MRSC A190: MARINE RESEARCH AND MONITORING TECHNIQUES

Item	Value
Curriculum Committee Approval Date	09/06/2023
Top Code	040100 - Biology, General
Units	3 Total Units
Hours	98 Total Hours (Lecture Hours 32; Lab Hours 66)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)

Course Description

This course is designed to illustrate some of the lab and field methods that marine scientists use to research physical and biological processes as well as the structure of marine monitoring programs to aid in marine resource management. PREREQUISITE: MRSC A100 or MRSC A100H; and MRSC A100L or MRSC A100M or MRSC A180L. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Differentiate between the various types of oceanographic equipment and techniques used to quantitatively learn about marine communities and processes.
2. Investigate the format of marine monitoring programs including their regulatory mandate, basic elements and considerations, and procedures used in assessing marine environmental health.
3. Design and conduct basic marine monitoring and research studies, the ability to search the scientific literature, and the ability to communicate scientific findings.

Course Objectives

- 1. Develop the skills to construct basic marine research and monitoring studies.
- 2. Identify the basic purposes and designs of marine research and monitoring programs.
- 3. Learn the basics of experimental design, biostatistics, hypothesis testing, and uses of indices.
- 4. Learn basic marine field sampling and laboratory testing techniques.
- 5. Understand how remote sensing, GIS, and modeling are used in marine environmental research and monitoring.
- 6. Learn how to search and utilize the various types of scientific literature.
- 7. Demonstrate the ability to communicate scientific research results in written and oral formats.

Lecture Content

Water quality testing and analysis Understanding important water quality parameters Methods of sampling Interpretation of results Remote sensing and use of satellite data Biological sampling and data collection methods Observational: transects, quadrats, ROVs, etc Collections: beach seines, trawls, organisms handling techniques, tagging, etc Invertebrate community identification Bioassays Designing and evaluation experiments and monitoring programs Use of proxy data Biostatistics Graph interpretation Modeling Searching and understanding scientific literature

Lab Content

1. Experience with water quality testing and analysis a. Chem colorimetric tests / titrations b. Probes / calibration c. Deploying and analyzing Seabird data d. Sediment grabs e. Rosettes / collecting water samples 2. Demonstration and experience with sampling and data collection methods a. Transects b. Quadrats c. Beach seines d. Trawls e. Proper handling techniques f. Tagging organisms 3. Bioassays 4. Designing experiments a. Collecting data b. Illustrating principles or correlations with statistics, tables and graphs c. Interpretations d. Written analyses and report formulation

Method(s) of Instruction

- Lecture (02)
- Lab (04)

Instructional Techniques

1. Lecture and PowerPoint presentations illustrating how researchers conduct scientific investigations including the equipment and techniques commonly used. 2. Lab investigations providing hands-on experience with commonly used equipment and procedures. 3. Field trips designed to allow students to collect data and gain experience using research equipment in marine environments. 4. Experience in data analysis and evaluation of hypotheses as well as marine monitoring program effectiveness.

Reading Assignments

Reading from assigned chapters in the course texbook or other provided materials to better understand research technique background information (1 hr/week).

Writing Assignments

Writing assignments based on manipulating and interpreting data collected in the lab or field (1 hr/week).

Out-of-class Assignments

Semester-long project designed to give students experience in planning, monitoring, and analyzing data from a study that they design (2 hrs/ week).

Demonstration of Critical Thinking

Critical thinking will play a large role in this course in that students will be required to develop testable hypotheses based off of data and observations, and then collect additional data, and critically interpret that information to arrive at a scientific conclusion. These conclusions must be discussed in the context of past studies and general principles of marine science.

Required Writing, Problem Solving, Skills Demonstration

Students will be required to demonstrate the use of a variety of sampling equipment and will need to interpret what the data they collect suggests as well as communicate those findings and interpretations in written reports.

Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Gerald J. Bakus. Quantitative analysis of Marine Biological Communities, ed. John Wiley Sons Publishing, 2007 Rationale: While this particular textbook is older than 5 years, it is considered to be an industry standard and since this course is a relatively niche field, this is the best teaching text that we have found to help students be successful in this field.