

Course: Biological Oceanography

Credits: 3

Semester: 1st, Year: 3rd

Course number: 308

Scope: Frontal lectures, 3 hours per week, 42 yearly hours + weekly online assignments

Course website: <https://moodle.ruppin.ac.il/course/view.php?id=19226>

1. **Prerequisites:** Physical Oceanography, Chemical Oceanography
2. **Course Topics:** Oceanography is the science of the marine environment and its relationships with the atmosphere, the continent, the ocean crust, and the biosphere. In other words, it is the study of the ecology of the ocean. This is a highly interdisciplinary science that encompasses physics, chemistry, earth and atmosphere science and of course, biology. Oceanography is a relatively young discipline that relies heavily on advance technology and instrumentation. The course is given from a holistic and systematic perspective and provides a wide view of the processes (physical, geochemical, and biological) that control the distribution, dynamics, and productivity of marine life, focusing on the major controllers of large-scale geochemical cycles in the pelagic zone, namely: phytoplankton, zooplankton, microbes, and fish.
Special attention is given to methodological approaches, critical thinking, and thorough understanding of the scientific process via the discussion of case studies and paradigm shifts in modern oceanography.
3. **Learning Outcomes:** Graduates of the course are expected to be acquainted with the language and terms used by biological oceanographers at a level that will enable them to critically read and comprehend recent and older texts in the field, plan simple experiments and properly interpret their results, and solve common problems encountered by biological oceanographers.
4. **Learning Mode:** The course is composed of frontal lectures and class discussions supplemented by weekly reading assignments (all in English) from the course textbook and contemporary and classic papers. Reading materials and an online quiz are published weekly at the course website.

The weekly quiz is given to promote active engagement and learning throughout the semester and is based on questions from former years' exams that are relevant to the reading material and topic that were already discussed in the course. To facilitate active thinking and independent learning, quizzes are automatically personalized and are given in a "Mastering mode", i.e., students are allowed (and encouraged) to attempt to solve all

questions until they reach 100% success. Teamwork is encouraged but please note that each quiz is unique with some questions drawn randomly by the computer from a pool of similar questions; the order of answers in multiple choice questions is repeatedly randomized; and numbers in quantitative questions are changed automatically. Students who have failed two or three times are encouraged to seek help through the course Q&A forum after reading the relevant course materials. There is no limit to the number of trials, but I discourage guessing. Please be aware that this is an honor system and I trust my students will not breach it. Nevertheless, the number and mode of trials of each student are monitored online.

The website is the portal to the course and provides access to all the course material including additional reading material, relevant links, presentations, recorded lectures, and full access to last year course. The website also provides a variety of communication options between the participants and between the teacher and the students including a Q&A forum and chat services. One can access the course website as “guest” and submit anonymous questions in the forum, but a username and password are required to submit assignments.

5. **Course Requirements:**

- Access to the internet, to Ruppin Moodle system, and to a personal computer are mandatory
- The course grade is based on a final exam (75%) and weekly quizzes (2.5% each, the best 10 quizzes are selected).

6. **Detailed content of lectures – course structure (optional):**

Week	Lecture topic
1	1. Introduction: The Ocean, Earth and You 2. Course structure
2	Introductory lectures: 3. Nekton, fish and, fisheries - The Fisheries Crisis 4. Seasonal phytoplankton bloom dynamics
3	5. Introduction to plankton 6. Phytoplankton diversity and introduction to major groups
4	7. Photosynthesis, Phototrophy and Primary Production in the ocean
5	8. Methods for estimations of phytoplankton standing stocks and primary production
6	9. Factor limiting primary production: I - Light
7	10. Factors limiting primary production: II – Nutrients, the paradox of plankton and Deep Chlorophyll Maximum 11. Factors limiting primary production: III - Nitrogen, N fixation, and F ratio
8	12. Factors limiting primary production: IV - HNLC and the case of Iron 13. Revisiting the Redfield ratio and the concept of Ecological stoichiometry
9	14. The Drifters: Introduction to zooplankton and a brief review of some major groups

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10	15. Aspects of zooplankton ecology: I- Vertical Migration 16. Aspects of zooplankton ecology: II- Patchiness
11	17. Aspects of zooplankton ecology: III- Prey-predator relationships and how do we study them 18. Abandoning Sverdrup's Critical Depth Hypothesis on phytoplankton blooms?
12	19. Microbial food webs: I - Bacterial abundance, diversity, and activity 20. Microbial food webs: II - Scale, biomass, and metabolism
13	21. Microbial food webs: III - Dissolved organic matter 22. Microbial food webs: IV - Mortality factors (viruses and protists); closing the microbial loop
14	23. Cascading effects and regime shifts - Decimation of groundfish populations reduce silica availability to diatoms 24. Oceanic multi decadal cycles, food webs and fisheries