MICR*3420 Microbial Diversity

Fall 2018
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - August 24, 2018

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1 Course Details

1.1 Calendar Description

The cycling of elements (carbon, nitrogen, sulphur) within ecosystems involves the contributions of diverse microorganisms. This course will study the diversity of Bacteria and Archaea in selected ecosystems at an organismal level, investigate the metabolic and enzymatic diversity in microbes that contribute to and thrive within these environments, and examine the methodologies used to study the relationships and evolution of microorganisms within an ecosystem.

Pre-Requisite(s): BIOC*3560, MBG*2040, MICR*2430

1.2 Timetable

2hrs 50 minutes per week Mondays 2.30-5.20 pm MAC149

(This is an interactive classroom to allow for maximum benefits from class activities)

1.3 Final Exam

Wednesday December 12th from 11.30am - 1.30pm, room tba

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2 Instructional Support

2.1 Instructional Support Team

Course Co-ordinator: Emma Allen-Vercoe
Email: eav@uoguelph.ca
Telephone: +1-519-824-4120 x53366
Office: SSC 3252
Dr. A-V can be contacted by email to arrange a mutually convenient meeting time if it is required.

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3 Learning Resources

3.1 Required Resource(s)

Microbiology: an Evolving Science (Textbook)

Slonczewski and Foster Microbiology: an evolving science, 4th edition. Norton publishers. If you have access to a copy of the 3rd edition, it will serve you quite well…. But remember that no text is of any use if you don't read it!

Courselink (Website)

https://courselink.uoguelph.ca
Additional materials will be posted on the D2L site for the class.

You are expected to check it at least weekly for updates and information.

3.2 Recommended Resource(s)

Prokaryotic Names (Other)

http://www.bacterio.net
List of Prokaryotic Names with Standing in Nomenclature: A regularly updated list of all bacterial names that have standing in nomenclature.

Warning: Content is Biological Material and as such is subject to mutation, evolution and CHANGE

The Prokaryotes (Other)

The Prokaryotes: This is an electronic library resource, accessible through the University of Guelph Library (QR 72.5 or use the title "Prokaryotes" for a Trellis search).

It is the equivalent of seven volumes of general information about bacteria and their taxonomic groups.

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Bergey's Manual of Systematic Bacteriology (Textbook)

Bergey's Manual of Systematic Bacteriology, 2nd edition.
Again, use the title of this book for a Library search that will take you to this as an electronic book, or shelf copies of some volumes. Just to be clear – this "manual" is in 5 volumes, which were printed as 8 large books of hard copy!

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4 Learning Outcomes

Learning goals and rationale: To develop a detailed understanding of the relationships and evolution of microorganisms, the intricacies of a microbial community, the concept of a species, and the classification and naming of microorganisms. The course is intended to build on concepts introduced in the 2000-level microbiology courses.

4.1 Course Learning Outcomes

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

1. Develop an understanding of communities of microorganisms, including the roles of microbes within an ecosystem, the structure of microbial communities, and the impact of environment on the community (and vice versa).
2. Investigate the participation of diverse microorganisms in maintaining elemental cycles.
3. Develop an understanding of physiological and molecular diversity within a community of microbes.
4. Understand and evaluate methods and approaches used to study **relationships and evolution (phylogeny) of microbes**, particularly *Bacteria* and *Archaea*, and develop an understanding of the current classification of microbe groups.
5. Explore taxonomic strategies and approaches used to name microorganisms, and the criteria used to define bacterial species and infrasubspecific divisions within species
6. Understand the principles and methods behind studying and identifying cultured and uncultured microorganisms.
7. Developing and improving reading and writing skills. Understanding where facts in textbooks come from. You will be looking at some primary research papers and specialist review articles, and considering the methods that are applied to answer research questions. You will also consider how to find information on microbiology topics - and assess it, and you will practice writing and referencing the information.

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5 Teaching and Learning Activities

5.1 Lecture Schedule

Date	Topics to be covered	Notes	Relevant reading/background preparation
Monday September 10th	First day of class – my 'rules' and expectations of you. A tutorial on how to approach reading the literature, and on preparing to write an assignment. Recap of what you should already know about microbial diversity.	In class activities: · Masters of grammar quiz (for fun) · Deconstructing the primary literature	Handouts will be provided
Monday September 17th	Bacterial systematics: definitions and debates. How are new microbial species named? How many microbial species are there?	In class activities: ·	Handouts; Chapter 17.3-17.5

	What is a microbial species, anyway? And why are we only now in the golden age of microbial discovery?	Requirements for naming a novel species · Building a phylogenetic tree Please bring your laptop/tablet (with Internet connectivity) for this class, or ensure you can share one with a partner In class activity: · Understanding diversity and sampling methods	
Monday September 24th	Discovering diversity – how do we measure microbial diversity? What tools can we use? How fast can microbes evolve?		Handouts will be provided.
Monday October 1st	Microbial metabolic diversity: types of microbial metabolism and metabolic diversity: autotrophy, heterotrophy, chemolithotrophy, phototrophy, syntrophy etc. In detail: phototrophy	In class activity: · A brief history of (Earth) time	Chapter 13.1-13.3, as well as parts of 13.4; Chapter 14.1-6
Monday October 8th	Thanksgiving Holiday – no classes	-	-
Monday October 15th	Microbial metabolic diversity continued. In detail: fermentation	In class activity: · Fermented food feast	Chapter 13.5; Chapter 14.1-6 continued; Chapter 16.2-16.4
Monday October 22nd	Midterm examination 1	Multiple choice exam, 90 mins, 2.30-4pm	n/a

		during class time, in classroom. In class activity: · The human microbiome and a tour of the Robogut lab Note: Friday Nov 2nd is the 40th class day	
Monday October 29th	Meet the microbes part 1: The Cyanobacteria, Firmicutes and Actinobacteria		Chapter 18.1-3
Monday November 5th	Meet the microbes part 2: The Proteobacteria, deep branching Gram negative phyla; Spirochetes; Oddballs (Chlamydiae, Planctomycetes and Verrucomicrobia).	In class activity: Metabolic networks	Chapter 18.4-7
Monday November 12th	In-class Library Workshop for first half of class with Madeline Donnely, Learning and Curriculum support librarian. Bring your questions on finding, using and citing literature sources, as well as other services offered by the library Meet the microbes part 3: The Archaea.	Course assignment will be handed out during this class.	Chapter 19
Monday November 19th	Meet the microbes part 3: The Archaea. (Continued)	In class activity: · ‘Name that Microbe’ game	Chapter 19
Monday November 26th	Microbial metabolic diversity within elemental cycling. Emphasis on the nitrogen cycle: overview, reactions, enzymes, microbes. Human influences on elemental cycling.	In-class activity: · ‘Fixing’ the nitrogen cycle	Chapter 22
Friday November	Review and catch-up class	Assignment due date	

30th	(If no class is needed, Dr. A-V will provide office hours during this time slot)	(assignment to drop-box by 5pm)

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6 Assessments

6.1 Assessments

There is 1 midterm examination, 1 final examination and 1 assignment associated with this course, as well as an in-class IFAT card question each week. The breakdown of dates and grades for the course is as follows:

Assessment tool	**% of final grade**	**Notes**
Midterm	25%	During class, Monday October 22nd
Assignment	25%	Will be provided in class on Nov 12th; due to Dropbox Friday November 30th, 5pm
IFAT card	10%	Each class
Final exam	40%	Weds 12th December, 11.30am -1.30pm, room tba

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7 Course Statements

7.1 When You Cannot Meet a Course Requirement

Please advise Dr. Allen-Vercoe promptly by e-mail if you encounter difficulties meeting any of the above deadlines and have just cause for accommodation to be made.

The final assignment will be accepted for grading up to 5 calendar days after the deadline, with a 20% paper grade penalty applied per day of lateness.

If you miss one of the midterms, there are no make-up exams. Similarly, if you miss the in-class IFAT questions, there are no make-ups. With adequate reason provided for your absence, Dr. A-V will re-weight accordingly.

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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.
- 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: Chemistry & Physics Help and 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.
- Student Health Services is located on campus and is available to provide medical attention.
- 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.

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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 regulations and procedures for Academic Consideration are detailed in the Undergraduate Calendar.

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 Dropping Courses are available in the Undergraduate Calendar.

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: www.uoguelph.ca/sas

9.6 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.

9.7 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.

9.8 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.