# OCN 626: Marine Microplankton Ecology Course Syllabus
# Fall Semester 2018

**Tuesday/Thursday Lecture: 0900-1015, MSB 307**
**Tuesday Lab: 1500-1615, MSB 307 (unless otherwise arranged)**
**4 credits**


**Course Instructors:**
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**Guest Lecturers:**
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## Course Description

Marine Microplankton Ecology (OCN 626) is one of several required core courses for graduate students in the Oceanography graduate degree program who are specializing in biological oceanography, and fulfills part of the distribution requirement in the Marine Biology graduate degree program at the University of Hawaii at Manoa. The course includes two lectures and one practicum (discussion/review/tutorial) session per week and covers fundamental concepts in biological oceanography specifically related to the ecology of marine microbes and their influence on ocean biogeochemistry. Lectures, home work exercises, tutorials, readings of primary literature, and in-class discussions will be used to explore topics such as marine microbial diversity, environmental and biological controls on plankton growth and mortality, and the role of microbes in ocean elemental cycling. There is no required textbook for the course; however, students will be assigned readings that include both primary literature and textbook chapters that the instructors feel are pertinent to the weekly themes.

Each of you will complete a short research proposal in which you identify an open question related to the ecology of microscopic plankton and/or biogeochemistry, present background information relevant to the question, propose a strategy to answer the question, briefly describe the methods that you would be use, and estimate the expected costs of completing the research. The written proposal should be structured similar to one that would be submitted to NSF (just shorter and with less detail!). We expect the body of the proposal will be 5-8 pages with additional pages for references and budget, and budget justification. Early in the semester, we will introduce you to databases, and provide instruction on how to retrieve data. We expect that you will use data from some of these sources as background information when framing your research question. In one of the last two class periods of the semester you will orally summarize your proposal in a 12-minute presentation to the class. The written version of the proposal will be due on the day of the final.

We anticipate that this exercise will 1) help you become more familiar with the primary literature and current gaps in our knowledge, 2) provide you the opportunity to practice persuasive writing,

3) give you experience delivering a technical presentation and prepare you for defending a thesis proposal, and 3) familiarize you with the components of a research budget.

Your grade for the oral and written reports will be based on the quality of the proposal and the clarity your presentation. Criteria include the soundness of the research question, your ability to place your findings in context of what you have learned in class, and the reasonableness of the research plan. You are expected to attend all of the oral presentations and contribute to the question/discussion session after each talk.

Grading

Grades will be earned based on three criteria: 1) Participation in weekly lectures and discussion sections; 2) Performance on periodic homework assignments and final exam; 3) Performance on an oral (15 min) and written (5 to 8 page) presentation of a proposal focused on a topic relevant to this class. Proposals will involve learning to retrieve, manipulate, and interpret data from online databases, synthesis of ideas from the scientific literature, formulation of a question related to those data and ideas, and development of a plan to answer the question (more details below). Students are expected to attend all lectures and afternoon practicums and are expected to arrive having read the assigned reading material.

Grades will be weighted as follows:

1) Attendance, preparation for, and participation in lectures, tutorials, and discussions (10%),
2) Performance on the homework tasks (5% each = 30% total) and exam (20%)
3) Performance on written (20%) and oral presentation (20%) of your proposal

Office Hours

Instructor office hours are by appointment; if you would like to meet with instructors you should contact them by email or in person to set up a mutually convenient time to meet.

**Student Learning Outcomes:**

1) *Students should be able to define the major forms of microbial life in the sea and describe the characteristics that distinguish these forms.*
2) *Students should be able to explain how microorganisms influence bioelemental cycling in the sea, specifically related to cycles of carbon, nitrogen, and phosphorus.*
3) *Students should be able to define processes that control microbial abundances and growth in the marine environment.*
4) *Students should be able to identify and explain distinguishing microbial and biogeochemical features of the following ocean ecosystems: oligotrophic ocean gyres; mid-latitude temperate ecosystems; high-nutrient, low-chlorophyll regions; and high latitude polar regions.*
5) *Students should be able to describe methodological approaches appropriate for evaluating: microbial biomass, production, growth, mortality, and diversity.*

## OCN 626 - Fall 2018 Schedule

| Theme | Day | Date | Event (HW = homework) | Lecture # | Lecture Topic | Lecturer | Lab # | Lab Topic |
|---|---|---|---|---|---|---|---|---|
| Basic Concepts | Tuesday | 21-Aug-18 | HW1 Out | 1 | Overview of life and the marine food web | Steward | 1 | Imagining life at the Microscale (Calculation) |
| | Thursday | 23-Aug-18 | | | Class cancelled - Hurricane Lane | | | |
| Intro to Microscopic Plankton | Tuesday | 28-Aug-18 | HW1 Due | 2 | Classifying Plankton - phylogeny, size, function | Steward | 2 | Visualizing and Counting Microbes (Lab Demo) |
| | Thursday | 30-Aug-18 | | 3&4 | Primary Producers - Prokaryotes and Eukaryotes | Steward | | |
| | Tuesday | 4-Sep-18 | HW2 Out | 5 | Patterns of Productivity I - light, nutrients, mixing | Edwards | 3 | Exploring Oceanographic Data I (Computer Work) |
| | Thursday | 6-Sep-18 | | 6 | Patterns of Productivity II - global and seasonal patterns | Edwards | | |
| | Tuesday | 11-Sep-18 | HW2 Due | 7 | Consumers I - Predatory Protists | Steward | 4 | **Paper Discussion (Critical Depth)** |
| | Thursday | 13-Sep-18 | | 8 | Consumers II - Protist ecology | Steward | | |
| | Tuesday | 18-Sep-18 | HW3 Out | 9 | Consumers III - Heterotrophic bacteria | Steward | 5 | Grazing rates and remineralization (Calculation) |
| | Thursday | 20-Sep-18 | | 10 | Parasitoids - Eukaryotes, Bacteria, Viruses | Steward | | |
| | Tuesday | 25-Sep-18 | HW3 Due/HW4 Out | 11 | Viral ecology - Revisiting the Food Web | Steward | 6 | Microbial Contributions to Biomass (Calculation) |
| | Thursday | 27-Sep-18 | | 12 | Molecular analyses of plankton communities | Steward | | |
| | Tuesday | 2-Oct-18 | HW4 Due | 13 | *Physics of Life at the Microscale* | Edwards | 7 | **Paper Discussion (Microbial & Viral Ecology)** |
| | Thursday | 4-Oct-18 | | *14* | *Ecophysiology and functional traits* | Edwards | | |
| | Tuesday | 9-Oct-18 | | *15* | *Population and community principles* | Edwards | 8 | **Paper Discussion (Phytoplankton & Bacterial Ecology)** |
| | Thursday | 11-Oct-18 | | *16* | *Seasonal Community Dynamics* | Edwards | | |
| *Plankton Ecology* | Tuesday | 16-Oct-18 | Proposal Draft Due/HW5 Out | *17* | *Microbial food webs I* | Edwards | 9 | Plankton models (Computer Exercises) |
| | Thursday | 18-Oct-18 | | *18* | *Microbial food webs II* | Edwards | | |
| | Tuesday | 23-Oct-18 | | *19* | ***Mesoscale/Sub-mesoscale Workshop*** | -- | 10 | Workshop |
| | Thursday | 25-Oct-18 | | *20* | *Primary Productivity I - in situ methods* | White | | |
| | Tuesday | 30-Oct-18 | HW5 Due | 21 | Primary Production II - satellite oceanography | White | 11 | **Paper Discussion (Net Production and Export)** |
| Biogeochemical Consequences of Plankton Ecology | Thursday | 1-Nov-18 | | 22 | Carbon pools and cycles | Nelson | | |
| | Tuesday | 6-Nov-18 | | | HOLIDAY - voting | | | |
| | Thursday | 8-Nov-18 | | 23 | Nutrient Cycles - Nitrogen | Steward | | |
| | Tuesday | 13-Nov-18 | | 24 | Nutrient Cycles - Phosphorus | Björkman | 12 | **Paper Discussion (Nitrogen Biogeochemistry)** |
| | Thursday | 15-Nov-18 | | 25 | The Biological Carbon Pump | Edwards | | |
| | Tuesday | 20-Nov-18 | Written Proposals Due | 26 | Case Study - Molecular ecology of nitrogen fixation | Steward | 13 | **CONCEPT REVIEW** |
| | Thursday | 22-Nov-18 | | | HOLIDAY - Thanksgiving | | | |
| | Tuesday | 27-Nov-18 | | 27 | HNLC Systems and Iron Fertilization Experiments | Steward | 14 | **CONCEPT REVIEW** |
| | Thursday | 29-Nov-18 | | 28 | Effects of Climate Change on Ocean Ecosystems | Edwards | | |
| Presentations | Tuesday | 4-Dec-18 | Proposal Presentations | 29 | Student presentations | | 15 | Student presentations |
| | Thursday | 6-Dec-18 | Proposal Presentations | 30 | Student presentations | | | |
| | Friday | 14-Dec-18 | Final Exam Due | | | | | |