**BISC 419 Environmental Microbiology Spring 2020**

Dr. Eric Webb

Dr. Cameron Thrash

Meets Tue Thurs 10-11:50 AHF 259

Course Summary: This course covers the roles of microorganisms, primarily protists, bacteria, archaea, and viruses, in natural systems, both pristine and contaminated. Material includes qualitative and quantitative appraisal of microbial biomass and activities; microbial communities and their development; molecular biological approaches to study natural systems; biogeochemical processes including major elemental cycles; microbial interactions; effects of microorganisms on their surroundings and vice versa.

Textbook: Kirchman, Processes in Microbial Ecology, 2nd edition

Syllabus/Schedule Subject to changes. Please check Blackboard regularly for assignments including additional assigned readings and any changes.

Date lecturer Lecture Chapters &/or Readings

1/8 Webb Course Overview and Intro 1

1/10 Webb Lecture 2: History & Overview of microbial communities. 2

1/15 Webb Challenges Studying microbial spp. & Environments 3 +

1/17 Webb Environments, elements, biochemicals & microbes Paper #1 Pres.: Elser et al 2000

1/22 Thrash Overview of diversity and ecology of proks & viruses 8 + Reading:

1/24 Thrash Overview of diversity and ecology of euks Reading: Caron (2012)

1/29 Webb Primary producers (proks) 4 + Reading: Paerl&Otten (2013)

1/31 Webb Primary producers (Euks) Paper #2 Pres.: Worden etal (2015)

2/5 Midterm 1

2/7 Thrash Community stucture of microbes in nature (Part I) 9

2/12 Thrash Community stucture of microbes in nature (Part II)

2/14 Webb The nitrogen cycle 12 + Thompson, A. W. et al., Science 2012

2/19 Webb The nitrogen cycle Paper #4 Pres: Van Kessel et al. 2015 Nature

2/21 Thrash Microbial growth, biomass production, and controls 6

2/26 Thrash Microbial growth, biomass production, and controls

2/28 Webb Genomes & metagenomes: microbes & viruses (Part I) 10 + Venter, J., et al., Science 2014

3/5 Webb Genomes & metagenomes: microbes & viruses (Part II

3/7 Midterm 2

Spring Break

3/19 Thrash Protistan and Micrometazoan life histories 7

3/21 Thrash Predation, mixotrophy and trophic transfer

3/26 Thrash Symbiosis and microbes (relationships involving proks) 14

3/28 Thrash Symbiosis and microbes (relationships involving euks) 5

4/2 Thrash Viruses

4/4 Thrash Viruses 11

4/9 Webb Processes in anoxic environments

4/11 Webb Processes in anoxic environments

4/16 Webb Introduction to geomicrobiology 13

4/18 Midterm 3

4/23 Thrash Final review (Fuhrman)

4/25 Webb Final Review (Webb)

5/7 Final Exam (cumulative) 8-10AM (this room)

Grading: 3 midterms 100 pts each

2 paper presentations each 20 pts each

Final 150 pts

Participation 10 pts

Class total points 500

**Lab/Discussion** section meets Friday 10-11:50 AHF 259 unless otherwise noted – **Check Blackboard** for announcements

Week Plan

2 Discussion session - Overview of methods that exist: Chap 18 (Brock) (Webb & Fuhrman

Culturing, staining, cloning, sequencing, Flow cytometry, PCR, SSU DNA surveys, FISH

3 Lab: Microbial Ecology Methods (all 3)

Basic Culturing methods and DNA stains/microscopy

4 The Dirt Field trip (TA)

5 Nucleic acid extraction/purif (TA)

6 Discussion session: Technology for DNA/RNA applications. (Webb)

Obtaining sequence, using sequence (uses & present limitations) (bring computers)

7 Lab: Sequence analysis and tree building (TA)

(Bring computers)

8 Discussion session/Lab demo - Choosing your method(s) (Webb&Fuhrman)

Flow cytometry; FlowCAM; FlowCytoBot; ESP; WQM; EcoMapper

9 Lab: What USC microhabitat has the most microbes?

Sample Collection, Preservation, Enrichment, etc. (self-guided field trip)

10 Lab: What USC microhabitat has the most microbes?

Viewing, counting of samples previously collected.

11 Lab: Aquatic env survey (TA). NHM

Bring material back to lab

12 Field sequence analysis (TA)

**Students with Disabilities**

Students requesting academic accommodations based on a disability are required to register with the Office of Disability Services and Programs (DSP) each semester and provide a letter of verification for approved accommodations. Be sure that the letter is delivered as early in the semester as possible. The telephone number of DSP is 213-740-0776. If a student’s approved accommodation is limited to extra time on examinations, accommodation will be provided. For any other accommodation, such as a private room, translator, etc., students must make prior arrangements with the DSP office 2 weeks before the exam date. See: <http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html>.

**Statement on Academic Integrity**

Ethics of academic integrity is a primary focus of the course. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00: <http://web-app.usc.edu/scampus/1100-behavior-violating-university-standards-and-appropriate-sanctions/>, while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

Discrimination, sexual assault, intimate partner violence, stalking, and harassment are prohibited by the university.  You are encouraged to report all incidents to the *Office of Equity and Diversity*/*Title IX Office* <http://equity.usc.edu> and/or to the *Department of Public Safety* [http://dps.usc.edu](http://dps.usc.edu/). This is important for the health and safety of the whole USC community. Faculty and staff must report any information regarding an incident to the Title IX Coordinator who will provide outreach and information to the affected party. The sexual assault resource center webpage <http://sarc.usc.edu> fully describes reporting options. Relationship and Sexual Violence Services <https://engemannshc.usc.edu/rsvp> provides 24/7 confidential support.

## **Support Systems**

A number of USC’s schools provide support for students who need help with scholarly writing.  Check with your advisor or program staff to find out more.  Students whose primary language is not English should check with the *American Language Institute* [http://ali.usc.edu](http://ali.usc.edu/), which sponsors courses and workshops specifically for international graduate students. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu>will provide safety and other updates, including ways in which instruction will be continued by means of Blackboard, teleconferencing, and other technology.