FNH 313 Food Microbiology Syllabus

Course Details

Course	FNH 313
Prerequisites	BIOL 112
Term/year	Winter term 1 (Sept – Dec 2023)
Class day/time	Monday, Wednesday, Friday 12 – 1 pm
Class location	BIOL 1000
Instructor	Dr. Patricia Hingston
Email	Patricia.hingston@ubc.ca (Please contact through Canvas mail)
Office	Room 223, MacMillan Building
Office hours	Wed 2 – 3 pm
TAs	See Canvas
TA contact	Please contact through Canvas mail
Syllabus version	August 2023

Welcome Message

Hello! My name is Patricia Hingston and I am an Assistant Professor of Teaching in Food Science at UBC and your instructor for this course. I teach the upper-level laboratory courses in Food Science as well as Food Microbiology which is my area of expertise. Throughout my degrees I discovered a passion for teaching and mentoring students which lead to my current position. As an Assistant Professor of Teaching, instead of conducting research in a traditional laboratory, I investigate new and innovative ways to improve student learning and prepare students for their future careers. Accordingly, I hope that you will find the learning experiences in this course fun and meaningful as they are designed to engage you in the course material while helping you learn the course content. I am a very friendly and approachable person so please feel welcome to connect with me regarding the course or any other matters. In my free time you can find me mostly hanging out with my husband and son (2 years old) but I also enjoy travelling, anything artsy (painting, pottery), biking, yoga, and wine tasting!

Course Objectives

In order to produce safe and high quality foods, it is important to understand the role of microorganisms in food production, preservation, spoilage, and foodborne disease. This course will build upon basic information developed in BIOL 112 and will focus on the growth and survival of microorganisms in different food commodities and environments. We will examine how extrinsic environmental factors and intrinsic parameters within foods influence the growth, survival, and inactivation of microorganisms and what can be done to reduce food spoilage and foodborne disease. More specifically, this course will cover the following:

- Importance of microorganisms in relation to the safety, spoilage, flavour, and preservation of foods
- Where and how microorganisms contaminate foods
- Factors affecting growth and survival of microorganisms in foods and food processing environments
- Methods for controlling microorganisms in foods and food processing environments
- Methods for detecting and enumerating foodborne microorganisms
- Steps involved in solving a foodborne outbreak
- Cleaning and sanitation of food processing plants

Learning Outcomes

Upon completion of this course, learners who have effectively engaged with the course material will be able to:

1. List types of foodborne microorganisms and explain common contamination routes
2. Describe the roles of microorganisms in food production, sensory properties, food safety and food quality
3. Describe intrinsic and extrinsic factors impacting the growth and survival of microorganisms in food
4. Distinguish whether a microorganism will grow, survive or die given a set of conditions and the microbe's characteristics
5. Select laboratory techniques to identify and quantify microorganisms in food
6. Explain pathogenic microorganism disease-causing mechanisms
7. Identify foodborne pathogens of most concern in certain foods
8. List and describe the steps involved in a food safety outbreak investigation
9. Describe food plant cleaning and sanitation procedures and select appropriate methods and chemicals for specific needs
10. Apply critical thinking skills to solve microbial food safety and quality problems

Institute of Food Technologists (IFT)

UBC's Food Science Program is approved by the Institute of Food Technologists (IFT), an internationally recognized leader in undergraduate education standards for degrees in food science. Programs with this approval badge are recognized as delivering a comprehensive food science education that covers 55 essential learning outcomes (ELOs) established by IFT. For further information on IFT ELOs, click here. The highlighted ELOs below are covered in this course.

Institute of Food Technologists Essential Learning Outcomes (IFT ELOs)

Food Chemistry (FC)

FC.1. Discuss the major chemical reactions that limit shelf life of foods.
FC.2. Explain the chemistry underlying the properties and reactions of various food components.
FC.3. Apply food chemistry principles used to control reactions in foods.
FC.4. Demonstrate laboratory techniques common to basic and applied food chemistry.
FC.5. Demonstrate practical proficiency in a food analysis laboratory.
FC.6. Explain the principles behind analytical techniques associated with food.
FC.7. Evaluate the appropriate analytical technique when presented with a practical problem.
FC.8. Design an appropriate analytical approach to solve a practical problem.

Food Microbiology (FM)

FM.1. Identify relevant beneficial, pathogenic, and spoilage microorganisms in foods and the conditions under which they grow.
FM.2. Describe the conditions under which relevant pathogens are destroyed or controlled in foods.
FM.3. Apply laboratory techniques to identify microorganisms in foods.
FM.4. Explain the principles involved in food preservation via fermentation processes.
FM.5. Discuss the role and significance of adaptation and environmental factors (e.g., water activity, pH, temperature) on growth response and inactivation of microorganisms in various environments.
FM.6. Choose relevant laboratory techniques to identify microorganisms in foods.

Food Safety (FS)

FS.1. Identify potential hazards and food safety issues in specific foods.
FS.2. Describe routes of physical, chemical, and biological contamination of foods.
FS.3. Discuss methods for controlling physical, chemical and biological hazards.
FS.4. Evaluate the conditions, including sanitation practices, under which relevant pathogenic microorganisms are commonly controlled in foods.
FS.5. Select appropriate environmental sampling techniques.
FS.6. Design a food safety plan for the manufacture of a specific food.

Food Engineering and Processing (FE)

FE.1. Define principles of food engineering (mass and heat transfer, fluid flow, thermodynamics).
FE.2. Formulate mass and energy balances for a given food manufacturing process.
FE.3. Explain the source and variability of raw food materials and their impact on food processing operations.
FE.4. Design processing methods that make safe, high-quality foods.
FE.5. Use unit operations to produce a given food product in a laboratory or pilot plant.
FE.6. Explain the effects of preservation and processing methods on product quality.
FE.7. List properties and uses of various packaging materials and methods.
FE.8. Describe principles and practices of cleaning and sanitation in food processing facilities.
FE.9. Define principles and methods of water and waste management.

Sensory Science (SS)

SS.1. Discuss the physiological and psychological basis for sensory evaluation.
SS.2. Apply experimental designs and statistical methods to sensory studies.
SS.3. Select sensory methodologies to solve specific problems in food.

Quality Assurance (QA)

QA.1. Define food quality and food safety terms.
QA.2. Apply principles of quality assurance and control.
QA.3. Develop standards and specifications for a given food product.
QA.4. Evaluate food quality assessment systems (e.g. statistical process control).

Food Laws and Regulations (FL)

FL.1. Recall government regulatory frameworks required for the manufacture and sale of food products.
FL.2. Describe the processes involved in formulating food policy.
FL.3. Locate sources of food laws and regulations.
FL.4. Examine issues related to food laws and regulations.

Data and Statistical Analysis (DS)

DS.1. Use statistical principles in food science applications.

DS.2. Employ appropriate data collection and analysis technologies.
DS.3. Construct visual representation of data.

Critical Thinking and Problem Solving (CT)
CT.1. Locate evidence-based scientific information resources.
CT.2. Apply critical thinking skills to solve problems.
CT.3. Apply principles of food science in practical, real-world situations and problems.
CT.4. Select appropriate analytical techniques when presented with a practical problem.
CT.5. Evaluate scientific information.

Food Science Communication (CM)
CM.1. Write relevant technical documents.
CM.2. Create oral presentations.
CM.3. Assemble food science information for a variety of audiences.

Professionalism and Leadership (PL)
PL.1. Demonstrate the ability to work independently and in teams.
PL.2. Discriminate tasks to achieve a given outcome.
PL.3. Describe social and cultural competence relative to diversity and inclusion.
PL.4. Discuss examples of ethical issues in food science

Course Format

This course takes place Monday, Wednesday, Friday from 12 - 1 pm. Students have the **option of participating in-person or virtually** via Zoom. If you are on campus, I strongly encourage you to attend class in-person as it may be more engaging for you than following along on Zoom. However, if for example, this is your only class on Fridays then it may be nice to save the commute to campus and participate virtually. If you need to a miss a class, recordings will be made available on Canvas.

iClicker will be used during lectures to engage students and to also determine if students are understanding concepts correctly. There is a 10% participation grade in this course and you must complete at least 80% of iClicker questions to obtain the full 10%. Whether you get a question right or wrong is not assessed, just that you participated.

Lectures slides will be **posted before** and after each **lecture**. Slide decks posted pre-lecture will not include the iClicker questions while those posted post-lecture will.

To support student learning in my courses I use **multiple small assessments** instead of fewer larger assessments. This helps students stay on top of the course material and prevents one poor grade from having a large impact on their overall grade. Each week in this course you will have a short quiz or a discussion post/short assignment due but there will be no midterm or large assignment. It is possible that a quiz and discussion post may be due in the same week since assignment due dates will vary based on the speed at which we cover course topics. Approximate assignment due dates are shown below in the course schedule.

On Canvas, the class will be divided into **groups of ~15 students**. Throughout the course you will complete discussion posts and your posts will be shared to your group discussion board for all group members to learn from.

Course Schedule

Below is the tentative schedule for the course including lecture topics and course activities. Please note that this schedule is subject to change depending on the pace at which we cover the course content.

Week	Lesson	Topic	Course Activities
1	1	Types of microorganisms in food	
2	1	Types of microorganisms in food (continued)	Syllabus quiz
3	2	Sources of microorganisms in food	Class Introduction Quiz 1
4	2	Sources of microorganisms in food (continued)	Discussion post 1
5	3	Intrinsic and extrinsic factors affecting microbial growth and survival	Quiz 2
6	3	Intrinsic and extrinsic factors affecting microbial growth and survival (continued)	Discussion post 2
7	4	Detection and enumeration of microorganisms in food	Quiz 3
8	5	Food poisoning: bacteria	Assignment 1
9	5	Food poisoning: viruses and moulds	Quiz 4
10	5	Food poisoning: parasites and prions	Assignment 2
11	6	Food plant cleaning and sanitation	
12	7	Food spoilage	Assignment 3 Quiz 5
13	8	Beneficial microorganisms in food: fermentations and probiotics	Discussion posts 3 and 4

Course Technologies

A number of different web-based technologies are used in this course to support student learning. They are as follows:

- iClicker - used for conducting engaging in-class activities and monitoring student participation
- Zoom - for those who would like to attend class virtually (optional)
- Canvas - homebase for the course
- Google Docs - format used for lesson study guides
- Respondus Lockdown Browser - used for final exam only
- Combase predictive modelling software - used for assignment 3

Learning Activities

Course activity	Description
Syllabus quiz	At the beginning of the term you will be asked to complete a syllabus quiz. You will have unlimited time and attempts to achieve a perfect score of 100%. This approach guarantees that you are well-informed about the course expectations and sets a solid foundation for your academic journey.
Course introduction	As previously mentioned, the class will be organized into multiple Canvas discussion groups, with approximately 15 students in each group. For your first discussion post, you will be required to complete the following tasks: 1. Introduce yourself and include a photo 2. Pose a question to two other group members 3. Respond to all questions that have been posed to you by other members of your group By engaging in this activity, students will have the opportunity to get acquainted with their peers, creating a supportive network that can contribute to a more enriched and effective learning experience in the course.
Quizzes	Throughout the duration of the course, students will encounter five online quizzes that are evenly spaced and intended to evaluate their comprehension of the class material. These quizzes serve the dual purpose of reinforcing learning and providing students with a means to monitor their progress as the course unfolds. Each quiz will consist of 15 questions, and students will have the opportunity to attempt them three times, with each attempt allowing up to 20 minutes. The highest grade attained among the three attempts will be considered in calculating the student's final grade. Additionally, to account for any challenges that may arise, the lowest grade out of the five quizzes will be disregarded when determining the student's overall course grade.
Discussion posts	In this course, students will complete a series of four discussion post assignments, alongside the initial introduction post mentioned above. Three of these assignments will prompt you to apply the food microbiology concepts you have learned in class to practical scenarios, allowing you to establish connections between theoretical knowledge and real-world applications. As the course nears its conclusion, you will be tasked with responding to the statement "I used to think _____, now I think _____." This

<table>
<tr><td></td><td>exercise serves as an opportunity for you to critically evaluate how your understanding of food microbiology has evolved throughout the course.
When contributing your responses on the group discussion board, you will not have access to other students' contributions until you have submitted your own post. This deliberate design encourages students to express their own thoughts and perspectives without being influenced or swayed by the ideas of others.</td></tr>
<tr><td>Assignments</td><td>There will be three assignments in this course, to be completed individually. The first assignment will focus on microbial enumeration and detection, the second will focus on a foodborne outbreak, and the third will relate to food spoilage. The assignments will comprise of 10 - 12 short answer and/or calculation questions. All assignments are to be submitted in a quiz format on Canvas.</td></tr>
<tr><td>Participation</td><td>In this course, iClicker is used during lectures to actively engage students and assess their understanding of concepts. Participation through iClicker responses contributes to a 10% grade in the course, and to earn the full 10%, you must complete at least 80% of the iClicker questions. All responses are anonymous but iClicker will note whether you participated or not. The assessment is based on participation rather than the accuracy of your answers. To accommodate potential absences, a 20% buffer has been incorporated, allowing for the equivalent of missing 2.5 classes without any penalty to your grade. Each class will commence with a fun icebreaker question so make sure to show up on time!
Below is how your 10% participation grade will be evaluated:
<table>
<tr><th>% of questions Answered</th><th>Grade (%)</th></tr>
<tr><td>80 - 100</td><td>10</td></tr>
<tr><td>70 – 79</td><td>8</td></tr>
<tr><td>60 – 69</td><td>6</td></tr>
<tr><td>50 – 59</td><td>5</td></tr>
<tr><td>40 – 49</td><td>4</td></tr>
<tr><td>30 – 39</td><td>3</td></tr>
<tr><td>20 – 29</td><td>2</td></tr>
<tr><td>0 – 19</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>Study guides</td><td>Study guides are available on Canvas for each lesson in the course. Each guide consists of an empty table(s) as well as a list of study questions that students are encouraged to fill in/answer during and/or after class.</td></tr>
</table>

	Both the charts and the questions are intended to help you prepare for the quizzes and the final exam. A concept map showing how all of the microorganisms in the course are connected is also available on Canvas.
Final examination	During the designated exam period, a 2.5-hour in-person final exam will be administered. This closed-book examination aims to assess your understanding of the course material and your ability to apply critical thinking skills in accordance with the stated course learning objectives. While the exam is closed book, you will be permitted to create a one-sided exam aid to support your preparation. The exam will be completed as a Canvas quiz and the Respondus Lockdown Browser will be required for secure exam completion. The exam room will be equipped with electrical outlets at each seat, enabling you to connect and power your computer if necessary.

Microbial Enumeration Workshop (optional)

Due to the large number of students who require this course for their degree, it is not feasible to conduct a laboratory session for the whole class. However, UBC's Food Science Club will be holding one or two Microbial Enumeration Workshops in the fall that can accommodate ~ 25 students each. The event(s) will take place in the evening from 5 - 7:30 pm in the FNH Teaching Lab in the MacMillan Building and the price will be $20 per student to help cover the costs of the supplies needed. Students will work in groups of two to perform the following tasks:

- Enumerate total aerobic microorganisms in a food product via spread plating (can bring your own product or use one that is provided)
- Conduct a Gram stain on the food product and observe it under a light microscope to see if Gram-positive and/or Gram-negative bacteria are present
- Determine the water activity of your assigned food product
- Determine the pH of 3 different foods and beverages
- Evaluate the microbial load on a surface by swabbing it (e.g. cell phone, toilet seat, door handle) and streaking the swab out onto an agar plate

Assignment Deadlines

All assignments and discussion posts for this course will be accessible from the beginning of the term. However, their **due dates** will be set for **one week after we have completed the relevant content in class**. The instructor will provide guidance during class sessions, indicating when you possess sufficient knowledge to commence working on the assignments and discussion posts.

Due to the size of this class and the grading process, **extensions will *not* be granted for assignments.** Ensuring that all assignments are submitted at the same time simplifies the grading

process for the teaching assistants (TAs). Therefore, it is important to adhere to the specified deadlines on Canvas and submit your assignments accordingly.

Course Evaluation

Course Activity	Amount	Weight (%)	Notes
Syllabus quiz	1	1	Unlimited time and attempts.
Class introduction	1	2	
Content quizzes	5	25	3 attempts each, highest grade used, lowest of 5 quiz grades dropped at end of course.
Discussion posts	3	14	
End of course discussion post	1	2	
Assignments	3	21	
Participation	Throughout course	10	Must answer >80% of iClicker questions to obtain full 10%.
Final exam	1	25	

Bonus Mark: You can obtain a 1% bonus mark added to your final grade by being one of the top 10 students who responded to the most student-asked questions on Piazza. See "Course Communication" to learn more about Piazza.

Course Readings

There is no assigned textbook for this course, but supplemental information on most of the topics covered in this course can be found in Food Microbiology – An Introduction (4th Edition), which is available online through the UBC library. This and similar textbooks are a great resource for gaining a deeper understanding of the course material and students are encouraged to engage in supplemental reading as part of their study habits for the course. Other supplemental resources are also available on Canvas under "Helpful Resources".

Learning Resources

If you require assistance gaining access to or navigating one of the online learning resources or would like additional support regarding online learning in general, the UBC Keep Learning website is a great resource for students: https://keeplearning.ubc.ca/

Course Communication

The discussion platform Piazza is used in this course to allow students to ask and answer questions related to the course, anonymously. The top 10 students who answer the most student questions will receive a 1% bonus mark in the course. The instructor will monitor Piazza closely and endorse student answers that are correct, correct incorrect answers, and answer any questions that have not been addressed. Students are encouraged to post to Piazza questions regarding assignment clarification. However, I kindly request that you **refrain from sharing specific assignment or quiz questions, and** their corresponding **answers**, on the platform. If any such posts are made, I will be compelled to remove the question or take necessary action to maintain the fairness and integrity of the assessments. Your cooperation in adhering to this guideline is greatly appreciated as it ensures a level playing field for all students. **Let's foster a supportive and respectful learning environment on Piazza.**

If you wish to contact myself (the instructor) or a TA, **please message us through Canvas** to prevent your message from getting lost in our inboxes.

Grade Related Concerns

If you believe your assignment was graded incorrectly or unfairly, please follow these steps:

1. Contact your TA through Canvas and politely raise your concern regarding the grading issue. The TA will review your submission, considering your feedback. They may provide further explanations for the assigned grade or make corrections if necessary.
2. If, after corresponding with your TA, you still feel that the assessment was unfair, you can escalate the matter by contacting the course instructor.

Please show consideration to both your TA and the instructor. Grading is a challenging task, especially in large enrollment courses like this one where numerous assignments must be graded within a short timeframe. We are all doing the best we can to support your learning in this course.

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. All UBC students are expected to behave as honest and responsible members of an academic community. At the most basic level, this **means submitting only original work done by you and acknowledging all sources** of information or ideas and attributing them to others as required. This also means **you should not cheat, copy, or mislead others about what is your work.**

It is the student's obligation to learn, understand and follow the standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions.

Violations of academic integrity lead to the breakdown of the academic enterprise, and therefore serious actions are taken. Plagiarism or cheating may result in a mark of zero on an assignment, exam, or course. More serious consequences may apply if the matter is referred to the

President's Advisory Committee on Student Discipline. Academic misconduct may result in a one-year suspension from the University and a notation of academic discipline on the student's record.

The UBC library has a useful Academic Integrity website that explains what plagiarism is and how to avoid it. If a student is in any doubt as to the standard of academic honesty in a particular course or assignment, then the student must consult with the instructor as soon as possible. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar.

Generative AI Tools

Students are permitted to use artificial intelligence tools, including generative AI, to gather information, review concepts or to help produce assignments. However, students are ultimately accountable for the work they submit, and any content generated or supported by an artificial intelligence tool must be cited appropriately.

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on **the UBC Senate website.**

Copyright

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the Course Instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline.