

## **Marine Microbiology and Molecular Biology (MMMB)**

**Spring Semester 2017**

**OCB 4525 (3 credits) CRN #17927**

Lectures day and time: Tuesday and Friday 10:40-noon.

Course Location: Johnson Education Center, Harbor Branch Oceanographic Institute

### **Instructors:**

Lead Instructor: Dr. Peter McCarthy (772-242-2632), [pmccart5@hboi.fau.edu](mailto:pmccart5@hboi.fau.edu), FAU Marine Science Building Room #147

Dr. Esther Guzmán, (772-242-2452), [eguzman9@hboi.fau.edu](mailto:eguzman9@hboi.fau.edu)

Dr. Susan Laramore, (772-242-2525), [slaramo1@hboi.fau.edu](mailto:slaramo1@hboi.fau.edu)

Dr. Clay Cook, (772-242-2301), [ccook30@hboi.fau.edu](mailto:ccook30@hboi.fau.edu)

Instructor Office Hours:

McCarthy: Tues 9-10am, Thurs 9-10am and by appointment

All other instructors by appointment

**Prerequisites:** CHM 2045 Minimum Grade of C-, and CHM 2045L Minimum Grade of C-, and CHM 2046 Minimum Grade of C-, and CHM 2046L Minimum Grade of C-

**Corequisite:** OCB 4525L

### **Course Description:**

The theory, techniques, applications, and interplay of microbiology, molecular genetics, recombinant DNA, and bioinformatics in the context of modern-day marine research. Formal teaching consists of two 80-minute lectures per week. To master the material covered in this course it is expected that the student will spend a minimum of two hours per week per credit hour on the out of classroom assignments.

### **General Course Outline (subject to change)**

- A. Introduction to microbial classification
  - 1. Viruses, Fungi, Archaea, Eubacteria
  - 2. Molecular genetics
  - 3. Molecular systematics
  
- B. Marine microbiology
  - 1. Microbes in marine ecosystems
  - 2. Nutrient cycling
  - 3. Microbiology Techniques
    - Isolation and quantification

Microscopy, FISH

4. Microbial Pathogens in the marine environment
5. Extremophiles  
Molecular adaptations of extremophiles

C. Introduction to molecular biology

1. History of molecular biology
2. Molecular techniques  
PCR, DNA sequencing, microarrays
3. Genomics - proteomes/transcriptomes  
Comparative methods

D. Biotechnology

- 1 Applied Marine Microbiology
- 2 Microbes and Secondary Metabolites  
History of antibiotics
- 3 Drug Discovery
- 4 Fermentation Technology
- 5 Biotechnology industry

E. Secondary metabolite genetics

- 1 Evolution of secondary metabolites
- 2 resistance, plasmids, transposons
- 3 Polyketides
- 4 Other compound classes
- 5 Combinatorial biosynthesis
- 6 Metabolomics  
Case studies - cyanobacteria , Actinomycetes

F. Possible special marine microbial topics

1. Microbial Metagenomics
2. Marine Symbiosis
  - i. Sponges
  - ii. Coral-dinoflagellates
  - iii. Deep sea, chemoautotrophy
  - iv. Bioluminescence
3. Marine Biofilms
4. Bioremediation

**Course Objectives:**

By the end of the course the student will understand the basic concepts of microbiology and molecular biology, the diversity of microbial life in the marine environment, and the interplay between the microbial world and higher organisms.

**Textbooks:**

Required: C.B. Munn, *Marine Microbiology: Ecology and Implications*  
2<sup>nd</sup> edition. ISBN: 978-0-8153-6517-4

Supplemental reading materials will be provided by the lecturers.

## **Course Calendar:**

February 3 <sup>rd</sup> :	Exam 1
March 2 <sup>nd</sup> :	Exam 2
April 17 <sup>th</sup> /20 <sup>th</sup> :	Oral presentations and deadline for written report
May 1 <sup>st</sup> :	Final Exam 10:00am-12:30pm

## **Course Policies and Procedures**

### **1. Course Evaluation**

Grades will be determined by 3 exams (20% for each of exams 1 and 2 and 30% for the final), and a written report (15%) and oral presentation (15%) on a course-related topic. Exams will consist of a combination of multiple-choice, short answer and short essay style questions. Written and oral reports on a course-related subject will be evaluated and graded by all of the instructors.

All exams will be scored using the following rubric:

90-100	A
86.5-89.9	A-
83.3-86.4	B+
80-83.2	B
76.5-79.9	B-
73.3-76.4	C+
70-73.2	C
66.7-69.9	C-
63.4-66.6	D+
60-63.3	D
56.6-59.9	D-
<56.6	F

**Attendance Policy:** *Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance.*

*Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University- approved activities. Examples of University- approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must*

*allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final grade as a direct result of such absence.*

Reasonable accommodation will also be made for students participating in a religious observance.

2. **Incomplete Grade**: A grade of Incomplete ("I") is reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate. As per university policy, an incomplete grade will only be given to a student who fulfills all of the following criteria:
  - a. misses multiple exams or the final examination due to a legitimately documented emergency as defined by the FAU Academic Policies and Regulations:  
[http://www.fau.edu/academic/registrar/09-10\\_catalog/academics.html](http://www.fau.edu/academic/registrar/09-10_catalog/academics.html)
  - b. has a grade of C or better
  - c. submits evidence of the emergency and signs an incomplete agreement.
  
3. **Safety**: No food or drinks are permitted in the laboratory.
  
4. **Classroom Etiquette Policy**: University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions." You may be asked to leave the class session for noncompliance.
  
5. **Student Honor Policy**: Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at [http://www.fau.edu/ctl/4.001\\_Code\\_of\\_Academic\\_Integrity.pdf](http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf)  
  
**Cheating is a serious offense. If you are caught cheating, you will receive an F in the course. In addition, you will be referred to the Dean of Student Services and charged with an academic crime. Test procedures and rules will be stated at the beginning of each exam.**
  
6. **Disabilities Statement**: In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses

7. **Important Dates:** The following dates are based upon the current university academic calendar. Changes to these critical dates have occurred in the past and you are responsible for checking the academic calendar on the university website for any changes during the academic term.

<http://www.fau.edu/registrar/pdf/acadcal1617.pdf>

Last day to withdraw w/o receiving a "W" January 21<sup>st</sup>  
 M.L.K. Jr. Holiday January 16<sup>th</sup>  
 Last day to withdraw w/o receiving an "F" April 7<sup>th</sup>  
 Spring Break March 6<sup>th</sup>-12<sup>th</sup>

University Final exam Schedule: <http://www.fau.edu/registrar/courses/final-exams.php>

**Course Schedule:**

Lecture		10:40-noon Tuesday and Friday		
Date		Topic	Lecturer	Assigned Reading
10-Jan	Tues	Introduction and scope	PM	Munn: Chapter 1
13-Jan	Fri	Observation and Growth	PM	Munn: Chapter 2; Kaeberlein et al Science 296:1127-1129 (2002)
17-Jan	Tues	Prokaryotic Taxonomy and Diversity Part 1	PM	Prescott: Microscopy and Cell Counting Chapters
20-Jan	Fri	Prokaryotic Taxonomy and Diversity Part 2	PM	Munn: Chapter 4
24-Jan	Tues	Archaea, Eukaryotic Cells, Fungi, Antibiotics	PM	Munn: Chapter 5; Quiz #1
27-Jan	Fri	Marine Microbes Biotechnology	PM	Fenical and Jensen, Nature Chemical Biology 2:666-673 (2006); Wiffjels, Trends in Biotechnology 26: 26-31 (2007)
31-Jan	Tues	Sponge Microbes/Symbionts/Quorum sensing	PM	Munn: Chapter 10 (Quorum Sensing only); Fiore et al, Trends in Microbiology 18:455-463
3-Feb	Fri	Exam I	PM	
7-Feb	Tues	Intro to Molecular Biology	EG	Stephen S. Hall. Hidden Treasures in Junk DNA. Scientific American October 2012. <a href="http://www.scientificamerican.com/article/hidden-treasures-in-junk-dna/">http://www.scientificamerican.com/article/hidden-treasures-in-junk-dna/</a> ; John Rennie. Celebrating the Genetic Jubilee: A Conversation with James D. Watson. Scientific American 2003.
10-Feb	Fri	Molecular Biology – techniques I	EG	Kary Mullis. The Unusual Origin of the Polymerase Chain Reaction. Scientific American 1990.
14-Feb	Tues	Molecular Biology – techniques II	EG	Geoffrey Carr. Special Report: The Human Genome. The Economist, Jun 17th 2010.
17-Feb	Fri	Molecular Biology – Advanced Techniques	EG	Kelly Rae Chi. Red Hot. The Scientist, March 1, 2015
21-Feb	Tues	'Omics' – genomics, transcriptomics, proteomics, metabolomics	EG	Monya Baker. The Omes Puzzle. Nature 494: 416-419, 2013
24-Feb	Fri	'Omics' – interactomics, epigenomics, metagenomics, chemogenomics	EG	Michael Pollan. Some of my Best Friends are Germs. The New York Times May 15, 2013
28-Feb	Tues	Marine Metagenomics Approaches/Applications	EG	Anna Azvolinsky. Sold on Symbiosis. The Scientist, July 1, 2015.
2-Mar	Fri	Exam II	EG	
6-Mar	Tues	SPRING BREAK		
9-Mar	Fri	SPRING BREAK		
13-Mar	Tues	SBTS Cruise		
16-Mar	Fri	SBTS Cruise		
20-Mar	Tues	Marine Microbial Eukaryotes	PM/CC??	Munn: Chapter 6
23-Mar	Fri	Symbiosis I: Prokaryotic associations	CC	Munn: Chapter 10 (Prokaryotes)
27-Mar	Tues	Symbiosis II: Eukaryotic associations	CC	Munn: Chapter 10 (Eukaryotes)
30-Mar	Fri	Microbial Oceanography	CC	Munn: Chapter 8
3-Apr	Tues	Pathogens of aquacultured organisms, crustaceans/ molluscs	SL	Munn: Chapter 11 (Part 1)
6-Apr	Fri	Pathogens of aquacultured organisms, fish	SL	Munn: Chapter 11 (Part 2)
10-Apr	Tues	Marine microbes affecting human health	PM	Munn: Chapter 12
13-Apr	Fri	Extremophiles	PM	Munn: Chapter 14
17-Apr	Tues	Student Presentations	ALL	
20-Apr	Fri	Student Presentations (continue if necessary)	ALL	Last Day of Classes April 25th
1-May	Mon	Final Exam (10:30-noon) To be confirmed	ALL	