

FNH 313 Food Microbiology Syllabus

Course Details

Course	FNH 313 [3-0-0]
Prerequisites	BIOL 112
Term/year	Winter term 1 (Sept – Dec 2022)
Class day/time	Monday, Wednesday, Friday 12 – 1 pm
Class location	Chemical and Biological Engineering Building (CHBE) 101
Instructor	Dr. Patricia Hingston
Email	Patricia.hingston@ubc.ca (Please contact through Canvas mail)
Office	Room 223, MacMillan Building
Office hours	TBA
TAs	TBA
TA contact	Please contact through Canvas mail
Syllabus version	August 2022

Welcome Message

Hello! My name is Patricia Hingston and I am an Assistant Professor of Teaching in Food Science at UBC. I teach the upper-level laboratory courses in Food Science as well as Food Microbiology which is my area of expertise. Teaching is my passion. I thoroughly enjoy mentoring students and observing their growth throughout their programs. I am a very friendly and approachable person so please feel welcome to connect with me regarding the course or any other matters. Originally from Owen Sound, Ontario, I lived in Halifax (Nova Scotia, Canada) and Copenhagen (Denmark) before moving to Vancouver for my PhD. I loved Vancouver so much that I decided to stay. In my free time you can find me mostly hanging out with my husband and son (1.5 years old) but I also enjoy painting, cooking, biking, and yoga.

Course Objectives

In order to produce 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.

This course focuses on the following:

- Importance of microorganisms in relation to the safety, spoilage, flavour, and preservation of foods
- Factors affecting growth and survival of microorganisms in food systems
- Methods for controlling microorganisms in foods
- Methods for detecting and enumerating foodborne microorganisms
- Steps involved in solving a foodborne outbreak
- Cleaning and sanitation of food processing plants
- Impact of food cultivation methods on the microbial quality and safety of foods

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. Explain pathogenic microorganism disease-causing mechanisms
4. Identify foodborne pathogens of most concern in certain foods
5. Distinguish whether a microorganism will grow, survive or die given a set of conditions and the microbe's characteristics.
6. Describe intrinsic and extrinsic factors impacting the growth and survival of microorganisms in food
7. Select laboratory techniques to identify and quantify microorganisms in food
8. Replicate 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. Explain the impacts of food cultivation and production methods on food-borne microorganisms
11. 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

You have the option of attending this course in-person or virtually. If you are on campus, I strongly encourage you to attend class as it will 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. Either way, to achieve your 10% course participation grade you will need to attend 80% of classes in-person or virtually. If you need to miss a class, recordings will be made available on Canvas.

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 in the course. 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 as assignment due dates will vary based on the speed at which we cover course topics. Approximate assignment due dates are posted on Canvas.

Class slides will be posted immediately after each class session but not before. This is because the slides contain the answers to the learning activities that I will be conducting in class and I want you to really think about the answers and not simply start scanning through the slides. I know students find it helpful to have slides in advance. To help make up for the delay in slide posting, I include all necessary details in my slides so you shouldn't have to take many notes and I will record and post all classes to Canvas for you to refer back to if you need. Students will additionally be provided with a structured chart for each lesson that they are encouraged to fill in during and after class to serve as study guides for the quizzes and final exam.

All quiz and most exam questions will come directly from my slides. On the final exam I may ask one or two questions that refer to a discussion we had in class.

Course Schedule

Below is a simple outline of the course. See Canvas for a more detailed schedule.

Week	Topics Covered	Assessments
1	Types of microorganisms in foods: The good, the bad and the ugly	Syllabus quiz Class introduction
2	Sources of microorganisms in foods	Discussion post
3	Intrinsic and extrinsic factors affecting microbial growth and survival	Discussion post
4		Quiz 1
5	Detection and enumeration of microorganisms in food	Assignment 1
6	The ugly: Pathogenic bacteria	
7	The ugly: Pathogenic viruses and moulds	Quiz 2
8	The ugly: Parasites and prions	Assignment 2

9	Food plant cleaning and sanitation	Quiz 3
10	The bad: Spoilage microorganisms	Assignment 3
11	The good: Beneficial microorganisms in food (fermentation, probiotics, bacteriophages)	
12		Discussion post Quiz 4
13	Effects of cultivation methods on the microbial quality and safety of foods (organic vs. conventional farming, GMO foods, large vs. small scale farming, aquaculture methods)	

Checklist for Course Preparation

This course will require you to use the following software:

- Canvas
- iClicker
- Zoom
- Google Docs
- Respondus Lockdown Browser
- Combase predictive modelling software

Learning Activities

Course activity	Description
Quizzes	Four online quizzes are distributed throughout the course and will be based on the material covered in class. The purpose of the quizzes is to provide students with the opportunity to practice what they have learned in class and ensure that they are keeping up with the course as it progresses. Each quiz will consist of 15 questions and students will be given 2 attempts and 20 minutes to complete them.
Course introduction	At the beginning of the course you will be asked to do two things: <ol style="list-style-type: none"> 1. Introduce yourself to your discussion group, ask 2 people questions, and respond to questions that others have asked you 2. Complete a syllabus quiz with infinite attempts
Discussion posts	Throughout the course, students will submit 3 discussion posts that ask them to apply concepts from class to their everyday lives or to locate and summarize research related to topics covered in class. These will be shared on discussion boards where all students can view each other's responses; however, no grades will be visible. Students must submit their post before they can see other responses. The class has been divided into 10 discussion groups of 20 students each so students will see responses from the same 20 students throughout the course.

	There are five TA's in this course and they will take turns grading different groups.																		
Assignments	There will be three assignments in this course that have correct answers as opposed to open-ended responses like the discussion posts. They will have around 10-12 questions to answer and are out of 20 marks.																		
iClicker questions	<p>Since this course has a high enrollment of 200 students, I do my best to engage the whole class as much as possible to make the course fun. To help facilitate interactive course activities I will use iClicker. I will not be grading your responses to the questions asked in class but I will be grading whether you participated or not. All question responses will be anonymous to your classmates but visible to your instructor. Below is how your 10% participation grade will be evaluated:</p> <table border="1"> <thead> <tr> <th>% of Questions Answered</th><th>% Grade</th></tr> </thead> <tbody> <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> </tbody> </table> <p>I understand that sometimes you may encounter technical difficulties or have to miss a class or two and that is why you can still obtain the full 10% if you only answer 80% of questions.</p>	% of Questions Answered	% Grade	80 - 100	10	70 – 79	8	60 – 69	6	50 – 59	5	40 – 49	4	30 – 39	3	20 – 29	2	0 – 19	0
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30 – 39	3																		
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Study guides	Students will be provided a structured but empty chart for each lesson that they are encouraged to fill in during and after class to serve as study guides for the quizzes and final exam.																		
Final examination	<p>A closed book final exam will take place at the end of the course. You will be allowed a one-sided exam aid. The final exam is designed to evaluate your knowledge and critical thinking skills accumulated throughout the course and your competency in the course learning objectives stated above.</p> <p>The exam will be conducted through Canvas using the Respondus Lockdown Browser. The reason for this is 200 exams use a great deal of paper, take hours to print, and are very heavy to carry around and can get lost. Paper exams also make grading very difficult for TA's and mistakes are more likely to occur when summing up marks.</p> <p>If you do not have a computer with a 2 h battery life, please let the instructor know in advance so they can find one for you to borrow or ensure you are seated next to an electrical socket.</p>																		

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 Assessment

Course Activity	#	Weight (%)
Quizzes	4	25
Syllabus quiz	6	1
Course introduction	1	1
Discussion posts	3	13
Assignments	3	20
Participation	Throughout course	10
Final exam	1	30

Bonus Marks: You can obtain a 1% bonus mark added to your final grade if you are one of the top 5 students who responded to other student’s Piazza posts. See more information regarding this under “Course Communication”.

Course Communication

All course communication should be conducted through Canvas. E-mail and discussion boards will be monitored between 9 am – 5 pm, Mon – Fri. During that time frame, the instructor or TAs should respond within 24 hours (or by Monday at noon for questions asked Friday afternoon). There is no guarantee of course communication during evenings, weekends, and holidays, so plan accordingly.

Whenever possible, questions pertaining to course material should be posted on the designated Piazza discussion boards. Many students will have the same questions, and so it is easier for the instructor/TAs to answer once instead of multiple times. Additionally, posted questions may trigger deeper discussion that will benefit the whole class. Students should also monitor the discussion boards and provide their own feedback. The instructor/TAs will endorse comments/answers that are acceptable. **As an incentive, the five students with the most instructor-endorsed responses to classmate questions on Piazza will be awarded a 1% bonus to their final course mark.**

Learning Analytics

Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will use Canvas including programs embedded within it. Many of these tools capture data about your activity and provide information that can be used to improve the quality of teaching and learning. In this course, I plan to use analytics data to:

- View overall class progress
- Track your progress in order to provide you with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion forums

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](#).

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.