

# *Marine Adaptations: Invertebrate Physiology*

## *FAS 6154 section 188G (F2F) (3 credits) Fall 2017*

### **Course Description**

This course will examine and compare the physiological adaptations of marine, coastal, and estuarine invertebrates to environmental conditions. The processes examined will span several levels of organization, from ecological and organismal to cellular and molecular. Examples will be drawn from rocky intertidal, salt marsh, coral reef, and deep sea habitats, among others.

**Prerequisites:** BSC 2010 and 2011 or equivalent; courses in animal physiology and ecology are recommended.

### **Instructor**

Dr. Shirley Baker

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### **Teaching assistant**

Taylor Lipscomb

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### **Student Learning Outcomes**

At the end of this course, each student will be able to:

- Describe the basic principles and key mechanisms of physiological adaptation in a variety of invertebrate phyla
- Compare the physiology of invertebrate organisms adapted to marine, coastal, and estuarine environments
- Apply critical thinking in evaluating literature of the discipline
- Analyze the underlying importance of physiology in ecological patterns observed in communities and ecosystems

**Course Meeting Times** T 9 (4:05-4:55), R 8-9 (3:00-4:55)

**Location** McCarty Hall B (MCCB) 3096

## **Required Texts/Readings**

1. There is no required textbook for this course. However, the following textbook is highly recommended; reading appropriate sections before the corresponding lecture will help clarify the topics discussed. This book can be purchased new, used, as an e-book, or as a rental, from a variety of online vendors.

Willmer, Pat, Graham Stone, and Ian Johnston. 2005. *Environmental Physiology of Animals*, 2<sup>nd</sup> Edition. Wiley-Blackwell.

2. Relevant readings from journals or other media will be required for discussion sessions.

## **Class Format, Policies on Attendance and Assignments**

### **Contacting the instructor and/or TA:**

Please use the Canvas message system. Messages sent by email or posted in the Canvas discussion area may get lost.

### **Course format:**

This course will consist primarily of lecture and discussion sessions. Students are expected to have read assigned materials prior to class sessions.

### **Attendance policy:**

Class participation facilitates learning. Regular attendance and participation in lecture and discussion is expected. Absent students are responsible for acquiring missed lecture notes. See specific assignments for further details.

### **Late assignment policy:**

Late materials will have 10% of the total possible points deducted for every day late.

### **Quiz policy:**

Once a quiz closes, it will NOT be reopened.

## **Please check *Announcements* in Canvas on a regular basis**

## Assignments

**Critical reading questions: 12 @ 2 points each.** A critical thinking writing assignment associated with the discussion paper will be due at 3pm on *Discussion* days (see schedule). Questions will be posted on Canvas the week prior to their due date and must be submitted in Canvas.

**Discussion participation: 10 @ 5 points each.** The class will discuss papers from the primary literature, which will be made available on Canvas during the week prior to the discussion. Students will be expected to read the paper prior to class and to *actively participate* in every discussion. There will be 12 discussion sessions. During two of the sessions, the student will be graded as a Discussion Leader; these sessions will not double-count. Students who anticipate missing a discussion session must contact the instructor *prior* to class. Unexcused absences will result in a score of zero for that day's discussion session. Further details and a grading rubric will be provided.

**Discussion Leadership: 2 @ 10 points each.** Twice during the semester, students (pairs or groups, depending on class size) will be expected to lead the literature discussion session. A schedule will be posted on Canvas. Further details and a grading rubric will be provided.

**Quizzes: 14 @ 2 points each.** Quizzes will be administered through Canvas (see schedule). Quizzes will consist of multiple choice, short answer, and short essays. Questions will be "open notes" but will require critical thinking, integration, and application of interdisciplinary concepts. Quizzes will open and close on the dates noted.

**Assignments: 50 points.** Students will develop a "**Species Profile**" over the course of the semester. Each of six assignments must be submitted to Canvas by midnight on the due date (see schedule). Assignment #1: The instructor will approve the species selected and provide feedback on literature resources. Beginning with Assignment #2, writing will be edited by the instructor/TA, and returned via Canvas. When submitting the following assignment (e.g., Assignment #3), students are expected to submit the new section as well as correct the previous section (e.g., Assignment #2). Each assignment will add to the Species Profile. Primary scientific literature must be cited; **a limited number of web sites may be used**. Further details and a grading rubric will be provided.

Assignment #1: Species selection, justification, and list of potential resources, **5 pts**

Assignment #2: Introduction to species, **10 pts**

Assignment #3: Physiological challenges faced, **10 pts**

Assignment #4: Discussion of adaptations to one physiological challenge, **10 pts**

Assignment #5: Discussion of adaptations to a second challenge, **10 pts**

Assignment #6: Final submission, **5 pts**

**Presentation Participation: 2 @ 5 points each.** Graduate students have the additional assignment of giving a presentation on their selected species (see schedule). All students will be expected to actively participate in the presentations.

**F2F students:** 1) Must be present in class, actively listen to the F2F presentations, and participate in the discussion, **and** 2) Watch the DE *VoiceThread* presentations, either in class or on your own time, and actively participate in *VoiceThread* responses. Further expectations and a grading rubric will be provided.

**Grad only – Species profile presentation: 1 @ 15 points.** Graduate students will present their Species Profile to the class as a lecture of at least 20 minutes, but no more than 25 min.

**F2F Students:** Students will present in class, followed by a discussion. A F2F question and answer period will follow. The lecture will be recorded in class for DE students to view asynchronously. F2F Students will be expected to respond to DE student questions via *Canvas*. Assigned presentation dates will be posted on *Canvas*. A PDF of the PowerPoint will be due on the day of the presentation. Further details and a rubric will be provided.

### Evaluation of Student Learning

Critical reading questions, 12 @ 2 points each	24 points
Discussion participation, 10 @ 5 points each	50 points
Discussion leadership, 2 @ 10 points	20 points
Quizzes, 14 @ 2 points each	28 points
Assignments, 2 @ 5 points each, 4 @ 10 points each	50 points
Presentation participation, 2 @ 5 points each	10 points
Species profile presentation, 1 @15 points	15 points
<b>TOTAL</b>	<b>197 points</b>

### Grading Scale

Final grades will be assigned based on the percentage of total points earned. For additional information on UF grading policies, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

A	= 90-100%
B+	= 85-89%
B	= 80-84%
C+	= 75-79%
C	= 70-74%
D	= 60-69%
F	= < 60%

<b>Schedule</b>			
<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Assignments</b>
<b>1</b>	22 August	<b>Introduction to the course</b>	
	24	<b>Course assignments and expectations</b>	<b>Quiz wk 1</b> <i>Opens midnight</i>
<b>2</b>	29	<b>Adaptations in context: Habitats</b>	<b>Quiz wk 1</b> <i>Closes midnight</i>
	31	<b>Adaptations in context: Invertebrate phyla</b> <i>Discussion wk 2</i>	<b>Reading Q wk 2</b> <i>Due 3pm</i> <b>Quiz wk 2</b> <i>Opens midnight</i>
<b>3</b>	5 September	Metabolism	<b>Quiz wk 2</b> <i>Closes midnight</i> <b>Assignment #1</b> <i>Due midnight</i>
	7	<b>Life in Fluid</b> <i>Discussion wk 3</i>	<b>Reading Q wk 3</b> <i>Due 3pm</i> <b>Quiz wk 3</b> <i>Opens midnight</i>
<b>4</b>	12	<i>No F2F class</i> <i>Online activities will be assigned.</i>	<b>Quiz wk 3</b> <i>Closes midnight</i>
	14	<b>Life in Fluid</b> <i>Discussion wk 4</i>	<b>Reading Q wk 4</b> <i>Due 3pm</i> <b>Quiz wk 4</b> <i>Opens midnight</i>
<b>5</b>	19	<b>Sensory adaptations</b>	<b>Quiz wk 4</b> <i>Closes midnight</i> <b>Assignment #2</b> <i>Due midnight</i>
	21	<b>Feeding and digestion</b> <i>Discussion wk 5</i>	<b>Reading Q wk 5</b> <i>Due 3pm</i> <b>Quiz wk 5</b> <i>Opens midnight</i>
<b>6</b>	26	<i>No F2F class</i> <i>Online activities will be assigned.</i>	<b>Quiz wk 5</b> <i>Closes midnight</i>
	28	<b>Symbioses</b> <i>Discussion wk 6</i>	<b>Reading Q wk 6</b> <i>Due 3pm</i> <b>Quiz wk 6</b> <i>Opens midnight</i>
<b>7</b>	3 October	<b>Symbioses</b>	<b>Quiz wk 6</b> <i>Closes midnight</i>

	5	<b>Respiration – Gases, exchange surfaces</b> <i>Discussion wk 7</i>	<b>Reading Q wk7</b> <i>Due 3pm</i> <b>Quiz wk 7</b> <i>Opens midnight</i> <b>Assignment #3</b> <i>Due midnight</i>
<b>8</b>	10	<b>Respiration – Ventilation</b>	<b>Quiz wk 7</b> <i>Closes midnight</i>
	12	<b>Respiration – Circulation, respiratory pigments</b> <i>Discussion wk 8</i>	<b>Reading Q wk 8</b> <i>Due 3pm</i> <b>Quiz wk 8</b> <i>Opens midnight</i>
<b>9</b>	17	<b>Temperature</b>	<b>Quiz wk 8</b> <i>Closes midnight</i>
	19	<b>Thermal adaptations</b> <i>Discussion wk 9</i>	<b>Reading Q wk 9</b> <i>Due 3pm</i> <b>Quiz wk 9</b> <i>Opens midnight</i>
<b>10</b>	24	<i>No F2F class</i> Online activities will be assigned.	<b>Quiz wk 9</b> <i>Closes midnight</i> <b>Assignment #4</b> <i>Due midnight</i>
	26	<b>Salt and water</b> <i>Discussion wk 10</i>	<b>Reading Q wk 10</b> <i>Due 3pm</i> <b>Quiz wk 10</b> <i>Opens midnight</i>
<b>11</b>	31	<b>Salt and water balance</b>	<b>Quiz wk 10</b> <i>Closes midnight</i>
	2 November	<b>Excretion</b> <i>Discussion wk 11</i>	<b>Reading Q wk 11</b> <i>Due 3pm</i> <b>Quiz wk 11</b> <i>Opens midnight</i>
<b>12</b>	7	<b>Oxygen limitation</b>	<b>Quiz wk 11</b> <i>Closes midnight</i>
	9	<b>Anaerobic metabolism</b> <i>Discussion wk 12</i>	<b>Reading Q wk 12</b> <i>Due 3pm</i> <b>Quiz wk 12</b> <i>Opens midnight</i> <b>Assignment # 5</b> <i>Due midnight</i>
<b>13</b>	14	<b>Grad presentations</b> <i>Presentation participation#1</i>	<b>Quiz wk 12</b> <i>Closes midnight</i>
	16	<i>No F2F class</i> Online activities will be assigned.	<b>Quiz wk 13</b> <i>Opens midnight</i>
<b>14</b>	21	<b>Grad presentations</b> <i>Presentation participation #2</i>	<b>Quiz wk 13</b> <i>Closes midnight</i>

	23	<i>Thanksgiving No class</i>	
<b>15</b>	28	<b>Extreme habitats, Deep sea</b>	<b>Assignment #6</b> <i>Due midnight</i>
	30	<b>Global change</b> <i>Discussion wk 15</i>	<b>Reading Q wk 15</b> <i>Due 3pm</i> <b>Quiz wks 14 and 15</b> <i>Opens midnight</i>
<b>16</b>	5 December	<b>Course summary/Flex day</b>	<b>Quiz wks 14 and 15</b> <i>Closes midnight</i>

*Note that this schedule may be changed due to hurricane days, needing to spend more time on a particular topic, etc. Students will be given ample notification of any changes. **Please check Announcements in Canvas on a regular basis.***

### **Additional References**

Background material for two of the lectures, *Life in Fluid* and *Symbioses*, is not available in the recommended Willmer et al. text book. Therefore, it is suggested that the following materials be read before the corresponding lectures to help clarify the topics. These books can be purchased new, used, as an e-book, or as a rental, from a variety of online vendors. Older editions may be available in the UF library.

1. Levinton, Jeffrey S. 2009. *Marine Biology; Function, Biodiversity, Ecology*, 3<sup>rd</sup> Edition. Oxford University Press.
2. Nybakken, James W. and Mark D. Bertness. 2005. *Marine Biology; An Ecological Approach*, 6<sup>th</sup> Edition. Pearson Benjamin Cummings.

## Other Information

### Academic Honesty, Software Use, UF Counseling Services, Services for Students with Disabilities

In 1995 the UF student body enacted an [honor code](#) and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

**The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.**

On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior.

Students should report any condition that facilitates dishonesty to the instructor, department chair, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office.

*(Source: 2011-2012 Undergraduate Catalog)*

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

#### **Software Use:**

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.



## **Campus Helping Resources**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)*  
Counseling Services  
Groups and Workshops  
Outreach and Consultation  
Self-Help Library  
Training Programs  
Community Provider Database
- *Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)*

## **Students with Disabilities**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)