

08/09/2016

**University of Guelph**  
**College of Biological Science**  
Department of Molecular and Cellular Biology (MCB)

**COURSE OUTLINE**

Introduction to Microbiology, MICR\*2420

Fall 2016

**Course description (3-2) [0.50]**

This course will introduce students to the diversity of microorganisms, including, bacteria, viruses and fungi, and its impact on everyday life. The interactions of these organisms with both 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.

Prerequisite(s): 4.00 credits including (1 of [BIOL\\*1040](#), [BIOL\\*1070](#), [BIOL\\*1080](#), [BIOL\\*1090](#), [CHEM\\*1040](#))

**Teaching Team**

1. Dr. Wendy J. Keenleyside, Course Instructor/Coordinator. Office SSC3506 (Summerlee Science Complex), [wkeenley@uoguelph.ca](mailto:wkeenley@uoguelph.ca)
2. Rohan van Twest, Lab Coordinator/Demonstrator. Office SSC4113, [rvantwes@uoguelph.ca](mailto:rvantwes@uoguelph.ca)
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7. Joseph Ciufo, GTA. [jciufo@uoguelph.ca](mailto:jciufo@uoguelph.ca)
8. Stephanie Gilbert, GTA. [sgilbe03@uoguelph.ca](mailto:sgilbe03@uoguelph.ca)

**Course Schedule**

1. Lectures M, W, F 9:30 - 10:20 am, ALEX200
2. Labs Mon., Tues., Wed. 2:30-4:20 pm, SSC4102

**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 (LOs; A-D) and the specific conceptual details associated with those outcomes (a, b etc.) 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](#)).

**A. ENERGY IN BIOLOGICAL SYSTEMS; METABOLIC PATHWAYS**

*By the end of the course, successful students will:*

- A1. Demonstrate an understanding that metabolic diversity exists among eukaryotes, prokaryotes and viruses

## B. STRUCTURE-FUNCTION RELATIONSHIPS IN BIOLOGICAL SYSTEMS

*By the end of the course, successful students will:*

- B1. Demonstrate an understanding of macromolecular interactions, structure and function
- B2. Demonstrate an understanding that the properties of cells are a function of the chemical structures of their constituent macromolecules
- B3. Demonstrate a deep understanding of the roles of cells as the fundamental unit of life
- B4. Demonstrate an understanding of how cells, organelles and all major metabolic pathways evolved from early prokaryotic cells
- B5. Demonstrate an understanding of communication within and between cells and their environment
- B6. Demonstrate an understanding of intracellular trafficking and cellular motility

## C. EVOLUTION AND THE FLOW OF GENETIC INFORMATION

*By the end of the course, successful students will:*

- C1. Demonstrate an understanding that mutations, recombination and horizontal gene transfer have selected for a huge diversity of organisms
- C2. Demonstrate an understanding that related organisms have a common ancestor
- C3. Demonstrate an understanding of the factors that affect the frequency of genotypes and phenotypes in a population over time

## D. SCIENTIFIC METHOD

*By the end of the course, successful students will:*

- D1. Describe or assess the appropriate method of visualization and identification of example microbes
- D2. Perform experiments using appropriate safety precautions, and microbiological techniques for the isolation, identification and enumeration of representative groups of bacteria, archaea and fungi
- D3. Use appropriate and accurate mathematical calculations for microbial enumeration
- D4. Successfully interpret and communicate scientific data

## Course Content

### a. Lectures –

Lecture # <sup>a</sup>	Lecture Topic	3 <sup>rd</sup> edition textbook chapters <sup>b</sup> [2 <sup>nd</sup> edition where different]
1-3 (Sept. 9, 12, 14) (1.5)	1. Introduction - relevance of microbes to health, industry and the environment; how microbes have shaped history; Tree of Life and the microbes 2. Microscopic visualization of the microbes	1, 2
4-8 (Sept. 16, 19, 21, 23) (2)	3. Specific characteristics of cellular microbes - distinguishing characteristics of bacteria, archaea, fungi and protists (size/structure,	3, 19, 20 <sup>c</sup> & appendix 2 [3, 6, 19, 20 <sup>c</sup> & appendix 2]

9-11 (Sept. 26, 28, 30) (2.5)	4. Viruses/bacteriophages: - size/structure, unique properties, how they grow; viruses as biocontrol agents	Ch. 6
12-16 (Oct. 3, 5, 7, 12, 14) (2.5)	5. Microbial ecology - microbes in different niches, factors that shape and define community structure; identifying the uncultivated	21, 4 (pp. 119-127), 14 <sup>c</sup> , 21 <sup>c</sup> & 22 <sup>c</sup> [5 <sup>c</sup> , 6 <sup>c</sup> , 19 <sup>c</sup> ]
17/*19-21 (Oct. 17, 21, 24, 26) (2) *L18: Midterm	6. Biotechnological applications of microbes – bioremediation, biocontrol, food/beverage industries, vaccines and antibiotics	16, 22, 27
22-25 (Oct. 28, 31, Nov. 2, 4) (2)	7. Microbial Associations – biofilms, quorum sensing, symbioses, human microflora	Sec. 4.6, Sec. 10.8, 21, 23
26-36 (Nov. 7-30)	8. Microbes in health and disease - innate vs. acquired immunity, Koch's postulates, characteristics of a pathogen, select infectious diseases – diagnosis, treatment, control, resistance	23, 24, 25, 26 <sup>c</sup> , 27 <sup>c</sup> , 28 <sup>c</sup>
37 (Fri. Dec 2)	Classes rescheduled from Thanksgiving holiday – completion of last topic & review	

<sup>a</sup> these are approximate dates and are subject to minor alteration. Lecture 1 is the Friday immediately prior to “week 1” for the labs.

<sup>b</sup> these are subject to minor change.

<sup>c</sup> select pages

#### b. Labs –

Week	Lab Topic	Readings
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 <i>Halobacterium</i> , 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 <i>Halobacterium</i> isolation	Week 4
5	Complete all observations and laboratory data sheets	

- c. 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 4 2-hour labs and will provide hands-on experience as well as demonstrations. Classes will include Powerpoint slides, skeleton versions of which will be posted prior to class, and to facilitate a more interactive class, REEF polling questions (a cloud-based "clicker" system) will be used. The midterm and final will also have a collaborative component. Lectures will be recorded and made available after class.

### **Course Resources**

*Textbook* – the required textbook for this course is "Microbiology - An evolving Science", 3rd edition by J L Slonczewski and JW Forster (WW Norton Inc, ISBN 0- 393-91929-5). This is available from the bookstore, in hard copy or as an E-book (6 months, 12 months or permanent access) or in the library on 2h reserve (<http://www.bookstore.uoguelph.ca/courselistbuilder.aspx> ).

*Laboratory manual* – this is required and may be purchased from SSC 2302), 4 days ONLY: Thurs. & Fri. Sept. 8<sup>th</sup> & 9<sup>th</sup>, and Mon. & Tues. Sept. 12<sup>th</sup> & 13<sup>th</sup>. Sale times are 9:30am-12pm and 1pm-3:30pm. The cost is \$10.00, cash only. After Sept. 13<sup>th</sup>, the price increases to \$15.00.

*Lecture videos* – lectures will be captured and made available for streaming via Courselink

*Courselink* – the course website will be used extensively and will include all relevant course materials, discussion boards, links for additional readings & a course calendar.

*Instructor's office hours* - times for group office hours tba. Individual meetings by appointment

*REEF Polling* – You will be required to purchase a subscription to REEF Polling R 3.1 (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. Last year the cost was \$9.99 USD per semester, however based on negotiated pricing at one of our neighbouring universities, I am hoping this will come down substantially. You will need to register online, using the link and instructions posted on the course website. The first 14 days are a free trial, after which you will be prompted to purchase a subscription. International students may experience problems with acceptance of their credit card; this can be resolved by purchasing a pre-loaded credit card.

*PeerWise* – this is a free online tool for authoring, answering, commenting on and rating student-authored multiple-choice questions. A site for MICR\*2420 F16 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 and criteria for high quality MCQs will be discussed in class. Dr. Keenleyside will provide some introductory/review questions to the MICR\*2420 repository, to help you get started and lecture 1 will include a brief discussion of Bloom's taxonomy and what makes good, higher level MCQs. *Any good quality, higher Bloom's level questions, 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.

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

*Instructor's office hours* – times for group office hours tba. Individual meetings by appointment

## Methods of Assessment

Assessment				
Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcomes Addressed <sup>a</sup>
REEFPolling <sup>b</sup>	10%	Each lecture period	Participation in polling <sup>b</sup>	All but D2 & D3
PEERWise bonus marks <sup>c</sup>	Bonus marks to supplement REEFPolling mark	Throughout semester until Dec. 2	Creation & answering of MCQs on seminar material	All but D2 & D3
Midterm <sup>d, g</sup>	25 or 0%	Oct. 19 -in class	Lectures 1-6/labs 1-2; screencast	A1; B1c-d; B2a, f; B3; B4; B6; C2; D1; D4
Lab	20%	Lab book or data sheets due at end of 5 <sup>th</sup> lab period	<b>5%</b> pre-lab online quizzes; <b>5%</b> in-lab quizzes; <b>10%</b> lab exercises	A1; B2c; B3a, c, d; D
Independent study assignment <sup>e</sup>	Tested on the final exam ~10% of exam grade	Dec. 15 (tested on final exam)	Independent research on chosen organism	A1; B1, 2, 3; D4
Final exam <sup>f, g</sup>	45 or 70%	Dec. 15 8:30-10:30am	Cumulative	All but D2 & D3

<sup>a</sup> These are subject to change depending on changes in lecture progress. Any changes will be reflected in an updated course outline on Courselink. Lower case letters refer to LO-associated concepts, and can be found in the posted file "MICR2420 Learning outcomes & concepts".

<sup>b</sup> **REEF Polling**: each lecture will include 2 or more clicker 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 80-90 marks.

<sup>c</sup> **PEERWise participation** - can be used to recover lost marks from REEFPolling, and will be added onto REEFPolling grade, which be allowed to exceed 100%. 2 marks per authored PEERWise question, 1 mark per PEERWise question answered, to a maximum of 16 marks.

<sup>d</sup> Students who miss the midterm will write a 70% (cumulative) final exam. For students who **DO** write the midterm, but perform better on the final, the midterm grade will be dropped and the grade weight transferred to the final exam. You are strongly

encouraged to write the midterm rather than gamble on performing well on the final exam.

<sup>e</sup> Investigation of a chosen microorganism (instructions will be provided), done independently throughout the semester and tested on the final exam. Exam questions 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.

<sup>f</sup> Cumulative, includes questions on independent assignment

<sup>g</sup> 2-stage midterm & final: consists 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. **The midterm will not be handed back** however there will be ample opportunity to view and discuss midterms. **Because of the nature of the 2-stage exams, students registered with SAS are asked to contact Dr. Keenleyside ASAP.**

### Important Dates

➤ these will also be identified in the Courselink calendar

	DATE	DESCRIPTION
1	Fri. Sept. 9	First class
2	Sept. 12 & 13	First lab <sup>a</sup>
3	Mon. Oct 10	Thanksgiving holiday – no classes
4	<b>Wed. Oct. 19</b>	<b>In-class MIDTERM</b>
5	Nov. 4	40 <sup>th</sup> class day – drop deadline
6	Fri. Dec. 2	Last day of classes – class rescheduled from Thanksgiving holiday
7	<b>Dec. 15, 8:30-10:30am</b>	<b>Cumulative final exam. Location tba</b>

<sup>a</sup> see lab manual for report due dates & mark distribution

## Course and University Policies

### a. UNIVERSITY POLICIES

#### 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 lab demonstrator in writing, with your name, id#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic consideration:

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

#### Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.csd.uoguelph.ca/csd/>

#### Academic Misconduct

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 discourages misconduct. 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.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

#### E-mail Communication

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

#### Drop Date

The last date to drop 6-week summer courses, without academic penalty, is the 20<sup>th</sup> class day. To

confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:

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

#### 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.

#### Recording of Materials

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

#### Resources

The Academic Calendars are 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>

### b. INSTRUCTOR POLICIES

#### Grading

1. **Midterm** - students who **MISS** the midterm write a 70% (cumulative) final exam. For students who **DO** write the midterm, but perform better on the final, the midterm grade will be dropped and the grade weight transferred to the final exam.
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 Rohan 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. See above for information on academic consideration.
4. **Collaborative tests** (midterm & final exams) - the individual grade will contribute 100% of that grade item if higher than the collaborative component. Students who choose to write the individual component only will similarly 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, b) write a 100% individual test, or c) get the class average of the group test as their group component.

#### E-mails

1. Student enquiries will not be answered on nights, weekends or holidays. In addition, because of the sheer volume of e-mails your instructor receives, e-mail enquiries for which the answer is easily available by checking the lab manual, course outline or other information on the courselink site **will not be answered**.

#### 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. **Laboratory attendance:** participation and completion of laboratory components is mandatory. If you cannot attend a laboratory session, and have valid grounds, please e-mail Rohan to provide your documentation and enquire about making up the missed activities.
3. **Laboratory preparedness:** 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.
4. **REEF polling:** students are expected to resolve any connectivity issues with their device immediately and inform the instructor when such issues arise. These issues are generally the result of the wireless function of the device, however sometimes disconnecting and reconnecting your devices wifi will allow you to access the first available router, so will allow you to reconnect more quickly. If you cannot attend a seminar and have valid grounds, please e-mail the instructor to provide your documentation. Academic accommodations for instances where a student cannot meet a course requirement, are discussed below.
5. **Lab partners & lab reports:** Students are responsible to their lab partners. They are expected to work collaboratively, to communicate effectively with each other and the demonstrators, and to hand in independently written lab books.

## 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:

- The Centre for Students with Disabilities (CSD) 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/csd/>