**Microbial Ecology 2016**

Earth 390-2, Winter Quarter, MWF 12:00 – 1:00 PM

**Course Objectives:**  This course will provide a framework for understanding the role of microbes in natural environments in terms of cell numbers, metabolisms, and interactions with geochemical cycles. We will delve deeply into the interactions between microbial populations, higher organisms, and even our own bodies. The course will finish on a survey of microbial composition and dynamics in key settings across the planet.

**Prof: Magdalena Osburn**

maggie@earth.northwestern.edu

Phone: (847) 491-4254

Office: Tech F291

Office Hours: Arranged upon request

Readings: There will be no official book, but mandatory readings will be posted prior to the lecture topic that they support. Readings will be required for the completion of the assignments and will be helpful for understanding of the lectures.

**Lecture Schedule: Required Reading (Supplemental Reading)**

**1/4/16** Course introduction, abundance Whitman 1998 (Brock Ch1, 2)

1/6/16 Defining ‘microbe’ and growth Cohan and Perry 2007 (Brock Ch 5)

1/8/16 Diversity: Archaea and Bacteria Pace 1999 (Brock Ch 4, 14, 16)

**1/11/16** Diversity: Eukaryota Baldauf 2008 (Brock Ch 17)

1/13/16 Viruses Suttle 2007 (Brock 8, 9)

1/15/16 Mechanisms of genetic change Thomas and Nielsen (Brock 10)

**1/18/15** No class MLK day

1/20/16 Methods 1: cultivation Rappe 2002 (Brock 18)

1/22/16 Methods 2: molecular Rinke 2013 (Brock 18)

**1/25/16** Metabolism 1: Basics NA (Brock 3.3 - 3.7)

1/27/16 Metabolism 2: Primary Production Falkowski (Brock 13.1-13.5, 14.2-14.3)

1/29/16 Metabolism 3: Chemoautotrophy Rocap 2003; Johnson 2006 (Brock 13.6-13.10, 14.9-14.19)

**2/1/16 Exam 1**

2/3/16 Metabolism 4: Heterotrophy Teeling et al. 2012 (Brock 3.8-3.13)

2/5/16 Metabolism 5: Anaerobic Processes Yergeau et al. 2010 (Brock 13.11 - 13.24)

**2/8/16** Interactions between microbes Hibbing et al (Barton and Northrup 6)

2/10/16 Microbial Comm.and Associations McGlynn et al. (NA)

2/12/16 No Class Donlan 2002 (Brock 22.1)

**2/15/16** Syntrophy w/ plants van der Heide 2012 (Brock 22.3 - 22.5)

2/17/16 Syntrophy w/ animals Nyholm and McFall-Ngai 2004 (Brock 22.6-22.14)

2/19/16 ME of aquatic environments Wright et al., 2012 (Brock 19.8-19.11)

**2/22/16** ME of deep marine environments Walsh et al., 2015 (Brock 19.12-19.13)

2/24/16 ME of Terr. environments: shallow Chu et al. 2010 (Brock 19.6)

2/26/16 ME of Terr. environments: deep Chivan et al. (NA)

**2/29/16** Extremophiles none (NA)

3/2/16 *Student Presentations*: Dana (Slime molds), Leena (Salt Marsh ME)

3/4/16 *Student Presentations*: Jordan (Arsenic Metabolisms), Tiffany (Cellulose degradation for fuel)

**3/7/15** **Final**

**Assignment Schedule:**

**Distributed Due Topic**

1/8/15 1/15/15 Abundance

1/15/15 1/22/15 Diversity

1/22/15 1/29/15 Methods

2/5/16 2/12/16 Metabolism

2/12/16 2/19/16 Syntrophy

2/25/16 3/7/16 Microbes in the environment

**Final Project:** Students will complete a project on a topic of their own choosing culminating in a lecture style presentation in the last week of class.

Topic proposals (1/2 page) 2/15/15

Presentation Summary (~5 pages with key figures) 2/29/15

Presentations 3/2/15 or 3/4/15

**Prerequisites:** There are no required prereqs, however a basic understanding of chemistry, biology, and earth science will be helpful. Should be complementary for co-enrollment with Biogeochemistry

**Course Requirements**:

This course will feature active learning techniques in addition to lecture components. We will meet for three lectures a week (M,W,F 12-1pm) and one discussion section (F, 1-2:30). This section will be used to discuss papers from the primary literature and will be required of all students. A short summary of the paper will be due the following week. There will be one midterm and one final. While the final is not strictly cumulative, the course will build on itself so topics still in play are fair game. An independent project on a topic of your choosing will be ongoing throughout the term and will culminate in a presentation during the last week of class.

Participation 10%

Assignments 20%

Midterm Exam 20%

Final 30%

Independent project 20%

**Collaborations and Academic Ethics**: Science is a generally collaborative enterprise and I expect our classroom interactions to reflect this fact. I encourage you to discuss and collaborate on labs and problem sets, but the work you turn in must be your own. No copying directly from one another! I take academic integrity very seriously and will react badly to signs of violating these specifications.

**Disability Accommodations**: Any student with a documented disability needing accommodations is requested to speak directly to the Office of Services for Students with Disabilities (SSD) (847-467-5530) and me as early as possible in the quarter (preferably within the first two weeks of class). All discussions will remain confidential.