

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Winter 2024	
<b>Course Name</b>	Microbiology	
<b>Course Code</b>	BIOTECH 2MB3	
<b>Date(s) and Time(s) of lectures</b>	Monday 2:30-4:20 Tuesday 1:30-2:20	
<b>Program Name</b>	Biotechnology	
<b>Calendar Description</b>	An introduction to microbiological analysis with emphasis on use of microscopic techniques, staining, cultivation and control of microbial growth, enumeration, identification, potable water analysis, with environmental and industrial applications. Three lectures, one lab (three hours); one term	
<b>Instructor(s)</b>	Dr. Faiez Alani  Dr. Asif Mohammad (Lab Instructor)	E-Mail: alanif@mcmaster.ca Office Hours & location: Monday: 1:30--2:30 pm or by appointment. ETB 205  E- Mail: amohamm@mcmaster.ca Office Hours & Location: Thursday 1:30-2:30pm or by appointment, ETB 209

### 2. COURSE SPECIFICS

<b>Course Description</b>	The course includes the microscopic techniques, types of microscopes, light, fluorescent an electron microscope and their applications. The morphology of bacterial cells and preparations for microscopic examination such as staining with simple and differential staining. The structure of gram positive and negative cell walls and the effect of antimicrobials agents. The growth kinetics of microbial cell and methods of cultivation and enumeration of microorganisms and the control of microbial growth by physical and chemical methods. Identification and classification of microorganisms by using phenotypic and genotypic characteristics. Applications of microbiology such as in drinking water and wastewater treatment and in food industry. The laboratory part will include training in microbiology lab techniques such as isolation, distribution of and enumeration of microorganisms using standard plate and spectrophotometric methods. Culture media preparation and effect of physiological factors on the growth of bacteria, and pure culture techniques. Simple and gram staining to differentiate between different groups of bacteria. Applications of microbiology in food industry and health.		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	39
	L	Laboratory, workshop or fieldwork	36
	T	Tutorial	0
	DE	Distance education	0
	<b>Total Hours</b>		75

<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN10: 1260735508	Nester's Microbiology: A Human Perspective 10th Edition (2022)	Denise Anderson, Sarah Salm, Deborah Allen McGraw-Hill Education
	ISBN:0077730895	OR Nester's Microbiology: A Human Perspective 9 or 8th Edition	Eugene W. Nester, Martha T. Nester, Denise G. Anderson, C. Evans Roberts, Jr. McGraw-Hill Ryerson
	<b>Other Supplies</b>	<b>Source</b>	
	Lectures	<a href="http://avenue.mcmaster.ca">http://avenue.mcmaster.ca</a>	
<b>Prerequisite(s)</b>	<i>BIOTECH 2M03, 2CB3</i>		
<b>Corequisite(s)</b>	n/a		
<b>Antirequisite(s)</b>	n/a		
<b>Course Specific Policies</b>	<p>The attendance of lectures is strongly encouraged and there are many quizzes and discussions. Students should attend all laboratory sessions and submit lab report. Absence from lab with no well documented excuse or failure to submit the report in time result with F grade in that lab. It is the responsibility of the student to download Lab. procedures from lab manual on-line (Avenue learning). There is no make---up policy in the term tests for this course. Students must pass both components of the course--labs and lectures--to pass the course. Students should be aware that, when they access the electronic components of this course, 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 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.</p> <p>The instructor may also use other software including: e-mail, Avenue, Learn Link, web pages, capa, Moodle, Thinking Cap, etc. The communication via email is strictly by Official McMaster University Account, no reply to the commercial emails and/or nick names. Late submissions of assignments and Lab report will be penalized 10% per day within one week.</p>		
<b>Departmental Policies</b>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>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.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p>		

	<p>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.</p> <p>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.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
<b>3. SUB TOPIC(S)</b>		
Week 1	Introduction: Importance of microbes, Microbial world, Microbes and Biotechnology, Applications of microbiology.	Ch1
Week 2	Microscopy: Microscopic techniques, Types of microscopes, staining, Morphology of microbial cells.  <b>Quiz 1</b> <b>Case study 1</b>	Ch3
Week 3	Bacterial structure: Gram positive and gram-negative cell wall, antibacterial substances that target peptidoglycan, bacteria that lack cell wall, capsules and protein appendages.  <b>Quiz 2</b> <b>Case study 2</b>	Ch3
Week 4	Culture, growth in laboratory conditions, environmental factors, methods of measures microbial growth.  <b>Quiz 3</b> <b>Case study 3</b>	Ch4
Week 5	Control of microbial growth: principles of control, selection of antimicrobial procedure, physical and chemical methods.  <b>Quiz 4</b> <b>Case study 4</b>	Ch5
Week 6	Identification and classification: Principles of taxonomy, phenotypic and genotypic characteristics for identification, strain differences.  <b>Quiz 5</b> <b>Case study 5</b>	Ch 10
Mid-term Recess: Monday, February 19 to Sunday February 25		
Week 7	Prokaryotic microorganisms: Diversity of prokaryotes, anaerobic chemotrophs, aerobic bacteria.  <b>Quiz 6</b> <b>Case study 6</b>	Ch 11
Week 8	Eukaryotic microorganisms: Structure and importance of fungi, algae, and protozoa.  <b>Quiz 7</b> <b>Case study 7</b> <b>Mid Term Test</b>	Ch 12

Week 9	Acellular microorganisms: General characteristics of viruses, bacteriophages, animal viruses, cultivation and quantification of viruses, other infectious agents: viroids and prions. <b>Quiz 8</b> <b>Case study 8</b>	Ch 13
Week 10	Epidemiology: Principles of Epidemiology, Epidemiological Studies, Infectious Disease Surveillance, Emerging Infectious Diseases <b>Quiz 9</b> <b>Case study 9</b>	Ch 19
Week 11	Antimicrobial medications: Development of antimicrobial drugs, features, mechanisms of action, Determining susceptibility of Bacterial Strain, Resistance to antimicrobial Drugs. <b>Quiz 10</b> <b>Case study 10</b>	Ch 20
Week 12	Environmental Microbiology: Microbiology of wastewater treatment, drinking water treatment and testing.	Ch 29
Week 13	<b>Review</b>	

Midterm Recess: Monday, February 19 to Sunday, February 25  
 Test and Examination Restriction Period: Thursday, April 4 to Thursday, April 11  
 Classes end: Wednesday, April 10  
 Final examination period: Friday, April 12 to Thursday, April 25  
 All examinations MUST be written during the scheduled examination period

**List of experiments**

Lab 1	Introduction
Lab 2	The Handling and Distribution of Microorganisms
Lab 3	Microscopy
Lab 4	Simple Staining
Lab 5	Gram Staining; Strain Storage
Lab 6	Culture Media Preparation and Hydrolytic Tests
Lab 7	Bacterial Enumeration
Lab 8	Evaluation of Anti-Microbials
Lab 9	Analysis of Bacteria in Dairy Products
Lab 10	Simulated Epidemic and Food Microbiology
Lab 11	Lab Quiz

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.

<b>4. ASSESSMENT OF LEARNING *including dates*</b>	<b>Weight</b>
Quizzes & case studies	20
Participation	05
Mid-term test	15
Team Project	10

Labs	25
Final examination (tests cumulative knowledge)	25
<b>TOTAL</b>	<b>100%</b>

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

### 5. LEARNING OUTCOMES

1. Identification of different group of microorganisms such as: bacteria, fungi, algae, protozoa, and non-cellular microorganisms.
2. Evaluate the use of the different microscopic techniques in diagnosis of microorganism
3. Differentiate between gram negative and gram-positive bacteria and cellular and non-cellular microorganisms.
4. Design physical, chemical and biological methods to control the growth of microorganism and preservation of products.
5. Differentiate between antimicrobial drugs, mechanisms and effect on microbial drug
6. Perform safely laboratory techniques in microbiology such as sterilization, isolation, purification, and enumeration of microorganisms in environmental and industrial sample.

### 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](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](http://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](mailto: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.