BIO 697 Microbiome and Disease Ecology

Course syllabus

Instructor: Doug Woodhams, Ph.D.
Office hours: MW 11:15-12:15 or by appointment
Office: Integrated Sciences Complex 5760
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Meeting:

MoWe 10:00AM - 11:15AM	W03-0022

Text: None required. I will email articles to the class for discussion.

Course Description:

This course will be a workshop for understanding next-generation targeted gene sequencing from sample collection and preparation of an Illumina Mi-Seq run through data analysis. Both 16S rRNA and ITS or 18S genes will be the focus for analysis of microbial communities of hosts (microbiomes). We will explore next-generation microbiome sequencing studies to gain an understanding of **1) computational technologies** for open-source (public) microbiome dataset storage and analysis including Qiita, VAMPS, MG-RAST, MOTHUR, and focus on the QIIME pipeline for in-class data analyses, **2) host-microbe interactions** from a variety of systems. Students will begin with a literature search for microbiome studies on targeted taxa including: plants, corals, hydra, insects, and vertebrates. Downloaded data will be processed and combined to form a global dataset for meta-analysis. Rather than analysis of different datasets, students will work with the global dataset but have specific questions. Focal questions will be determined as a group, but include a comparison of immune system complexity with microbiome complexity across taxa. We will synthesize our emerging understanding of host-microbe symbioses with a meta-analysis leading to a team-produced manuscript ready for publication.

Previous questions in microbiome research have included: evolution of symbiosis, comparative germ-free and gnotobiotic studies, historical contingency and co-infection in symbiont establishment, host development and colonization resistance, host immunity vs environmental determinants of symbiotic communities, and comparative micro-habitat selection on host skin, gut, and other body sites.

Goals:

Students will learn how to collect and store samples, process samples in preparation for Illumina sequencing, and analyze data with the QIIME pipeline. Papers presented by students will focus on methodology. In addition to this workshop-style objective, a number of research questions can be answered by using public databases of sequences obtained from microbial communities of hosts. Students will develop questions and interrogate a

class-produced global microbiome dataset with the goal to produce, as a team output, a publishable manuscript. Data for the review is already available in open-source databases, and students will learn to access this public resource for future studies.

Grading:

Literature search and taxon-specific microbiome data download 10

Curating metadata 10

Mastering computational tools assignment 20

Leading methods literature discussion 20

Self-assessment of contribution to team meta-analysis 20

Participation including attendance 20

100 points total

Grading Scale:

Grade	Grade points	Percentage
A	4.0	94-100
A-	3.7	90-93
B+	3.3	87-89
B	3	83-86
B-	2.7	80-82
C+	2.3	77-79
C	2	73-76
C-	1.7	70-72
D+	1.3	67-69
D	1	63-66
D-	.7	60-62
F	0	Below 60

Accommodations for Students with Disabilities:
The University of Massachusetts Boston is committed to providing appropriate academic accommodations for all students with disabilities. If you have a disability and feel you will need accommodations in this course, please contact:
The Ross Center for Disability Services:
Campus Center, Upper Level, Room 211 (617-287-7430).
Website: http://www.umb.edu/academics/vpass/disability/

Course Policies:

- **Participation** – Participation includes completing all required assignments prior to class, thoughtfully participating in discussions, and taking responsibility for helping create a positive learning environment by arriving promptly, listening respectfully,

and participating constructively. In particular, students are expected to participate in discussions of readings, and in-class assignments.

- **Attendance** -- Students are expected to attend all classes. This class is heavy on discussion, and as such, students are expected to be respectful of each others' time and effort. Sick students are expected to bring a note from health services. Students who are otherwise prevented from coming to class are expected to bring a note from the relevant party (e.g., if your car is towed, the relevant ticket).
- **Late Work** – Late work is not accepted unless there is a documented emergency or illness.
- **Team Work** – Several team-based assignments are included in this course. Grades will incorporate individual effort, and team success. Time will be provided in class for some team exercises, but students may need to meet outside of class to coordinate some assignments.

Code of Conduct and Academic Integrity

It is the expressed policy of the University that every aspect of academic life, not only formal coursework situations, but all relationships and interactions connected to the educational process shall be conducted in an absolutely and uncompromisingly honest manner. The University presupposes that any submission of work for academic credit is the student's own and is in compliance with University policies, including its policies on appropriate citation and plagiarism. These policies are spelled out in the Code of Student Conduct. Students are required to adhere to the Code of Student Conduct, including requirements for academic honesty, as delineated in the University of Massachusetts Boston Graduate Catalogue and relevant program student handbook(s).

You are encouraged to visit and review the UMass website on *Correct Citation and Avoiding Plagiarism:* http://umb.libguides.com/citations

Penalties for academic misconduct in the course, including plagiarism and cheating, are strictly enforced, and the penalties are very serious. Penalties include an F in the assignment or exam, an F in the course, or suspension from the University. If you have questions about what constitutes plagiarism or other forms of academic misconduct, see Prof. Woodhams **before** completing an assignment or exam.

Student Code of Conduct:

- http://www.umb.edu/life_on_campus/policies/community/code

Ignorance of the rules does not excuse any academic conduct violation.