

MARINE ECOLOGY – MR 210

SPRING 2017

Instructor: Allain Bourgoin **e-mail:** allanb@comfsm.fm
Office: Math/Science **Tel.:** 320-2480 Ext:222
Office hours: Monday, Wednesday, Friday from 12h00 to 13h30 (or by appointment)
Lecture schedule: Monday, Wednesday, Friday: 14:10-15:05 **Room:** A-104

Prerequisite: C or better in MR-120, SC-120, or SC-255, or consent of the instructor

Course description: The basic principles of ecology as applied to the marine environment are initially discussed. Then, these fundamental ecological concepts are integrated and surveyed through the respective marine communities: intertidal zones; estuaries (including mangals); the subtidal benthic communities (including seagrass meadows, kelp communities; coral reefs); the epipelagic zone; and the ocean depths. The last section of the course relates to the resources of the sea and the human impacts on both the resources and the marine environment.

INSTITUTIONAL STUDENT LEARNING OUTCOMES:

(Ref: <http://www.comfsm.fm/catalog/2016-2017/Catalog%202016-2017UPDATED8.pdf> -- page 19)

COM-FSM graduates will demonstrate:

1. **Effective oral communication:** capacity to deliver prepared, purposeful presentations designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.
2. **Effective written communication:** development and expression of ideas in writing through work in many genres and styles, utilizing different writing technologies, and mixing texts, data, and images through iterative experiences across the curriculum.
3. **Critical thinking:** a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.
4. **Problem solving:** capacity to design, evaluate, and implement a strategy to answer an open-ended question or achieve a desired goal.
5. **Intercultural knowledge and competence:** a set of cognitive, affective, and behavioral skills and characteristics that support effective and appropriate interaction in a variety of cultural contexts.
6. **Information literacy:** the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and share that information for the problem at hand.
7. **Foundations and skills for life-long learning:** purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills, and competence.
8. **Quantitative Reasoning:** ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations; comprehends and can create sophisticated arguments supported by quantitative evidence and can clearly communicate those arguments in a variety of formats.

PROGRAM LEARNING OUTCOMES:

Upon completion of the COM-FSM Marine Sciences requirements, students will be able to:

1. Demonstrate fundamental knowledge of geological, geomorphological, physical, chemical, and biological oceanography.
2. Apply fundamental knowledge of marine sciences towards identifying and critically analyzing, and outlining potential solutions for local, regional and global problems relating to marine systems.
3. Apply the scientific process to formulate hypotheses, design experiments, and collect and analyze data from which valid scientific conclusions are drawn.
4. Communicate effectively, in written and oral forms, utilizing the language and concepts of marine science.

STUDENT LEARNING OUTCOMES (SLOs-General and Specific): With 60% mastery

Students will be able to achieve the following learning outcomes:

G-SLO 1. *The student will be able to demonstrate an understanding of the basic principles of ecology as applied to the marine environment.*

The student will be able to...

- **SLO 1.1** ... to define and describe the organization of communities and the basic principles of population dynamics
- **SLO 1.2** ... to list and give examples on how species interact including the concepts of competition, competitive exclusion, predator-prey interactions, and symbiosis.
- **SLO 1.3** ... to describe using diagrams energy flow and nutrient cycles as applied to the marine environment.
- **SLO 1.4** ... to describe and diagram the major ecological zonation of the marine environment

G-SLO 2. *The student will be able to compare and contrast the major physical and biological factors that influence the zonation in the intertidal community structures*

The student will be able to...

- **SLO 2.1** ... to list the factors and demonstrate how they affect the zonation of rocky intertidal communities

- **SLO 2.2** ... to describe some of the outstanding adaptations of typical organisms inhabiting the characteristic zones of rocky intertidal communities
- **SLO 2.3** ... to list the factors and demonstrate how they affect the zonation of the soft-bottom intertidal communities.
- **SLO 2.4** ... to describe some of outstanding adaptations of typical organisms inhabiting the characteristic zones of soft bottom (muddy and sandy) intertidal communities.

G-SLO 3. *The student will be able to list the unique physical and chemical characteristics of estuaries and how estuarine organisms are adapted to these particular demands.*

The student will be able to...

- **SLO 3.1** ... to compare and contrast between the major types of estuaries according to their geological origin: drowned river valleys, bar-built, tectonic, and fjords.
- **SLO 3.2** ... to list the unique physical and chemical factors that categorize estuaries and to discuss the adaptations of estuarine organisms to these particular demands.
- **SLO 3.3** ... to compare and contrast the mudflats, salt marshes, and mangrove forests in terms of geographical distribution, primary productivity, biodiversity, and economic importance.

G-SLO 4. *The student will be able to list the unique physical characteristics influencing subtidal communities and how benthic continental shelf organisms are adapted to these particular demands.*

The student will be able to...

- **SLO 4.1** ... to list the most important physical characteristics influencing benthic subtidal communities.
- **SLO 4.2** ... to outline the dynamics of deposit and suspension feeders in soft bottom subtidal communities.
- **SLO 4.3** ... to compare and contrast the seagrass meadows and the kelp forests in terms of geographical distribution, primary productivity, biodiversity, and economic importance.

G-SLO 5. *The student will be able to describe the taxonomic groups that compose reef-building corals and describe the unique and complex ecology of coral reef ecosystems.*

The student will be able to...

- **SLO 5.1** ... to describe the taxonomic groups that compose reef-building corals and explain the role of zooxanthellae on the biology of hermatypic reefs
- **SLO 5.2** ... to explain the most important physical factors influencing the development, growth, and geographical distribution of coral reefs, including reef corals and other reef builders.
- **SLO 5.3** ... to compare and contrast between the three major types of coral reefs (fringing, barrier, and atolls)
- **SLO 5.4** ... to explain how competition for space, predation, and grazing influence the development of coral reef communities

G-SLO 6. *The student will be able to define the term epipelagic, classify the organisms that occupy this ecological zone, describe their various adaptation traits, and discuss the epipelagic food webs.*

The student will be able to...

- **SLO 6.1** ... to differentiate the plankton from the nekton and summarize various ways of categorizing plankton.
- **SLO 6.2** ... to outline the crucial adaptations of epipelagic organisms and to furnish examples of such adaptations.
- **SLO 6.3** ... to explain the most important characteristics of epipelagic food webs, including the microbial loop.

G-SLO 7. *The student will be able to list the unique physical and chemical characteristics influencing communities of ocean depths, explain the outstanding adaptations of organisms occupying the deep-ocean water bodies, and describe the different benthic communities occupying the great ocean depths.*

The student will be able to...

- **SLO 7.1** ... to list the most important physical and chemical characteristics influencing communities of the ocean depths.
- **SLO 7.2** ... to outline the most outstanding biological adaptations of organisms occupying the great ocean depths.
- **SLO 7.3** ... compare and contrast between animals living in the epipelagic, mesopelagic, and abyssalpelagic zones.
- **SLO 7.4** ... compare and contrast the organisms associated to the deep-sea benthos with particular attention to the communities occupying the hydrothermal vent.

G-SLO 8. *The student will be able undertake a comprehensive examination of the human use of marine resources, both living and non-living.*

The student will be able to...

- **SLO 8.1** ... to identify the major food resources and the current situation of the world's fisheries including major fishing areas, major food species and fish products.
- **SLO 8.2** ... List some of the most important non-living resources that we obtain from the ocean floor and from seawater.

Course Content:

1. AN INTRODUCTION TO ECOLOGY
 - The organization of communities
 - The flow of energy and materials
 - Ecological zonation of the marine environment
2. ECOSYSTEMS BETWEEN THE TIDES
 - Rocky shore communities
 - Soft-bottom intertidal communities
3. ESTUARIES
 - Origins and types of estuaries
 - Physical characteristics of estuaries
 - Estuaries as ecosystems
4. LIFE ON THE CONTINENTAL SHELF
 - Physical characteristics of the subtidal environment
 - Continental shelf as an ecosystem
5. CORAL REEFS
 - The organisms that build reefs
 - The ecology of the coral reefs
6. LIFE NEAR THE SURFACE
 - The organisms of the epipelagic
 - Living in the epipelagic
 - Epipelagic food webs
7. THE OCEAN DEPTHS
 - The twilight world
 - The world of perpetual darkness
 - The deep-ocean floor
 - Hot springs, cold seeps and dead bodies
8. RESOURCES FROM THE SEA
 - The living resources
 - Non-living resources from the sea floor
 - Non-living resources from seawater

Required textbook:

Castro P. & M.E. Huber. 2013. Marine Biology. 9th ed. McGraw-Hill Companies. New York, NY (USA)

Required Course Materials: None

Reference Materials:

Kaiser M.M.J., M.J. Attrill, S. Jennings, D.N. Thomas, D.K.A. Barnes, A.S. Brierley, J.G. Hiddink, H. Karrts Kallio, N.V.C. Polunin, & D.G. Raffaelli. 2011. Marine Ecology: Processes, Systems, & Impacts. 2nd ed. Oxford University Press. Oxford (UK).

Karleskint G.(Jr.), R. Turner, J.W. Small (Jr.). 2013. Introduction to Marine Biology. 4th ed. Brooks/Cole Cengage Learning. Belmont, CA (USA)

Levinton J.S. 1995. Marine Biology. Function, Biodiversity, Ecology. 1st ed. Oxford University Press. New York NY (USA)
[QH91.L427 1995]

Milne D.H. 1995. Marine Life and the Sea. 1st Ed. Brooks/Cole Publ. [QH.91 M45 1995]

Molles M.C. 2010. Ecology: Concepts and Applications. 5th ed. McGraw-Hill. Boston, MA (USA) (QH541.M553 2010)

Nybakken J. W. & M.D. Bertness. 2005. Marine Biology: An Ecological Approach. 6th ed. Pearson/Benjamin Cummings. San Francisco, CA (USA)

Sumich J.L. & J.F. Morrissey. 2004. Introduction to the Biology of Marine Life. 8th ed. Jones and Bartlett Publ. Sudbury, MA (USA)

Instructional Cost: -----

Methods of instruction: The course will be taught by lectures extensively supported by PowerPoint presentations. Handouts will be furnished for each covered chapter. These handouts will be placed on WIKI. The students are asked to print the notes out and bring them to class. These notes will guide the students throughout the lectures and will be a useful tool to prepare the exams. Other material, such as peer-reviewed journal articles and recent news clippings will be furnished for in class discussion and supplemental reading.

Evaluation: Class quizzes and home assignments; 4 tests (including the mid-term and final exams); please note that all test are of “cumulative nature” i.e. always covering the full course content covered up to the date of the given exam

Grading:

Homework, quizzes...	20%
Exams	
Exam 1	20%
Mid-Term	20%
Exam 3	20%
Final Exam	20%

Grading scale:

89.5-100%	A	59.5-69.4%	D
79.5-89.4%	B	0-59.4%	F
69.5-79.4%	C		

Class Attendance: The COM-FSM attendance policy is described on page 117 of the General Catalog 2016-2017 (<http://www.comfsm.fm/catalog/2016-2017/Catalog%202016-2017UPDATED8.pdf>):

“Regular and prompt class attendance is expected of all students. It shall be the student’s responsibility to inform the instructor(s) of anticipated or unavoidable absences and to make up work missed as a result of absences. Mandatory attendance is at the discretion of the instructor provided that conditions for the attendance are included in the course syllabus and communicated to the students on the first day of class.”

My attendance policy is as follow: Students who are absent for more than six classes, will automatically be dropped from the course. The total missed classes include unexcused and excused absences, such as sickness, funerals, and any other circumstances. LATE ARRIVALS COUNT AS AN ABSENCE.

In order to reward the students who always show up on time and never miss class nor laboratory sessions, the following additional grades will be awarded in the following way.

<i>0 absence</i>	<i>3% added to the final grade</i>
<i>1 absence</i>	<i>2% added to the final grade</i>
<i>2 absences</i>	<i>1% added to the final grade</i>
<i>3 absences or more</i>	<i>no bonus</i>

Exams: All students are obligated to write each of the exams. If a student misses an exam, he or she will automatically receive a zero (0) for that specific exam unless the student was sick and furnished a written note signed by a medical expert as proof of sickness. In this case, the other three (3) tests will be re-weighted accordingly. **Please note that there are no “make-up tests”.**

Assignments (Quizzes, homework...): Details of home assignments, quizzes will be given in class.

It is the responsibility of each student to assure that he or she completes and returns all assignments given by the professor. Due dates will be indicated for each assigned work. After this due date, the work will no longer be accepted and the student will automatically receive a zero (0) for the specific assignment not turned in. **All assignments are due at the beginning of the class/lab period. I will not accept any late assignments.**

Academic Honesty: *To ensure the integrity of the educational process and the institution, the College encourages academic honesty, and therefore does not condone cheating, plagiarism, or any related form of academic dishonesty which prevents an instructor from being able to assess accurately the performance of a student in any facet of learning. Students found guilty of academic dishonesty, cheating, plagiarism, and facilitating academic dishonesty will be liable to dismissal or suspension from the College. . (p.115 of the General Catalog 2016-2017: (<http://www.comfsm.fm/catalog/2016-2017/Catalog%202016-2017UPDATED8.pdf>)*

Graffiti and betel nut: Any student found scribbling on desks or chewing betel nut in classes will be liable to dismissal or suspension from the class. (see below for obligations relative to the Pohnpei State betel nut policy effective January 1, 2017)

Peilapalap, Pohnpei: September 16, 2016 - On Friday September 16, 2016 Governor Marcelo Peterson signed the historic BETEL NUT legislation that was unanimously and recently passed by the Pohnpei State Legislature.

The historic legislation prohibits anyone to consume or chew betel nut in government offices, buildings, vehicles, boats, ships and other public gathering settings including Churches and traditional houses (Nahs). The bill also prohibits businesses to sell betel nut to minors under the age of 18. Furthermore, anyone who is in violation of this law will be fined, put in jail or both.

The Governor stated that this legislation was long overdue and is necessary due to the increasing number of cancer related cases and deaths in the State of Pohnpei. He also mentioned that Pohnpei is still under a State of Emergency for Non Communicable Diseases (NCD) and therefore will require the State leadership, community leaders and local stakeholders to work together in reversing the crisis. Furthermore, the Governor tasked the State Department of Health Services and its partners to start with the education and work with relevant State Departments and agencies in enforcing the new Betel Nut law.

The FSM National Cancer Control and Non Communicable Disease Program Manager, Mr. Xner Luther who represented the FSM Secretary of Health Magdalena Walter praised the Governor and the State Legislature for their leadership in tackling the NCD crisis and for setting the standard for Cancer related legislation.

Be on time in class: The official way to synchronize clocks on campus is to refer to:

<http://www.timeanddate.com/worldclock/micronesia/kolonia>

This is the official time based on atomic clocks in Boulder, Colorado. Synchronize your watch to that time and show up on time in class. If you are late, you might face a “locked door” and will not be able to assist class. **Do not forget that late arrivals count as “absences”.**

Electronics: None of the students will be allowed to use electronics in class unless approved. This means that there will be NO USE OF Laptops, MP3s IPods, iPads, iPhones, Tablets etc. Equally, I will not tolerate that students have “earphones” dangling from their ears or around their necks. All these gadgets must be stored away before class starts.

MARINE ECOLOGY --MR210
TENTATIVE COURSE SCHEDULE – SPRING 2017

Week 1 (Jan 9- Jan 13) (Jan 11- Last day add/drop)	<ul style="list-style-type: none"> • Syllabus (Monday, January 9) • Introduction to ecology Readings: Ch 10 & Lecture notes
Week 2 (Jan 16 – Jan 20)	<ul style="list-style-type: none"> • Introduction to ecology (cont.) • Intertidal ecosystems (Ch 11) Readings: Ch 10 & 11 & Lecture notes
Week 3 (Jan 23 – Jan 27)	<ul style="list-style-type: none"> • Intertidal ecosystems (cont.) Readings: Ch 11 & Lecture notes
Week 4 (Jan 30 – Feb 3)	<ul style="list-style-type: none"> • Intertidal ecosystems (cont.) Exam 1 (Wednesday, Feb 1) Readings: Ch 11 & Lecture notes
Week 5 (Feb 6 – Feb 10)	<ul style="list-style-type: none"> • Estuaries Readings: Ch 12 & Lecture notes
Week 6 (Feb 13 – Feb 17)	<ul style="list-style-type: none"> • Estuaries (cont.) • Life on continental shelf Readings: Ch 12/Ch. 13 & Lecture notes
Week 7 (Feb 20 – Feb 24)	<ul style="list-style-type: none"> • Life on continental shelf (cont.) Readings: Ch 13 & Lecture notes
Week 8 (Feb 27 – Mar 3) (Feb 27-28 – mid-terms)	Mid-term evaluation (Monday, February 27) <ul style="list-style-type: none"> • Coral reefs Readings: Ch 14 & Lecture notes
Week 9 (Mar 6 – Mar 10)	<ul style="list-style-type: none"> • Coral reefs (cont.) Readings: Ch 14 & Lecture notes
Week 10 (Mar 13 – Mar 17) (March 17 – Last day to “W”)	<ul style="list-style-type: none"> • Coral reefs (cont.) • Life near surface Readings: Ch 14 & 15 & Lecture notes
Week 11 (Mar 20 – Mar 24)	<ul style="list-style-type: none"> • Life near the surface (cont.) Readings: Ch 15 & Lecture notes
Week 12 (Mar 27– Mar 31) (March 30 – COM-FSM founding day) (March 31 -Holiday: cultural day)	<ul style="list-style-type: none"> • Life near the surface (cont.) Exam 3 (Wednesday, March 29) Readings: Ch 15 & Lecture notes
Week 13 (Apr 3 – Apr 7)	<ul style="list-style-type: none"> • Exam 3 - revision • The ocean depths Readings: Ch 16 & Lecture notes
Week 14 (Apr 10 – Apr 14) (Apr 12-14 Easter Recess & Good Friday)	<ul style="list-style-type: none"> • The ocean depths Readings: Ch 16 & Lecture notes
Week 15 (Apr 11 – Apr 21)	<ul style="list-style-type: none"> • The ocean depths Readings: Ch 16 & Lecture notes
Week 16 (Apr 24 – Apr 28)	<ul style="list-style-type: none"> • Living and Non-living resources from the sea Readings: Ch 17; Lecture notes
Week 17 (May 1 – May 5) (May 2 – last day of instruction) (May 4-6: final exams)	<ul style="list-style-type: none"> • Course revision (May 1) • May 3,4,m & 5– Final Exams
Week 18 (May 8 – May 12) (May 10 – Holiday (FSM Const. day) (May 11 – Graduation)	<ul style="list-style-type: none"> • May 10 – Holiday (FSM Constitutional Day) • May 11 -- Graduation