

**Ruppin Academic Center
School of Marine Sciences**

Title: Marine Biotechnology

Meeting Times:

Instructors: Professor Yonathan Zohar
Institute of Marine and Environmental Technology
Chair, Department of Marine Biotechnology
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Professor Frank Robb
Institute of Marine and Environmental Technology
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University of Maryland School of Medicine
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Course Description:

This course covers the application of advanced molecular and biotechnological platforms to studying the marine environment and obtaining useful resources and natural products from marine systems. Students study recent progress in marine genomics and post-genomics, discovery of drugs and enzymes from marine microbes and macro-organisms, mapping oceans' biodiversity, the role of marine microbes in global carbon cycling, life in extreme environments, molecular and biotechnological approaches in fisheries and aquaculture, aquaculture genomics, transgenic, genetic engineering and surrogate technologies and applications, algal biotechnology and marine-based bioenergy, and environmentally sustainable mariculture. **Course's language is English.**

Required Texts: There are no suitable text-books for this class. A list of references to articles in the primary literature will be e-mailed to students two weeks before the first class.

Class Presentations: Six students will be able to volunteer for presentation of research papers during the class. Sign-up is on a "first come, first served" basis. Each student will present a combined analysis of two scientific papers on one theme, to be selected from a list of pairs of publications provided by the instructors. Presentations will be graded and students who present papers will not be required to do the final examination. **Student presentations should be timed to last for 20 minutes, leaving 10 minutes for questions and discussion.** Presentations must include a general introduction, detailed presentation of the methods and results described in the papers, discussion of the significance of the work and a critique in which strengths and weaknesses of

the papers are discussed. The presenter should cover background material and additional details of methods by doing supplementary reading when necessary. **Presentations must be given in English.**

Course Outcomes:

Students will become familiar with the multidisciplinary, rapidly-emerging field of Marine Biotechnology. Students' existing skills and backgrounds in molecular platforms will be enhanced by exposure to a wide range of molecular techniques applied to the study of marine ecosystems and resources, and their application to industrial uses. Since the course is based entirely on recent papers in the scientific literature, skills in scientific literacy will be developed. Presentation skills will be enhanced by the participatory nature of the class and by student presentations. Students will emerge from this class well-equipped to assess developments in Marine and Environmental Biotechnology and Genomics and to participate in this exciting emerging field of research, development and industry.

Examination: A three-hour examination will be held on the final day of the course. The examination will include 30 multiple choice questions.

Examination answers must be given in English.

Grading:

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| Scale: | |
| >97% | A+ |
| 94-97% | A |
| 90-93% | A- |
| 87-89% | B+ |
| 84-87% | B |
| 80-83% | B- |
| 70-79% | C |
| <70% | F |

| Date | Topic | Instructor |
|----------------------------------|---|--|
| Sunday (9 to noon) | Course overview and introduction to Marine Biotechnology Mol. techniques in microbial ecology Microbial ecology and biotechnology | YZ (1.5 h) FR (1.5 h) |
| Sunday (1:00 pm to 6:00 pm) | Marine bacterial rhodopsins: from metagenomics to ocean cycles Marine genomics Marine enzymes and bio-products | Prof. Oded Beja (Technion) (2 h) FR (2.5 h) |
| Monday (9 to noon) | Natural products discovery/Marine pharmaceuticals/Symbiosis | FR (3 h) |
| Monday (1:00 pm to 5:00 pm) | Aquaculture Biotechnology-general overview Algal Biotechnology | YZ (2 h) Dr. Isaac Berzin (VAXA) (2h) |
| Tuesday, (9 to 12:30) | Aquaculture Genomics Paper presentations | Dr. Yossi Aizen, (2 h) Student Presentation 1 Student Presentation 2 Student Presentation 3 |
| Tuesday, (1:30 to 5:00 pm) | Marine Bioenergy Extremophiles and biotechnology/ Bioremediation | FR (1 h) FR (2 h) |
| Wednesday (9 to 1:00) | Zebrafish Molecular Biology Marine nano-biotechnology- sea anemone to human health | Dr. Alon Daya (RAC) (2 h) Prof. Tamar Lotan (Haifa U.) (2 h) |
| Wednesday (2 to 6 PM) | Aquaculture: Reproduction Surrogate technology | Dr. Yossi Aizen (2 h) YZ (2h) |
| Thursday (9 to 12:30) | Transgenic technology Paper presentations | YZ (2 h) Student Presentation 4 Student Presentation 5 Student Presentation 6 |
| Thursday (1:30 pm to 4:00 pm) | Recirculating Mariculture: Microbes, Genes to Production | YZ (2.5 h) |
| Friday (9 am to 12) | Examination | YZ/FR (3 h) |