2017-09-11

University of Guelph

College of Biological Science

Department of Molecular and Cellular Biology (MCB

COURSE OUTLINE

Introduction to Microbiology, MICR*2420

Fall 2017

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. Ajila Chandran Matheyambath, Instructor, Office SSC3516 (Summerlee Science Complex), achandra@uoguelph.ca
2. Rohan van Twest, Lab Coordinator/Demonstrator. Office SSC4113, rvantwes@uoguelph.ca
3. Ashley Brott, GTA. abrott@uoguelph.ca
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8. Sandi Yen, GTA. syen@uoguelph.ca

Course Schedule

1. Lectures M, W, F 9:30 -10:20 am, Albert A. Thornbrough Building, Room 1200
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 #[a]	Lecture Topic	4th edition textbook chapters[b] [3nd edition were different]
1-3 (Sept. 8, 11, 13) (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
4-7 (Sept. 15, 18, 20, 22) (2)	3. Specific characteristics of cellular microbes -	3, 19, 20 & appendix 2 [3,6, 14, 18, 20]

	distinguishing characteristics of bacteria, archaea, fungi and protists (size/structure,	
8-10 (Sept. 25, 27, 29) (2.5)	4. Viruses/bacteriophages: - size/structure, unique properties, how they grow; viruses as biocontrol agents	Ch. 6
11-15 (Oct. 2, 4, 6, 11, 13) (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[c], 21[c] & 22[c] [5 [c], 6 [c], 19 [c]]
16, 17/*19, (Oct. 16, 18, 20, 23) (2) *L18: Midterm	6. Biotechnological applications of microbes – bioremediation, biocontrol, food/beverage industries, vaccines and antibiotics	16, 22, 27
20-23 (Oct. 25, 27, 30, Nov.1) (2)	7. Microbial Associations – biofilms, quorum sensing, symbioses, human microflora	Section 4.5; 10.5; 21, 23
24-35 (Nov.3-30)	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[c], 27[c], 28[c]
36 (Fri. Dec 1)	Classes rescheduled from Thanksgiving holiday – completion of last topic & review	

[a] these are approximate dates and are subject to minor alteration. Lecture 1 is the Friday immediately prior to "week 1" for the labs.

[b] these are subject to minor change.

[c] 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 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 *Vibrio fisheri*, bacterial swimming and swarming motility, complete Halobacterium isolation	Week 4
5	Complete all observations and laboratory data sheets	Week 5

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. 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", 4th 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. 7 & 8th, and Mon. & Tues. Sept. 11th & 12th. Sale times are 9:30am-12pm and 1pm-3:30pm. The cost is $10.00, cash only. After Sept. 12th, the price increases to $15.00.

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

Course link – 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.

Methods of Assessment

Assessment				
Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcomes Addressed[a]
Midterm [d, g]	25 or 0%	Oct. 18 -in class	Lectures 1-8, screencast	A1; B1c-d; B2a, f; B3; B4; B6; C2; D1; D4
Lab	20%	Lab book or data sheets due at end of 5th lab period	**5%** pre-lab online quizzes; **5%** in-lab quizzes; **10%** lab exercises	A1; B2c; B3a, c, d; D
Independent study assignment[e]	Tested on the final exam ~10% of exam grade	Dec. 8 (tested on final exam)	Independent research on chosen organism	A1; B1, 2, 3; D4
Final exam [f, g]	45 or 70%	Dec. 8- 11:30am-1:30pm	Cumulative	All but D2 & D3

[a] 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".

[d] 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.

[e] 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.

f Cumulative, includes questions on independent assignment

Important Dates

- these will also be identified in the Courselink calendar

	DATE	DESCRIPTION
1	Fri. Sept. 8	First class
2	Sept. 11 & 12, 13	First lab[a]
3	Mon. Oct 9	Thanksgiving holiday – no classes
4	**Wed. Oct. 18**	**In-class MIDTERM**
5	Nov. 3	40th class day – drop deadline
6	Fri. Dec. 1	Last day of classes – class rescheduled from Thanksgiving holiday
7	**Dec. 8, 11:30am-1:30pm**	**Cumulative final exam. Location tba**

[a]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 email 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 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 20th 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. **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/