



MICR*2420 Introduction to Microbiology

Summer 2019

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 3.00 - May 10, 2019

1 Course Details

1.1 Calendar Description

This course will introduce students to the diversity of microorganisms, including, bacteria, viruses, and fungi, and the impact of microbes on everyday life. The interactions of microorganisms with the biotic and abiotic worlds will be discussed. Topics will include the roles of microorganisms in host-pathogen interactions in disease, the beneficial aspects of microorganisms in bioremediation and food production, and their application in biotechnology.

Pre-Requisites:

4.00 credits including (1 of BIOL*1070, BIOL*1080, BIOL*1090, CHEM*1040)

Restrictions:

This is a Priority Access Course. Enrolment may be restricted to particular programs, specializations or semester levels during certain periods. Please see the departmental website for more information.

1.2 Timetable

Lectures: M, W, F 11:30 - 1:20 pm, THRN1307

Labs: Tues., Wed. 2:30-5:20 pm, SSC4102

1.3 Final Exam

Fri. June 28, 11:30-1:30 THRN1307

2 Instructional Support

2.1 Instructional Support Team

Instructor: Wendy Keenleyside Dr.
Email: wkeenley@uoguelph.ca
Telephone: +1-519-824-4120 x53813
Office: SSC3506
Office Hours: Course coordinator

Instructor: Melissa Perreault Dr.
Email: perreaum@uoguelph.ca
Telephone: +1-519-824-4120 x52013
Office: SSC 3446

Lab Co-ordinator: Pamela Loughran
Email: ploughra@uoguelph.ca
Telephone: 519-824-4120 x53448
Office: 3516

Office Hours:

- Any requests for academic accommodation related to lab attendance or lab reports should be directed to Pam.

Lab Co-ordinator: Debra Flett
Email: dflett@uoguelph.ca
Telephone: +1-519-824-4120 x52533
Office: SC1 3504

Office Hours:

- Deb is a MICR Lab Coordinator acting as TA for the summer, in lieu of hiring a graduate student.

3 Learning Resources

3.1 Required Resources

Microbiology: Canadian Edition (Textbook)

<https://ecampusontario.pressbooks.pub/microbio/front-matter/preface/>

- **By Keenleyside et al., 2019. Adapted from "Microbiology" by OpenStax**
- This is an Open Education Resource (OER). The electronic version is free. Students who wish to have a hard copy may speak to Dr. Keenleyside about how to order a printed version.

Labratory Manual (Other)

Purchased for \$10.00 (cash only) from SSC2302 the following times:

1. Thurs. May 9 - 9:30-11:30 & 1:00-3:00
2. Fri. May 10 - 9:30-11:30 & 1:00-3:00
3. Mon. May 13 - 9:30-11:30 & 1:00-3:00

After this, the price increases to \$15.00 and manuals are purchased from SSC4481

Courselink (Website)

The course website will be used extensively and will include all relevant course materials, discussion boards, group self-enrolment for the various group activities, links for additional readings & a course calendar.

REEF Polling (Software)

You will be required to purchase a subscription to REEF Polling (by iclicker), to allow participation in class polling. This is a cloud-based platform that allows you to use your laptop or digital device to respond to MCQs, short answer or targeting questions; **the hand-held iclickers will not be used.**

- The access code is purchased at the bookstore - please keep this code until you are certain it has been entered correctly and you are able to participate in polling. Subscriptions are 6 months or a year: if you are taking **MICR2430 F19 or W20, purchase a 1 year subscription**, as the system will also be used in that course.
- Once you have the access code, you will need to register online
- **Polling begins lecture 2** and the site is accessed through Courselink

PeerWise (Website)

<https://peerwise.cs.auckland.ac.nz/docs/>

- This is a free online tool for authoring, answering, commenting on and rating student-authored multiple-choice questions. A site for MICR*2420 S18 will be set up shortly and the class list imported. You will need to create an account (assuming you have not used the tool before) and then select the course. The tool is simple to use but instructions for creating, and for answering, questions, are provided in text as well as video on the PeerWise site. You can provide feedback on other student's questions, correct, are enquire.
- To encourage you to think more critically about the material, any good quality,

higher Bloom's level questions that you write, will be considered for inclusion in the midterm and final exams, with no upper limit! So you will derive double benefits from authoring and answering/providing feedback on, other questions: you will be learning as you do both, and you raise the likelihood that you will know some questions AND THEIR ANSWERS on the midterm and final exam! Participation can also be used to make up for missed REEFPolling, to a limit.

3.2 Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: <http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

If you are concerned about any aspect of your academic program:

* make an appointment with a program counsellor in your degree program.
<http://www.bsc.uoguelph.ca/index.shtml> or
<https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

* There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>

If you are struggling with personal or health issues:

* Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
<https://www.uoguelph.ca/counselling/>

* Student Health Services is located on campus and is available to provide medical attention.
<https://www.uoguelph.ca/studenthealthservices/clinic>

* For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

* Student Accessibility Services (SAS) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the

centre please see: <https://www.uoguelph.ca/accessibility>

4 Learning Outcomes

Course Goals

This course serves as the foundation of the Microbiology program. It is designed to capture your interest by introducing you to the relevance of Microbiology in everyday life, discussing the global impact of microbes, and by providing an opportunity for hands-on experience with microbes in a laboratory setting. The course learning outcomes and the specific conceptual details associated with those outcomes (in bullet point) are listed below. Specific LOs and concepts will be identified at the beginning of each lecture and collectively will be assessed through the various graded components of the course. The list may be updated periodically during the semester, through deletion or addition, depending upon the pace and depth of coverage of a given topic. Course readings, class discussions and group work will also further develop the broader MCB Program Learning Outcomes (MCB Learning Outcomes) and the University of Guelph learning outcomes (UofG Learning Outcomes).

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. By the end of the course, successful students will
 - Appreciate the roles of cells as the fundamental unit of life and the essential roles of the microbes in the biosphere, biotechnology, the food industry and health and disease
2.
 - Demonstrate an understanding of how cells, organelles and all major metabolic pathways evolved from early prokaryotic cells, the differences between the cellular microbes and the viruses and how the evolutionary history and relatedness of cellular life is depicted in the Universal tree of Life
3.
 - Demonstrate an understanding that the properties and metabolic diversity among eukaryotes, prokaryotes and viruses are a function of the chemical structures of their constituent macromolecules and how their evolutionary history relates to the greater metabolic diversity of the prokaryotes compared to the eukaryotes
4.
 - Demonstrate an understanding of the interactions of microbes with their

environment, and specifically the macromolecular interactions that underlie cellular motility, biofilm formation, quorum sensing, antimicrobial therapy, immune recognition and response, and pathogenesis

5. • Demonstrate an understanding that mutations, recombination and horizontal gene transfer have selected for a huge diversity of microorganisms and the various factors that affect the frequency of genotypes and phenotypes in a population over time
6. SCIENTIFIC METHOD By the end of the course, successful students will:
 - Describe or assess the appropriate method of visualization and identification of example microbes
 - Perform experiments using appropriate safety precautions, and microbiological techniques for the isolation, identification and enumeration of representative groups of bacteria, archaea and fungi
 - Use appropriate and accurate mathematical calculations for microbial enumeration
 - Successfully interpret and communicate scientific data

5 Teaching and Learning Activities

These **lectures** are approximate dates and are subject to minor alteration.

Lecture 1 is the Friday immediately prior to “week 1” for the labs.

5.1 Lecture

Topics:		Lecture	
<u>Lecture #</u>	<u>Date</u>	<u>Topic</u>	<u>Textbook chapters & sections</u>
1-2	May 10,13	Introduction. Relevance of Microbes in society, health, industry, tree of life	Ch. 1

3	May 15	Microscopy	Ch. 2
4-6	May 17, 22, 24	Specific characteristics of bacteria, archaea. Comparison to eukaryotic microbes.	Ch. 3, 4 & 5
6-7	May 24-27	Viruses, bacteriophages. Size/structure, unique properties, how they grow	Ch. 6
7	May 27	Case study #1 group quiz during last 50 minutes of class	Assigned reading
Midterm (8)	May 29	Midterm first 50 min. of class; includes individual & group components	
		Followed by introduction to microbial ecology and applied microbiology	Ch. 4 & 10
9-11	May 31, June 3 & 5	Applied microbiology: bioremediation, biocontrol, vaccines, antibiotics & antibiotic resistance	Ch. 10, Ch. 15, Sec. 19.5
12-13	June 7-10	Microbial Associations – biofilms, quorum sensing, symbioses, human microflora	Sec. 4.1, 4.2/12.7, 10.2
14-17	June 12 - 19	Microbes in health and disease - innate vs. acquired immunity, Koch's postulates, characteristics of a pathogen, select infectious diseases –	Select Sections & subsections from Ch. 16-27

		diagnosis, treatment, control, resistance	
17	June 19	Case study #2 group quiz during last 50 min. of class	Assigned textbook readings
18	June 20	Victoria Day rescheduled class –	
		Completion of infectious diseases	
Final	June 28		Final Exam (Cumulative)

5.2 Lab

Topics: Labs

<u>Week</u>	<u>Lab Topic</u>	<u>Readings</u>
1	Rules & regulations, biosafety; aseptic techniques, streak plate isolation, brightfield microscopy, yeast cellular morphology, Gram's stain	Week 1
2	Culturing microorganisms, preparation of tryptic soy agar (TSA), direct isolation with selective and differential media, enrichment and isolation of Halobacterium, efficacy testing of hand washing & alcohol-based gel disinfection of hands	Week 2
3	Pour plate count, enrichment and isolation of bacteriophage from soil	Week 3
4	Bioluminescence of <i>Vibrio fischeri</i> , bacterial swimming and swarming motility, complete Halobacterium isolation	Week 4

- 5 Complete all observations and laboratory data sheets

5.3 Method of Presentation

This course is designed to capture students' attention and interest; as such classroom teaching will be interactive wherever possible, and centered on microbiology as it pertains to everyday life, current affairs and news items. The lab component consists of 3-hour labs and will provide hands-on experience and demonstrations, as well as time and TA guidance at the end, to write up and submit that week's lab report. Classes will include Powerpoint slides, and to facilitate more active learning, REEF polling questions (a cloud-based "clicker" system). There will be two case studies that students will work on in groups outside of class, and group quizzes on the material during class. The midterm and final will also have a collaborative component.

5.4 Important Dates

Thurs. May 9 - Pre-lab quiz 1 opens @ 8:30

Fri. May 10 - First class

Tues. May 14 - Pre-lab quiz #1 closes @ 2:30

Tues. May 14 / Wed. May 15 - First lab

Mon. May 20 - Victoria Day holiday – no classes

Mon. May 27 - in-class group quiz on case study #1

Wed. May 29 - In-class MIDTERM

Thurs. June 7 - drop deadline for 6-week summer courses

Wed. June 19 - in-class group quiz on case study #2

Thurs. June 20 - Class rescheduled from Mon. May 20

Fri. June 28 - Final exam (cumulative) - 11:30-1:30 THRN1307

See lab manual for report due dates & mark distribution

5.5 Independent assignment

Each student will “adopt” a microorganism from the following list of choices:

1. Pelagibacter ubique
2. Pyrococcus furiosus
3. Leptospira interrogans
4. Cryptosporidium parvum
5. Hantavirus

- You do not need to confirm your choice with the instructor.
- This assignment is designed to develop independent thinking skills and literature research skills, as well as provide you with the opportunity to pursue an aspect of microbiology that interests you and apply some of the major concepts learned in class, to your investigation of your chosen microbe. Detailed instructions will be provided at the beginning of the semester.
- Approx. **10% of the FINAL EXAM grade** will comprise questions pertaining to the adopted microorganism.
- **You cannot bring notes into the exam**, so must study your independent assignment along with the rest of the course material.

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)	Scheme B (%)
REEFPolling	5	5
PeerWise Bonus Marks	0	0
Midterm	25	0
Lab	20	20
Independent Assignment	0	0
Final Exam	45	70
Case study group quizzes (2)	5	5
Total	100	100

6.2 Assessment Details

REEFPolling (5%)

Learning Outcome: 1, 2, 3, 4, 5, 6

Each lecture will include polling questions which, depending upon the difficulty level, may be polled, discussed, then re-polled, prior to revealing answers. 1 mark per question answered, with an **estimated** semester total of 30 marks.

PeerWise Bonus Marks (0%)

Learning Outcome: 1, 2, 3, 4, 5, 6

Can be used to recover lost marks from REEFpolling, and will be added onto REEFPolling grade, which be allowed to exceed 100%. 1 mark per authored PEERWise question, 0.5 marks per PEERWise question answered, to a maximum of 8 marks.

Case study group quiz 1 (2.5%)

Date: Fri, May 24, THRN1307

Learning Outcome: 1, 2, 3, 4, 6

Case study is done in groups and involves online discussion and/or meetings outside of class time. Case study quiz will be done in those groups, in class, using IF-AT cards (<http://www.epsteineducation.com/home/>).

Midterm (25%)

Date: Wed, May 29, In class

Learning Outcome: 1, 2, 3, 4, 6

- 2-stage structure consisting of individual, followed by group test using IF-AT cards (<http://www.epsteineducation.com/home/>). On all material up to and including the previous class. Group grade will only be used if it is no lower than the individual grade.
- Because of the nature of the 2-stage exams, students registered with SAS are asked to contact the instructor ASAP, to discuss options.
- Students who miss the midterm will have the grade weight transferred to the final exam
- The midterm will not be handed back however there will be ample opportunity to view and discuss midterms.

Case study #2 quiz (2.5%)

Date: Wed, Jun 19, THRN1307

Learning Outcome: 1, 4, 5, 6

Case study is done in groups and involves online discussion and/or meetings outside of class time. Case-study quiz will be done in those groups, in class, using IF-AT cards (<http://www.epsteineducation.com/home/>).

Lab (20%)

Learning Outcome: 1, 4, 6

Lab data sheets for each of the 4 labs are written up and submitted at the end of the lab in

which that exercise is completed (usually the week after that exercise was begun).

- 5% pre-lab online quizzes: these open Thursdays @ 2:30 and class Tuesdays @ 2:30 (regardless of your lab section). On each upcoming lab
- 5% in-lab quizzes - on that day's lab
- 10% lab exercises - data sheets from the lab manual are written up at the end of each lab, as results and observations are obtained. **These are handed in before leaving the lab.**

Independent Assignment (0%)

Date: Final Exam

Learning Outcome: 1, 3, 4, 6

Tested on the final exam, worth approximately 10% of final exam grade. Instructions will be provided for independent research on a chosen microorganism (chosen from a list of ~5). Exam questions pertaining to this research will represent ~10% of the final exam grade. Students cannot bring notes into the exam, so they must study their independent assignment along with the rest of the course material.

Final Exam (45%)

Date: Fri, Jun 28, 11:30 AM - 1:30 PM, THRN1307

Learning Outcome: 1, 2, 3, 4, 5, 6

- Cumulative, includes questions on independent assignment - 2-stage structure consisting of individual, followed by group test using IF-AT cards (<http://www.epsteineducation.com/home/>).
- Group grade will only be used if it is no lower than the individual grade.
- Because of the nature of the 2-stage exams, students registered with SAS are asked to contact the instructor ASAP, to discuss options.

7 Course Statements

7.1 Instructor Policies

Grading

1. Midterm - Covering the first half of the course.

2. Assignments/reports - lab reports are due by 2:30 pm on the due date; the time for submission of other assignments will be announced. For ALL assignments/reports, deductions for late submissions will be 10% per day (the weekend will cost a 20% grade reduction), up to a 30% deduction. After 3 days, the submission will not be accepted.

3. Quizzes - Lab quizzes are written at the beginning of the lab periods; please contact the demonstrator if you have valid grounds for being unable to complete one or more of these – you may be able to write the quiz later, or simply drop that particular quiz from the lab quiz grade – however this requires documentation. Case study quizzes are written in class; please contact the instructor if you have valid grounds for academic consideration.

4. Collaborative tests (midterm & final exams) - the individual grade will contribute 100% of that grade item if higher than the collaborative component, which would otherwise be worth 15% of that exam's grade. Students who choose to write the individual component only will have that count as 100% of that grade item. Students registered with SAS may a) write early so that they can join the class for the collaborative portion, or b) write the individual and then the "group" part on their own (with the IF-AT cards) in order to get the immediate feedback. The 15% group grade would come from whichever of these 3 options is highest: the individual grade, the student's "group" grade or the class average of the group test.

E-mails

1. Student enquiries will not be answered on nights, weekends or holidays. In addition, e-mail enquiries for which the answer is easily available by checking the lab manual, course outline or other information on the courselink site may not be answered at all.

2. Student e-mails to the instructor should be respectful, beginning with the appropriate salutation (Dr. Keenleyside/Perreault, Professor Keenleyside/Perreault, or Professor) and ending with your name. Use the same conventions you would use if you were e-mailing a boss or providing a cover letter for a job or grad school/professional application.

Student responsibilities

1. Respectfulness: students are expected to treat lab partners, classmates, the instructor and teaching staff with respect at all times. In class, this means paying attention, not talking while the instructor or another student is talking, not sending or receiving text messages or phone calls once class has started.

2. Standard operating procedures for laboratory participation - you must have read the relevant laboratory exercise in advance of the lab, and completed the associated online lab quiz, prior to coming to the lab. A flow chart for what you will be doing in the lab is an excellent way to ensure you are well prepared to complete the exercises quickly, and efficiently. You must bring with you: closed-toed shoes, a lab coat, your lab manual, an elastic for long hair, and a notebook. If you wear contact lenses, you must also bring safety glasses.

3. Student conduct:

- i. Students are responsible to their lab partners and case study group members.

Lab partners are expected to work collaboratively, to communicate effectively with each other and the demonstrators, and to hand in independently written lab books. Students are expected to work independently and collaboratively, as well as respectfully, with their case study group members, in order to maximize the group's success on the case study quiz.

- ii. Technology in the classroom: you are welcome to bring your laptop to lectures, but only use it for activities related to this course and in a manner that will not disturb those around you. Turn your cell phone on silent, and do not text-message during class.

4. REEF polling: missed polls due to connectivity issues, late arrival or missed class are to be made up using PEERWise. Students with groups for academic consideration AND who miss MORE than 1 class should e-mail the instructor.

8 Department of Molecular and Cellular Biology Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for course registration are available in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

More information can be found on the SAS website
<https://www.uoguelph.ca/sas>

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
