Course Number:	**MAR599-01**
Course Title:	**Ecological Mechanics**
Instructor:	Prof. Geoff Cowles
Offered:	Fall 2018
Location:	SMAST-East Room 101 + Distance Learning via Zoom
Time:	T/R 9:30-10:45
Contacts:	SMAST-East 227 / 508-910-6397 / gcowles@umassd.edu
Prerequisites:	Introductory College Calculus & Physics (May be waived with permission from instructor)
Textbook:	Ecological Mechanics, Mark Denny

Course Description: This course covers the physics and engineering principles underlying form and function in the natural world. The curriculum will emphasize application of these principles through classroom examples, homework content, and projects. Although applicable to terrestrial organisms, the majority of course examples will focus on marine organisms. The course level is appropriate for graduate students and upper division undergraduates. The class will be available for distance learning through Zoom videoconferencing.

Course Objectives:

1. Provide an introduction to the mechanics of fluids, heat, and materials using a descriptive approach
2. Analyze concrete ecological applications of mechanics including adaptation, morphology, locomotion, metabolism, and feeding across a wide range of scales.
3. Develop conceptualization and analytical skills to conduct analyses of ecological systems.

Tentative Course Topics:

1. Background: A review of physics and math and a close look at some of the functional forms that are used to model system response and interactions.

2. Fluid Mechanics: In this unit we will examine the conservation laws that govern the motion of fluids and look at several phenomena including diffusion, boundary layers, and turbulence. We will estimate forces generated by fluids and use these to examine the methods of locomotion of animals at small and large scale.

3. Thermal Mechanics: This unit will cover heat budget models and a study of mechanisms for heat transport in the context of metabolism and thermal regulation of animals.

4. Solid Mechanics: In this unit we will study key properties of materials such as stress, strain, and breaking strength. We will apply these to the application of fundamental statics problems including adhesion and bending to look at the structural morphology in several organisms.