Course Syllabus- Biology 322/322L- Physiological Ecology Fall Semester 2010

***Instructor*:** Dr. Scott Parker

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Office Hours: Tuesday 1:30-4:30, Wednesday 1:30-4:30, Thursday 1:30-4:30, or by appointment

***Class Meeting Time and Location*:** Lecture: Monday, Wednesday, Friday 9:30-10:20, SCI 107 Laboratory: Monday 2:30-5:20, SCI 222

***Required textbook*:** *Animal Physiology: Mechanisms and Adaptations*. Randall, Burggren, and French. 5th ed. W.H. Freeman and Company.
Supplemental reading material (Note: this is not a requirement): *Life at the Extremes: the Science of Survival.* University of California Press.

Course description: Bio 322- Physiological ecology lecture: (3) (Prereq: None, but Biology 122 or Marine Science 302 and Chemistry 331 are HIGHLY recommended) (Coreq: Biology 322L) The study of physiological adaptations which allows organism to function in their environment. Three lecture hours per week. S.
Bio 322L- Physiological Ecology Laboratory: (1) (Coreq: Biology 322) Laboratory exercises to accompany Biology 322. Three laboratory hours per week. S.

***Objectives*:** We will examine physiological mechanisms and evolutionary adaptations which allows animals to function in their environment. A central theme of the course focuses on understanding the constraints imposed by the biophysical environment and how animals adapt physiologically to these constraints. Topics to be covered include the molecular basis of adaptation, gas exchange, metabolism, energetics, locomotion, thermal relations, and water and solute metabolism.

Student Learning Outcomes:
After completing this course, students should be able to:

1. Understand important physiological challenges animals face, how those challenges vary in relation to environmental constraints, and the processes by which animals deal with these challenges.
2. Develop critical thinking skills and be able to apply physiological and evolutionary concepts and principles at the basic and applied levels.
3. Develop an understanding of the role of evolutionary processes (e.g. natural selection) in driving the organization of physiological systems.
4. Relate physiological processes, from the biochemical to the system level, to the function of the entire organism in its environment.

5. Develop an understanding of current research topics in physiological ecology using the primary literature and to develop research questions and methodology to address these questions.
6. Learn to properly, ethically, and safely use animals and modern laboratory equipment to conduct physiological research.

***Evaluation*:**

Midterms: **First exam 18% Wed, 22 Sept**
Second exam 18% Mon, 25 Oct

Final exam: **Comprehensive, 24% Mon, 6 Dec**

Exam make-up policy: Exam dates may not be changed unless you receive prior approval by me. Make up exams are only given for university-approved absences. Please see the CCU 2010 Catalog p. 41 for specific information.

Paper Discussion 1: 3.3%
Paper Discussion 2: 3.3%
Paper Discussion 3: 3.3%

In-class assignments: 18%

(Please note: the in-class assignments and paper discussions account for a total of 28% of your grade. Together they are worth more than one midterm exam. Take them seriously!)

Research paper: 12%

Exams: Exams are mandatory and will include all material covered in class up until the exam date. Format of exams can include: essays, short answer, true/false, multiple choice, fill in the blank, math problems, drawings, graphs and just about any other type of test question. **The final exam is cumulative.**

Paper discussion: I will assign three journal articles over the course of the semester for you to read. I will post the papers on Blackboard approximately one week before the class discussion. Your grade will be based on how well you are able to answer questions about the paper, vocabulary within the paper, and effort during the discussion.

In-class assignments: Short assignments that address the various topics/concepts covered will be given at various times throughout the course. These assignments may consist of calculations or range from a few words to a few paragraphs no more than two pages in length (double spaced with 1'' margins). The purpose of these short assignments are twofold: 1) they will help me determine which concepts students may

be having trouble with, and, 2) it will help you keep actively engaged in the material as we cover it.

Research paper: The purpose of the research paper is for you to conduct a literature review on a topic of your choice related to physiological animal ecology. You must conduct the literature review of your topic using **peer-reviewed** scientific literature. **No non-peer reviewed sources will be accepted! That means absolutely no Wikipedia or web citations.** Choice of topic can be anything related to physiological adaptations of animals to the environment so I encourage you to select a topic that you are enthusiastic about. You will turn in a prospectus to me by the third week of class stating your topic of choice and the reason why the topic is important. I will provide you with comprehensive information on the requirements for the paper in a separate handout.

Determination of Grade: The final grade will be assigned based upon the percentage of the total points earned. If you score in the ranges listed below you are assured getting at least the letter grade shown. It is possible that the scale could drop, but you are promised that it will not be raised. NO EXTRA CREDIT ASSIGNMENTS WILL BE GIVEN ON AN INDIVIDUAL BASIS. Extra credit may be given to the class as a whole.

Assignment	**Points**
Exam 1	180
Exam 2	180
Final exam	240
Paper disc 1	33.3
Paper disc 2	33.3
Paper disc 3	33.3
In-class assignments	180
Paper	120
Total	1000

Grade	%	**Earned Points**
A	90-100	899.5-1000
B+	87-89	869.5-899
B	80-86	799.5-869
C+	77-79	769.5-799
C	70-76	699.5-769
D+	67-69	669.5-699
D	60-66	599.5-669.5
F	< 60	< 599

Returned assignments: I will return all assignments in a timely fashion. If you have a question about a returned grade, you must notify me within TWO WEEKS of having received the returned assignment/quiz/exam. After two weeks, all grades will be considered final.

Policies:
My goal is to foster an active learning environment. To achieve this goal, I ask that you refrain from engaging in conversation during lecture. Try to avoid being late to class, however, should you have to arrive late, please find a seat near the entrance where you entered the classroom. Similarly, if you have to leave early, please sit near an exit so that your departure does not disturb the class. **Also, as a courtesy to all of your colleagues, please turn off all cell phones while class is in session. Just to be clear this means NO TEXTING!**

Academic dishonesty- I view students as junior colleagues and as such I expect that you will maintain the highest standards of academic integrity. Each student is expected to do their own work on all assignments and examinations. Copying another's work, plagiarism, and any other forms of academic dishonesty will result in a 0 for the assignment. Any students involved in copying or cheating on an exam will receive an F for that exam.

Attendance (student)- As life scientists, I assume that you are invested in your own education and are enrolled in this course because you want to be here. Consequently, attendance is not mandatory, but it is expected. I will take attendance daily (although it does not count towards a grade) to comply with federal financial aid regulations. Please understand that if you want to do well in the course you will need to attend class regularly and on time. **As an additional incentive, in-class assignments may be given on an impromptu basis so if you miss class you may very well also lose easy points on simple assignments.**

Attendance (mine)- I know that your time is important so I will do my utmost to begin class on time. I don't plan on being late but in the unlikely event that I am late and unable to provide prior notification, students are expected to wait 15 minutes before leaving the classroom.

Blackboard Site: All reading assignments, text of handouts and individual grades will be available on this site. The Blackboard website may be accessed at http://www.coastal.edu/blackboard/

Disability Accommodations: Accommodations are available for all students who have a disability that may prevent him or her from fully demonstrating their ability. Please let me know of any accommodations that you may need for this course as soon as possible. Please contact Counseling Services: http://www.coastal.edu/counseling/ to assess your disability and provide you with the necessary documentation that you will then pass on to me. Counseling Services can be reached at (843) 349-2305. The office is located at 204 University Blvd in the Student Health Services/Counseling Services Building.

Some suggestions for how to do well in the course:

Please Note: Subject matter for lectures will be drawn from a variety of sources. There is no truly comprehensive textbook on physiological ecology, therefore some of the material we talk about in class may not be included in the required course text. Whenever possible, I will provide additional resources to help support your study efforts.

- We will be covering a lot of material over the semester so it is crucial to stay actively engaged and not get behind. I recommend studying at least some every day and most importantly, if you do not understand something, make sure to come see me for help.

- If possible, form study groups with your colleagues. Talking about physiological concepts and processes with others will help show you where your strengths and weaknesses lie and also helps to increase your understanding of the material.
- Rewrite and clarify any parts of your lecture notes as needed. If you read through your notes and something does not make sense please ask me.
- Exams are based on material that we cover in class. I will use examples and material from the textbook to support the lectures but I will also use material from outside sources. The textbook should be used as a resource to compliment the lectures. Use the text to clarify and add context to material that you might not understand or that was only covered briefly during lecture.
- The evening or morning before class, skim the relevant areas of the textbook. By skimming the topics in the text prior to class you will be familiarized with the material and you will get a lot more out of the lecture.
- In science details matter. The material covered in the course will range from relatively broad concepts to understanding of specific mechanisms and metabolic pathways. If you are unsure of how best to study or what details are important please ask.
- As much as your can help it, do not try to "cram" for exams in this course. Try to get a decent amount of sleep before the exam.
- Always feel free to ask questions and please come see me if you need help or even if you are just curious about something that we talked about in lecture or lab.

Schedule of Topics (NOTE: this schedule is tentative)

Date	**Topic**
18- Aug	Course overview, administrative issues, animals and environments (Ch. 1)
20-Aug	Responses of animals to environmental change, homeostasis, the molecular basis of adaptation (Ch. 1)
23-Aug	The Earth' major environments: water vs. air, Gas exchange (Ch. 13)
25 Aug	Gas exchange and physiology of ventilation in aquatic environments: (Ch. 13)
27 Aug	Gas exchange in fish: water-breathers and air-breathers (Ch. 13)
1-Sept	Gas exchange in fish, con't
3-Sept	Gas exchange in terrestrial environments (Ch. 13)

Schedule of Topics (continued)

Date	Topic
6-Sept	**No Class: Labor Day, Holiday**
8-Sept	Oxygen and carbon dioxide transport: respiratory pigments
10-Sept	Hypoxic environments and physiological adaptations to hypoxia (Ch. 13 pp 568-570)
13-Sept	Oxygen and carbon dioxide transport: circulation (Ch. 12)
15-Sept	Circulation: influence of gravity on blood flow to the brain (supplementary material)
17-Sept	Digestive physiology and nutrient acquisition (Ch. 15)
20-Sept	Symbioses (supplementary material)
22-Sept	**Midterm I**
24-Sept	Metabolism: measuring metabolic rate, problems of size and scale (Ch. 3, pp 72-76, Ch. 16)
27-Sept	Metabolism, con't
29-Sept	Anaerobic metabolism
1-Oct	Physiology of diving animals (supplementary material)
4-Oct	Metabolic depression: leaving the pilot light on (supplementary material)
6-Oct	Muscle energetics (Ch. 10)
8-Oct	Energetics of locomotion: swimming, running, flying, buoyancy (Ch. 16)
11-Oct	Energetics of locomotion: what does it take to fly? (Ch. 16, supplementary material)
13-Oct	Thermal relations: Temperature adaptation and thermoregulation in poikilotherms (Ch. 17)
15-Oct	**Holiday-No classes**

Schedule of Topics (continued)

Date	Topic
18-Oct	Thermal relations: temperature adaptation and thermoregulation in homeotherms
22-Oct	Temperature adaptations in hot and cold environments
25-Oct	**Midterm II**
27-Oct	Sensory perception: auditory, olfactory and visual processing (Chs. 5, 6, 7)
29-Oct	Sensory perception (con't)
1-Nov	Osmoregulation in aquatic environments (Ch. 14)
3-Nov	Osmoregulation in terrestrial environments
5-Nov	Nitrogen metabolism and excretion (Ch. 14)
8-Nov	Nitrogen metabolism and excretion, con't
10-Nov	Reproductive physiology (Ch. 16, pp 693-695, plus supplementary material)
12-Nov	Reproductive physiology, con't
15-Nov	Physiology of parasites: life under your skin (supplementary material)
17-Nov	Physiology of parasites, con't
19 Nov	Space travel: physiological effects of zero gravity (supplementary material)
22-26 Nov	**Thanksgiving Break**
29-Nov	Physiological effects of zero gravity, con't
1-Dec	Catch-up and review

6-Dec (Monday) Final Exam (11:00 am)

Physiological Ecology Laboratory (BIOL 322-Fall 2010)
(Please note: this is schedule may be subject to change)

Date	**Topic**
23-Aug	Introduction, administrative issues, lab safety, hypothesis testing, data presentation
30-Aug	Metabolic oxygen consumption of avian embryos
6-Sept	**Memorial Day Holiday**
13-Sept	Metabolic oxygen consumption of avian embryos II
20-Sept	Metabolic oxygen consumption analysis
27-Sept	Characterization of skeletal muscle fiber
4-Oct	Tardigrades: cute, cuddly and almost indestructible
11-Oct	Molecular basis of adaptation I: alcohol metabolism in *Drosophila*
18-Oct	Molecular basis of adaptation II: alcohol metabolism in *Drosophila*
25-Oct	Osmoregulation in crayfish
1-Nov	Anaerobic metabolism in response to exercise in crayfish
8-Nov	Comparative analysis of eggshell calcium composition
15-Nov	Comparative analysis of eggshell calcium composition II
29-Nov	Student Presentations

Laboratory grade

Lab Write-up	25%
Lab notebook	50%
Presentations	25%

Letter grades for the lab are assigned as a percentage basis as follows:

90-100%	A
87-89%	B+
80-86%	B
77-79%	C+
70-76%	C
67-69%	D+
60-66%	D
< 60%	F

Please note: NO MAKE UP LABS ARE POSSIBLE!!

Notice of live animal use: Experiments in BIOL 322 laboratory will often involve the use of live animals. While maximum effort has been made to use non-invasive, non-lethal procedures, there is no better way to fully appreciate and understand the physiology of animals than by studying their function first hand. Computer simulations simply cannot mimic the integrated function of a living animal. If you have objections to carrying out experiments on live animals then I would recommend not taking this course. No substitute assignments will be made for individuals who choose not to participate in laboratory experiments. If you voluntarily choose to not participate in a laboratory experiment, then you will receive a "0" for that assignment.

Lab Write-ups- A selected number of laboratory experiments will be written-up in the style of a scientific journal article. You will receive further information on the specific requirements of a given laboratory in due course. An important component of this laboratory course is learning how to present data obtained from experiments in graphical or tabular format. We will spend considerable time on this topic so that by the end of the course you will be able to independently summarize and present your research data so that it is easily interpretable by readers.

Laboratory Notebooks: Laboratory notebooks are a critical component of any research project. At minimum, information in laboratory notebooks records the purpose, materials and methods, and results of experiments. The notebook provides an important record for you as the researcher as well as other scientists who may be working in similar areas. As you work through an experiment you will record the objective of the experiment, the methods, and results. This record will then be used as the basis of your formal laboratory write-up. Remember, the laboratory notebook should be organized and sufficiently clear so that an independent scientist generally familiar with the topic

can follow your instructions and duplicate the experiment. More information on laboratory notebooks will be provided in a separate handout.

Student Presentations- The presentation in lab will compliment and be based upon the research paper that you will submit as part of the lecture portion of the course. The presentation is your opportunity to explore an area of physiological ecology that you find interesting and present the results of your literature review to the entire class. Once you have developed the proposal you will present it to the class in a seminar format using Powerpoint. Presentations should be no more than 12 minutes long in total. At least 10-minutes of your allotted time should be dedicated to the presentation itself, and at approximately two minutes for questions. Begin investigating your research question early in the semester. Topics may be any area of physiological ecology that you find interesting. Your final selected topic will be developed through consultation with me. More information on presentations will be provided in a handout during one of the lab sessions

Legal Caveat/disclaimer: The above schedule, policies, procedures and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better student learning.