



MICR*4280 Microbial Ecology

Winter 2018

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 2.00 - January 03, 2018

1 Course Details

1.1 Calendar Description

This course is a study of natural microbial communities: their structure, function and the factors that impact them. The topics include standard and new techniques that are being developed for analyzing microbial communities, current research on microbial ecology of the ocean, the terrestrial and the human ecosystems, Gaia theory, astrobiology and the role of microbes in the evolution of life on Earth. This course covers the metagenomic approach and how it impacts the current view of the diversity of uncultured microbes in the biosphere, and the biochemical basis for extremophile survival and the application of this knowledge on protein structure-function relationships and biotechnology.

Pre-Requisite(s): MBG*2040, MICR*2430. (MBG*3350 is strongly recommended.)

1.2 Timetable

Lectures: M/W/F 10:30-11:20 AM; MCKN231

- Jan. 17 lecture tentatively scheduled in CBS computer lab

1.3 Final Exam

Wed. Apr. 18, 2:30-4:30, location TBA. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructor(s)

Dr. Wendy J Keenleyside

Email: wkeenley@uoguelph.ca

Telephone: 519-824-4120 x53813

Office: SC1 3506

Office Hours: Individual by appointment.

Online using open chat on Courselink, prior to the 2 quizzes and final exam

2.2 Teaching Assistant(s)

Teaching Assistant: Mitchele Demelo
Email: mdemelo@uoguelph.ca
Office Hours: By appointment

- Mitch is a marking TA and a resource person for the bioremediation project
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3 Learning Resources

There is no textbook for this course; *readings* come from the primary and secondary literature. Links for these readings, either to the abstract, or to the open access article, will be posted on Courselink.

3.1 Required Resources(s)

Courselink (Website)

<https://courselink.uoguelph.ca/d2l/home/503489>

The course *website* is available through Courselink. Other resources on the website: lecture slides; links related to the bioremediation project and description of the project, including due dates; course outline; class discussion board; midterm answers

4 Learning Outcomes

The learning outcomes for this course are those concepts and abilities that will be assessed through the various graded components of the course. Course readings, class discussions and term project will also further develop the broader MCB Program Learning Outcomes (<https://www.uoguelph.ca/mcb/undergraduate/program-learning-outcomes>) and the University of Guelph learning outcomes (<https://www.uoguelph.ca/vpacademic/avpa/outcomes/>).

4.1 Course Learning Outcomes

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

1. Understand how and why the microbes represent the biological infrastructure of the planet, and how they relate to the current Anthropocene era.
2. Understand the modern techniques and theories for characterizing microbial community structure, function and diversity, including those related to certain extremophilic environments.
3. Understand the role of the microbes in the evolution of life on Earth and how this relates to the field of astrobiology, our current view of the Universal Tree of Life, and the “species concept” as it relates to the bacteria and archaea
4. Demonstrate an understanding of, and be able to describe recent advances in, the fields of the human gut microbiome, and marine microbial ecology.
5. Reflect upon, develop and articulate, personal values and ethics related to the environment and microbial ecology.
6. Be able to critically analyse the primary literature, design, justify and communicate through

oral and written proposals, a novel and scientifically valid bioremediation project for a known ecological problem.

7. Demonstrate a good work ethic by setting goals, meeting deadlines and working cooperatively and responsibly with project team members.
 8. Through open and regular communication between project group members, learn to become an effective research team, and come to understand the difference between group work and teamwork, and the skills inherent in developing an effective team.
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5 Teaching and Learning Activities

- Lectures: The course material will largely be presented using an interactive lecture format with PowerPoint slides (uploaded prior to class). Assigned readings will be from the primary and secondary literature and will complement what is taught in class. For the more complex readings, questions will be provided along with the paper, to guide and focus your reading.
- Work outside of class: in some instances, 1 or more readings and relevant questions will be assigned and read in advance of lecture, and class time will be used for discussion/debate on the impact of the findings and the moral or ethical issues related to those studies.
- Team work: the bioremediation project will run the duration of the semester and will, with one exception, be worked on outside of class time. To facilitate electronic communication among team members, each team will have a dedicated discussion board and locker.

5.1 Lectures

Week	Lecture Topics	Readings
1	The evolution of microbial ecology and microbial community ecology	<ol style="list-style-type: none"> 1. Madsen, 2011. 2. Heidelberg et al., 2010 3. Goldenfeld and Woese. 2007 4. Konopka, 2009 5. Gilbert, J.A. & Neufeld, J.D. 2014.
2	Gaia theory and the Daisyworld model	<ol style="list-style-type: none"> 6. Lovelock, 2003 7. Wood and Coe, 2007
3-5	Technologies and strategies used in the study of microbial communities and microbial diversity	<ol style="list-style-type: none"> 8. Epstein, S.S. 2013. 9. Pedrós-Alió, 2006

		<p>10. Fromin, N. et al. 2002</p> <p>11. Uhlík <i>et al.</i>, 2012</p>
5-8	<p>Microbial ecology and evolution: theories for the origin of life, mapping the tree of life, astrobiology and the extremophiles</p>	<p>12. Atlas and Barta, 1998^c</p> <p>13. Woese, C.R. 2004</p> <p>14. Harold, 2012</p> <p>15. Pace, 2009</p> <p>16. Morris, 2010</p> <p>17. Rothschild and Mancinelli, 2001</p> <p>18. Bae and Phillips, 2006</p>
8-11	<p>Ecology of microbial communities</p> <ul style="list-style-type: none"> • <i>Marine</i> • <i>Human gut in health and disease</i> 	<p>19. Madsen, 2011</p> <p>20. Heidelberg et al., 2010</p> <p>21. Goldenfeld and Woese, 2007</p> <p>22. Pedrós-Alió, 2006</p> <p>23. Delong, E.F. 2007</p> <p>24. Nealson, K.H. and Venter, J.C. 2007</p> <p>25. Kimura et al., 2011</p> <p>26. Lynch & Neufeld, 2015.</p>
12	<p>Microbial ecology & the anthropocene era: Gaia revisited</p>	<p>27. Lovelock, 2003</p> <p>28. Goldenfeld and Woese, 2007</p> <p>29. Lovelock, 2008</p>

- These are approximate dates and are subject to minor alteration
- There will be 4 guest lecturers: Drs. Laura Hug and Josh Neufeld from the Dept. Biol., U. of Waterloo, and, from UofG, senior Ph.D. students Kaitlyn Oliphant and Sandi Yen in the Dr. Allen-Vercoe laboratory. Dates are TBA
- These are subject to minor change

- Chapter 2 – textbook is on 2h reserve in library

5.2 Important Dates

- Mon Jan 15: Deadline for selecting project group members (groups of 4)
 - Dr. Keenleyside will help in assembling groups upon request, on a first come-first served basis
 - Wed Jan 17: Initial project team meeting - class mtg in CBS computer lab
 - Mon Jan 22: Signed team charters due @ beginning of class
 - Fri Feb 9: Quiz 1, in class, 1st 25 mins, lecture follows
 - Fri Feb 16: Extended abstract (pdf) & 1st team effectiveness feedback summary due to respective dropboxes
 - Feb 19-23: Break week - no classes
 - Fri Mar 9: 40th class day (last day to drop one semester classes)
 - 2nd team effectiveness feedback summary due to dropbox
 - Fri Mar 16: Quiz 2, in class, 1st 25 mins, lecture follows
 - Mon Mar 26, Wed Mar 28, Mon Apr 2, Wed Apr 4: Project oral presentations
 - Plus peer eval of seminars
 - In class
 - Fri Apr 6: Last class day
 - Written research proposal due to dropbox
 - Group distribution of effort due to PEARTool
 - Wed. Apr. 18: Final Exam - cumulative
 - 2:30-4:30PM
 - Location TBA
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6 Assessments

6.1 Assessment Details

Bioremediation Project Team Charter (0.50%)

Due: Mon Jan 22 @ beginning of class
In class

- Group project
- Teams will discuss and create a team charter (template on Courselink)
- 1 hard copy, signed by all team members, will be handed in at the beginning of class
- All or none grading for meeting the deadline and evidence of good faith effort.

Quiz 1 (15.00%)

Date: Fri, Feb 9, In class

- Course Content: Lectures and assigned readings weeks 1-5
- 25 mins - no alternate dates

Bioremediation Project Extended Abstract for Bioremediation Project (4.50%)

Date: Fri, Feb 16, Dropbox

- Group project
- A detailed description and rubrics for this assignment will be provided separately

Bioremediation Project Team Effectiveness Feedback (1.50%)

Date: 1. Fri Feb 16, 2. Mon Mar 12 Dropbox

- Group project
- Teams will discuss their individual conclusions on the team's effectiveness, provide a summary ("Team Effectiveness Feedback" template on Courselink) and a resolution on how to further improve function.
- All or none grading for meeting the deadline and evidence of good faith effort.

Quiz 2 (15.00%)

Date: Fri, Mar 16, In class

- Course content: Lectures and assigned readings weeks 5-9
- 25 mins - no alternate dates

Bioremediation Project Oral Presentation (12.00%)

Date: Mon Mar 26, Wed Mar 28, Mon Apr 2, Wed Apr 4 In class

- Group project
- 12 min., strictly timed, with 3 min for questions
- Rubric provided in posted "Bioremediation project description"

Peer Review of Oral Presentations (2.50%)

Date: Mon Mar 26, Wed Mar 28, Mon Apr 2, Wed Apr 4 In class

- Group project
- Participation & peer feedback

Bioremediation Project Final Written Proposal (14.00%)

Date: Fri, Apr 6, 4:30 PM, Dropbox

- Group project
- Rubric provided in posted "Bioremediation project description"

Assessment of Team Distribution of Effort (0.00%)

Date: Fri, Apr 6, 4:30 PM - Sat, Apr 7, 4:30 PM, PearTool

- Ungraded
- Group project
- Each team member will assess the distribution of effort amongst team members and the average score for each student will be used to assess individual grades based on the team grade
- Individual grades may increase to 150% or decrease to 50% of the team grade, based on these average scores

Final Exam (35.00%)

Date: Wed, Apr 18, 2:30 PM - , 4:30 PM, TBA

- Cumulative
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7 Course Statements

7.1 Grading

- Quizzes - there will be no alternative dates for the two quizzes. Students who miss either or both, when accompanied by appropriate documentation, will have the grade weight transferred to the final exam.
- For written components of the bioremediation project, PDF submissions are due to the appropriate dropbox, by 11:59pm. Failure to meet the deadline will result in penalties of 10% per day.
- Failure to adhere to the terms of the group contract will be determined by confidential PEAR evaluation of the group's distribution of effort. Dr. Keenleyside will identify and remove any outliers, then use the resulting average score to mark individuals up or down, relative to the group marks. While these grades may theoretically increase or decrease by 50%, significant problems within a team should have been identified and resolved through the Team Effectiveness Feedback Summary activities and, if necessary (and as a last resort), mediation by Dr. Keenleyside
- In extreme circumstances, accompanied by failed mediation, an individual may be removed from a group; that student will be required to work on an independent bioremediation project.

7.2 Student Responsibilities

- Class preparedness: readings will be assigned in advance of most classes. For most of these, accompanying reading guides will also be provided. Students will be expected to have done these readings by the relevant class, and be prepared to answer the associated questions.
- Working in teams: Project teams of 3-4 will negotiate and sign the terms of a team charter and twice through the semester will individually fill out, then discuss as a group, their "Team Effectiveness Feedback" assessments. The team as a whole will use the individual results of the individual evaluations and their discussions to identify and report agreed-upon steps for improving performance. Finally, each individual will provide, through the UofG PEARTool, distribution of effort evaluations of their team members. The average assessment of each team member will be used to assess individual grades based on the team mark. The individual grade may go UP or DOWN, relative to the group grade, within limits. As with work-place teams (which are generally the norm), the development of an effective team requires effort, communication and skill but results in a synergy that leads to performance, creativity and productivity that are superior to what a single member working alone can accomplish.

7.3 When You Cannot Meet a Course Requirement

Missed quizzes: with appropriate documentation, the grade weight will be transferred to the final exam

7.4 Technology in the Classroom

While in class, please do not use your laptop for anything other than activities related to this course. Turn your cell phones off, or put them on silent, and do not text-message during class.

7.5 Expectations of Professional Conduct Among Group Members

- You are expected to treat each other with courtesy, including through electronic communication.
 - Electronic communication within the group may be done via e-mail, the group's dedicated discussion board and locker, google docs and google hangouts.
 - Where there is concern about a group member's behaviour, and a group discussion has not resolved the issue, document your group's concerns via e-mail, copying Dr. Keenleyside. If the concern is not appropriately addressed, you are to schedule a group meeting with Dr. Keenleyside to resolve the problem.
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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.
<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/>
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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.

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