DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Biology
BIOL/MARI3101
Microbial Ecology Course title
Fall 2016

Instructor(s): Julie LaRoche Julie.laroche@dal.ca LSC 5047 *Tel:494-4249*

Lectures: 10:05-11:25 C 234

Course Description:
Lectures on the ecology of microbes and microbial communities, including archaea, bacteria, viruses and unicellular eukaryotic algae, and protists. Community structure, food web, nutrient cycling, biogeochemical cycles, competition, succession and symbiosis are discussed with examples from marine, fresh-water and soil habitats. There is an emphasis on marine organisms.

Course Prerequisites/Restrictions
Courses: BIOL 2004.03 (or MICI 2100.03), and BIOL 2060.03 (or BIOA 3001.03)
CROSS-LISTING: MARI 3101.03

Knowledge/skills:
Before enrolling in this class students should be able to:

- Recall the fundamental characteritics of eukaryotic and prokaryotic cells
- Recall the central dogma of molecular biology
- Know the basic principles of redox reactions
- Know the basic processes of photosynthesis and respiration
- Be familiar with using library resources to find scientific literature
- Be able to properly cite science articles in a consistent format
- Explain the importance of scientific integrity

Course Objectives/Learning Outcomes
Course objectives:
provide a framework to understand:
1) the interaction within and between microbial communities
2) the role of microbes in their natural environment including microbially-induced cycling of elements.
The course emphasizes the marine environment and the functional diversity of microbes.
The specific objectives of this course are to expose students to the following topics:

- Role of microbes in the evolution and ecology of the biosphere.
- Ecological principles that drive microbial community structure.
- Abiotic interactions within microbial communities
- Biotic interactions within microbial communities

DALHOUSIE UNIVERSITY

- Microbial genomics and other molecular tools for understanding microbial communities
- Microbial metabolism and biogeochemical cycling in the ocean

On completion of the course the students shall be able to:

- Understand the role of microbes in the environment, and explain this to a non-specialist
- Understand the major techniques that are used to study microbial ecology
- Interpret phylogenetic trees based on SSU rRNA and other functional genes
- Debate the major departure in the species concept as it relates to microorganisms versus metazoans
- Calculate bacterial growth rates
- Understand the difference between different method to culture microbes
- Describe and diagram the major elemental cycle for carbon, nitrogen and sulfur
- Utilize online microbial genome browsers to understand the metabolic potential of selected microbes
- Write concise summaries of assigned scientific literature
- Analyse, extract and present the novel findings from recent high-profile scientific articles on microbial ecology.

Course Materials

Recommended text: Madigan, M.T., J.M. Martinko, D. Stahl, and D.P. Clark. 2010.Brock: Biology of Microorganisms(14th or 13th eds.), Prentice Hall
BIOL/MARI 3101 course website: Connect through my.dal.ca on Brightspace
Scientific literature: Additional readings will be assigned for selected classes.

Course Assessment

Literature summary: A 250-word literature summary is required at the beginning of class on20September.In your own words, summarize one of the assigned scientific readings assigned on 9 September as listed on the class calendar. Turn in a hard copy of this document at the beginning of class on September 18 and be prepared to discuss the articles and your personal views. Late assignments will not be accepted. Summaries that are not within the word limit (+/-10% of 250 words will be marked down.

Mid-term Exam: There will be a mid-term exam and a final exam. Both exams will consist of multiple choice (60%) and short answer (40%). If you miss the mid-term exam due to a documented illness or other serious (documented) excuses there will be a chance to do a make-up exam towards the end of the semester that will cover the same material.

Short essay and presentation: Each student will select a recent research paper from a list of work published in an upper tier journal that I will provide (e.g. Science, Nature, PNAS, etc.). You can propose your own selection, as long as it meets some criteria (recent and upper tier journalrelevant to microbial ecology) AND it has to be approved by me. This assignment consists of two parts:

DALHOUSIE UNIVERSITY

1) A 750 to 1000-word essay (double-spaced, 12-pt Times New Roman) that provides a critical analysis of the research findings. Submit a hard copy of your paper to me in class on22Novemberand send an electronic version of the paper to julie.laroche@dal.ca on the same day. There will be a penalty for late submission of 10% per day. There will be a special handout for the specific directions on content and requirements for this essay, and it will also be discussed in class.

2) Oral presentation: Students will present the assigned paper and their analysis of it during the last 4 lectures of the course. The presentation should be 10 minutes long (no more than 10ppt slides) followed by a 2 minutes question period. I will time you so make sure you stay within your time slot. The powerpoint presentations should be printed and handed in to the instructor on the day of the presentation. I will be very strict with attendances for the classes between Nov 22-Dec 1, during student presentations. If you miss a class without an adequate medical or other serious excuse, I will deduct 2 points from your final class mark

Class participation: There will be unanounced quizzes and occasional problem sets to be worked up in groups during class time. These will be marked and counted in your final grade.

Other course information: Students are expected to check the course website and read their email regularly for updates on the course.

Lecture slides: An electronic copy (pdf version) of the class slides and notes will be made available on the course website a few hours before the class.

Attendance: will be documented but is not factored into the final grade. However, it is important to attend the class as there will be quizzes, problem sets and discussion that will be marked.

To make the class enjoyable and a valuable learning experience: turn off cell phones and refrain from sending emails, texting, and any other disruptive behavior. Come prepared to discuss the class material.

Overall grading percentages:		Due date
Literature summary	2.5 %	20 September
Mid-term exam	20 %	18 October
Research paper essay	20 %	22 November
Oral presentation	10 %	22, 24, 29 November and 1 December
Class quizzes/problems	7.5 %	Throughout (less than 1% each)
Final exam	40 %	Exam period (or last lecture)

Component	**Weight (% of final grade)**	**Date**
Literature summary	***2.5%***	***20 September***
Mid-term exam	***20%***	***18 October***
Research paper essay	***20%***	***22 November***
Oral presentation	***10%***	***22, 24, 29 November and 1 December***
Class quizzes/problems	***7.5%***	***throughout (less than 1% each)***
Final exam	***40%***	***Exam period***

DALHOUSIE UNIVERSITY

Other course requirements: none

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies

Other course information:

Students are expected to check the course website and read their email regularly for updates on the course.

Lecture slides: An electronic copy (pdf version) of the class slides and notes will be made available on the course website a few hours before the class.

Attendance: will be documented but is not factored into the final grade. However, it is important to attend the class as there will be quizzes, problem sets and discussion that will be marked.

To make the class enjoyable and a valuable learning experience: turn off cell phones and refrain from sending emails, texting, and any other disruptive behavior. Come prepared to discuss the class material.

Course Content

Class	Date	Activity	Background reading†
1	8 September	Introduction: Microbes are awesome!	1 & 2
2	13 September	Origin and evolutionary record of life assigned readings for the literature summary	12 Fraser et al. (2009) a Ward (2006) b, Barrick and Lenski 2013
3	15 September	Microbial diversity and evolution	13-17
4	20 September	* Species and speciation (Discussion) **LITERATURE SUMMARY DUE**	16
5	22 September	Microbial habitats	19
6	27 September	Microbe: microbe interactions	22
7	29 September	Microbe: plant/animal interactions	22
8	4 October	Population ecology and microbial community structure	5
9	6 October	Physiological ecology of microbes	5
10	11 October	Biogeochemical cycling	20
11	13 October	Microbes in the carbon cycle	20
12	18 October	**MID TERM EXAM**	
	20 October	Microbes in the nitrogen cycle and sulfur cycle **RESEARCH PAPER TOPIC DUE**	20

DALHOUSIE UNIVERSITY

13	25 October	Microbial ecology in the genomic era	6 Rinke et al. (2013)
14	27 October	Thermodynamics and microbial ecology	13
15	1 November	Quantitative ecology: numbers, biomass and metabolism	5
16	15 November	Microbes in extreme environments	16
17	17 November	Microbes and global climate change	19
18	22 November	**RESEARCH PAPER DUE** (in class) Student mini-symposium day 1	
	24 November	Student mini-symposium day 2	
19	29 November	Student mini-symposium day 3	
20	1 December	Student mini-symposium day 4	
21	6 December	Review Exam during exam period	

ACCOMMODATION POLICY FOR STUDENTS

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The full text of Dalhousie's Student Accommodation Policy can be accessed here: http://www.dal.ca/dept/university_secretariat/policies/academic/student-accommodation-policy-wef-sep--1--2014.html

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the **Advising and Access Services Centre (AASC)** prior to or at the outset of the regular academic year. More information and the ***Request for Accommodation*** form are available at www.dal.ca/access.

ACADEMIC INTEGRITY

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

The Academic Integrity website (http://academicintegrity.dal.ca) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie's ***Policy on Intellectual Honesty*** and ***Faculty Discipline Procedures*** is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

DALHOUSIE UNIVERSITY

STUDENT CODE OF CONDUCT

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. In general:

"The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and non – academic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University's premises;
- the property of the University or its members."

The full text of the code can be found here:
http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

DALHOUSIE UNIVERSITY

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties	**Killam Library Ground floor** Rm G28 ***Bissett Centre for Academic Success***	In person: Killam Library Rm G28 By appointment: - e-mail: advising@dal.ca - Phone: (902) 494-3077 - Book online through MyDal
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	**Killam Library Ground floor** Librarian offices	In person: Service Point (Ground floor) By appointment: Identify your subject librarian (URL below) and contact by email or phone to arrange a time: http://dal.beta.libguides.com/sb.php?subject_id=34328
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	**Killam Library 3rd floor** Coordinator Rm 3104 Study Coaches Rm 3103	To make an appointment: - Visit main office (Killam Library main floor, Rm G28) - Call (902) 494-3077 - email Coordinator at: sfs@dal.ca or - Simply drop in to see us during posted office hours **All information can be found on our website: www.dal.ca/sfs**
Writing Centre	Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster) - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field	**Killam Library Ground floor** Learning Commons & Rm G25	To make an appointment: - Visit the Centre (Rm G25) and book an appointment - Call (902) 494-1963 - email writingcentre@dal.ca - Book online through MyDal We are open six days a week **See our website: writingcentre.dal.ca**