ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster University

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2023	
Course Name	Food Microbiology	
Course Code	BIOTECH 3FM3	
Date(s) and Time(s) of lectures	Monday 9:30-11:20 AM Thursday 12:30-1:20 PM	
Program Name	Biotechnology	
Calendar Description	An introduction to the microbiology of raw materials used in the manufacturing of food products. The course will review microbial growth and examine the types of microorganisms found in foods, the fermentation process in foods and food borne illnesses, strategies to prevent them growing and killing them.	
Instructor(s)	Dr. Asif Mohammad	E-Mail: amohamm@mcmaster.ca Office Hours & Location: Thu 11:30-12:20pm or by appointment, Office ETB/209 or via zoom

2. COURSE SPECIFICS

Course Description

The course includes the study of micro-organisms important in food, such as bacteria, yeast, fungi, viruses and prions, the role of microbes in food spoilage, deterioration, food poisoning, and food-borne diseases. The course covers the effect of intrinsic and extrinsic conditions on growth of microbes and food quality along with the effect of these conditions on growth curve with the study of different physical, chemical and biological methods of food preservation. The study of food borne diseases and illness particularly food poisoning and illness caused by gram negative bacteria such as Salmonella, Campylobacter, *E. coli* and *Shigella* in addition to gram positive bacteria such as *Clostridium botulinum*, *Bacillus cereus* and *Listeria monocytogenes*. The study of mycotoxins produced by fungi, and neuro diseases caused by prions, such as mad cow diseases. The course will include food fermentation as a method for food preservation, methods and techniques used for the production of probiotics bacteria. The course will end with the industrial strategies for food safety, quality control and assurance in food industry in particular the HACCP, along with modern, automated and molecular biology techniques for detection and enumeration of microbes in food.

Instruction Type

Code	Type	Hours per term
C	Classroom instruction	36
L	Laboratory, workshop or fieldwork	18
T	Tutorial	0
DE	Distance education	n/a
	Total Hours	54

Resources

ISBN	Textbook Title & Edition	Author & Publisher
ISBN: 9781555816360	Food Microbiology: An Introduction, 3rd or 4th edition	Thomas J. Montville, Karl R. Matthews and Kaliman E. Kniel, ASM Press

Other Supplies	Source
Lectures	http://avenue.mcmaster.ca

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	Lab Manuals	http://avenue.mcmaster.ca
Prerequisite(s)	BIOTECH 2CB3, 2MB3	
Corequisite(s)	Registration in level III or above of Biotechnology	
Antirequisite(s)	n/a	
Course Specific Policies	The attendance of lectures is strongly encouraged and there are several announced quizzes throughout the term during the lecture period on all recently covered course material, including lectures, assignments, readings, fellow student presentations, etc. No make-up quizzes will be allowed without an acceptable explanation. A three-hour lab (split into two 1.5-hour sub sessions one on Monday and the other on Thursday) will be delivered in-person in a condense format in ETB/121. Students should attend all laboratory sessions and submit lab reports. It is the responsibility of the student to download lab manuals posted on avenue. If you miss a lab session and do not provide an MSAF for the missed lab (or other appropriate official documentation if you have already used your MSAF) you will still receive mark for any pre-lab work you had already submitted but you will receive a zero for that lab and any post-lab work that was to be submitted later. Absence from lab session with no well documented excuse or failure to submit the report in time result with F grade in the lab. There will be two announced in-class tests during the term. It will each cover material from the lectures, case studies, assignments, and textbook course material up until the test**.** All tests must be written at the times announced. There is no make-up policy for this course. If the student missed a test, the percentage of the final will be increased to compensate the missing midterm if the student has **well documented and approved report** for the absence (See MSAF information below). The final exam will be cumulative and will cover all course material, including the lectures, assignments, reading, any discussed topics, laboratory theory, material posted online and student presentations. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, usernames for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor. The instructor may also use other software including e-mail, Avenue, LearnLink, web pages, capa, Moodle, Thinking Cap, etc. The communication via email strictly is by **official McMaster University Account**, no reply to the commercial emails and/or nick names. Late submissions of lab reports will be penalized 10% per day within one week.	
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class.	

	"Out-of-class" work includes reading, research, assignments and preparation for tests and examinations. Where group work is indicated in the course outline, such collaborative work is mandatory. The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception. Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class. Instructor has the right to submit work to software to identify plagiarism.	
3. SUB TOPIC(S)		
Week 1	Introduction: Micro-organisms in food, development in food microbiology	Chapter 1
Week 2	Factors influence microbial growth in foods: Food ecosystems, Extrinsic and intrinsic conditions. **Case study 1**	Chapter 2
Week 3	Spores: Spores in the food industry, importance of spore formers in public health, spore heat resistance. **Quiz 1** **Assignment 1**	Chapter 3
Week 4	Detection and enumeration of microbes in food: sample collection and processing, rapid and automated methods **Case study 2**	Chapters 4, 5
Week 5	Indicator microorganisms and microbiological criteria: Establish criteria, sampling plans, indicator microorganisms. **Quiz 2** **Case study 3**	Chapter 6
Week 6	Foodborne pathogens: Gram-Negative Bacteria, enterohemorrhagic *E. coli* and *Salmonella.* **Case study 4**	Chapters 12, 14
Week 7	Foodborne pathogens: Gram-Positive Bacteria, *C. botulinum* and *Listeria monocytogenes* **Case study 5** **Term Test 1**	Chapters 10, 13
Week 8	Foodborne pathogens: Molds; isolation, enumeration, mycotoxins. Prions and viruses: Food related viruses, bacteriophages in dairy industry, prion biology. **Assignment 2** **Case study 6** **Quiz 3**	Chapters 22, 24
Week 9	Control of microorganisms in food by antimicrobials: Factors affect antimicrobial activity, naturally occurring	Chapters 25, 26

	antimicrobials. Control of microorganisms in Food by biological methods: Biopreservation and probiotic bacteria.	
Week 10	Control of microorganisms in Food by physical methods: Dehydration, cold storage, irradiation **Quiz 4**	Chapter 27
Week 11	Food Safety & Quality control: Industrial strategies for safe food, good manufacturing practices and sanitation. **Case study 7**	Chapter 29
Week 12	Food nanotechnology: Type of nanoparticles, application of nanotechnology in control of microorganisms in food. **Term Test 2**	n/a
Week 13	**Review**	

Mid-term Recess: Monday, October 9 to Sunday, October 15
Classes end: Wednesday, December 6th
Final Examination Period: Friday, December 8 to Thursday, December 21
All examinations MUST be written during the scheduled examination period.

List of experiments	
Lab 1	**Lab Safety and Food Microbiology Introduction** Microscopic Examination of Yeast, Mold, and Bacteria
Lab 2	Enumeration of Yeasts and Molds from Foods
Lab 3	Cleaning and Sanitation
Lab 4	Screening of Listeria Enrichments Using PCR-Based Testing
Lab 5	Escherichia coli O157:H7 Enrichment and Immunomagnetic Separation
Lab 6	Enumeration of spores from pepper

Review and Lab Test

Note that this structure represents a plan and is subject to adjustment term by term.
The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	**Weight**
Cases/Assignments and Quizzes	15
Mid-term tests	30
Project	10
Participation	5
Labs	20
Final examination (tests cumulative knowledge)	20
TOTAL	**100%**

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. 1. Explain differences between the major groups of microorganisms in food and their role in foods and use these information in the diagnosis of food microorganisms
2. Differentiate between the intrinsic and extrinsic conditions and their influence on the growth of microorganisms in food and how they are applied to food processing

3. Understand key areas of microbiological food control ensuring food quality and safety
4. Design methods on controlling the transmission of food borne pathogens and know the industrial strategies for securing safe food in food industry particularly the quality control and assurance method, good manufacturing practices (GMPs), and the Hazard Analysis Critical Control Point (HACCP) system with respect to human safety and food quality
5. 5. Applying the rapid and modern methods and techniques in the diagnosis of microbes in foods especially the application of molecular, biochemical and microbiological methods in the identification and diagnosis of food borne pathogens in short time (hours) as compared to the traditional methods (days)
6. Evaluate the food spoilage and their importance in food industry and to know the different strategies to minimize the contamination and control spoilage in raw material.

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.
http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com, please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.