

Marine Functional Ecology and Biotechnology (3 credits)

Spring Semester 2009

OCN 403 (cross-listed as MBBE 405)

Course Instructor: Guangyi Wang

Guest Lecturer: Grieg Steward, Zackary Johnson, Matthew Church

Time: Tuesday/Thursday 01:30-02:45 PM

Lecture & discussion place: MSB 307

Lab lecture: POST 08

Course description

The world's oceans cover two-thirds of our planet and contain diverse marine habitats. Marine biotas, particularly marine microbes, are a key component of the biosphere. Their diversity and community structures determine the function and health of marine ecosystems and play a fundamental role in regulating world climate through feedback interaction between marine ecosystems and the atmosphere. This course introduces functional ecology of marine ecosystems, with a focus on microbial communities. The first part of this course introduces basic molecular and emerging "-omics" techniques and their applications, and the second part describe individual marine ecosystems and application of the techniques for understanding functional ecology. It is designed for undergraduate students (junior or senior) or graduate students who are interested in environmental sciences and marine biotechnology.

Course activities

Classroom: Typical in-class sessions will consist of lecture and/or instructor-led discussion of assigned readings. Two lectures will be on DGGE in laboratory.

Means of Evaluation

Class participation	10%
Topic discussion	20%
Midterm	20%
Final	20%
Project	30%

Texts and other reading materials

No required textbook, but students are encouraged to consult the following books for deep understanding of some topics:

1. Marine Ecology, Sean D. Connell and Bronwyn M. Gillanders, 2007
2. Microbial Functional Genomics, Jizhong Zhou, Dorothea K. Thompson, Ying Xu and James, M. Tiedje, 2004
3. Molecular Approaches to the Study of the Ocean, Keith E. Cooksy, 1998
4. Marine Microbiology: ecology and applications, Colin B Munn, 2004
5. Molecular Marine Microbiology, Douglas H. Bartlett, 2003
6. Microbial Ecology of the Oceans, David L. Kirchman, 2000
7. Marine Ecology: processes, systems, and impact. Michel J. Kaiser et al., 2005

In addition, reference papers and handouts will be provided for further reading.

Class Schedule

Date	Topic	Instructor
Jan. 13	Course introduction & project planning	GW
Jan. 15	Microbe in the Ocean	GW
Jan. 20	Microbe in the Ocean	GW
Jan. 22	Visiting UH sequencing/microarray facility	GM/GW
Jan. 27	Basic on Functional Ecology	GW
Jan. 29	Lab lecture 1 –environmental DNA extraction	GW
Feb. 3	Microbial diversity & assessment	GW
Feb. 5	Microbial diversity & assessment	GW
Feb. 10	Microbial diversity & assessment	GW
Feb. 12	Microbial diversity & assessment	GW
Feb. 17	Group discussion # 1: marine microbial diversity & earth's habitability	GW
Feb. 19	Functional genomics and functional ecology	GW
Feb., 24	Environmental genomics	GW
Feb. 26	Lab on DGGE analysis	GW
Mar. 3	Lab on DGGE analysis	GW
Mar. 5	Lab on DGGE analysis	GW
Mar. 10	Midterm	GW
Mar. 12	Proteomics	GW
Mar. 17	Functional approach for ocean N ₂ fixation	MC
Mar. 19	Meta/genomics and biogeochemistry of phytoplankton	ZJ
Mar. 23-27	Spring recess	
Mar 31	Group discussion # 2 Microbial engines & earth's biogeochemical cycles	GW
Apr. 2	Marine viral genomics and ecology	GS
Apr. 7	Sediment microbial ecology & biogeochemistry	GW
Apr. 9	Marine sponge ecology & biotechnology	GW
Apr. 14	Group discussion # 3 marine symbiont ecology & biotechnology	GW
Apr. 16	Mycoplankton ecology	GW
Apr. 21	Pollutants: ocean ecosystems & human health	GW
Apr. 23	Pollutants: ocean ecosystems & human health	GW
Apr. 28	Project presentation & discussion	GW
Apr. 30	Group discussion # 4: Marine biotechnology	GW
May 5	Review for final	GW
May 7-8	study days	
May 12	Final exam 1:30-2:45 pm	

Student Learning Outcomes (SLOs)

After successful completion of OCN 403, the students should be able to:

1. appreciate the complexity and dynamics of marine ecosystems
2. tell relationship of microbial communities and ecological function of marine ecosystem

3. use modern molecular and genomics approaches to explore microbial communities and biotechnological benefits of marine ecosystems
4. describe interactions between anthropogenic activities and ocean ecosystems
5. gain lab skills of marine environmental ecology.