Note on submissions:** Be aware of the folders assigned for each assignment in UML; if you use a different folder by mistake that will be your responsibility to load the assignment in the right folder and it will be marked as late. **Please notice that I won't accept assignments through email.**

**In the case of final exams, be advised that only the Dean's Office, not individual instructors or Departments, are in a position to grant deferred examinations.**

## UNIVERSITY SUPPORT OFFICES & POLICIES

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Instructors shall provide to every student the information on university support offices and policies in [Schedule "A"](#) within the first week of classes, either through a paper copy and/or via the university's student information system (i.e., Aurora, UM Learn, or such other university information system as may be approved by the university from time to time).

### 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](http://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 [peer support from Healthy U](#) or 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* <https://umanitoba.ca/student/health-wellness/welcome-about.html>

[britt.harvey@umanitoba.ca](mailto:britt.harvey@umanitoba.ca)

### **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 online:

### **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) <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 to 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](http://umanitoba.ca/admin/governance/governing_documents/community/230.html)

#### **Student Discipline**

[http://umanitoba.ca/admin/governance/governing\\_documents/students/student\\_discipline.html](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](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](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](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](mailto:student_advocacy@umanitoba.ca)

## **ATTENTION STUDENTS RESIDING OUTSIDE WINNIPEG**

As this is a remote learning course, all instructional activities and deadlines will be Winnipeg time (Central Time). Please make sure your calendars are adjusted to reflect any time changes. Please inform your Instructor as soon as possible if you are taking the course while residing outside of Winnipeg, specifically:

- If you are in a rural Canadian area affected by poor internet connections that may impact completing assessments and exams on time
- If you are in another time zone within or outside Canada, specify where you are, and if you foresee any challenges with attending classes and completing assessments and exams on time

NOTE: It is your responsibility to communicate with your instructors well in advance of tests/exams/assignment due dates, of any ongoing issues, OR immediately once an issue arises that *may* impact your ability to complete course work.