

Fish Physiology (Biol 4010/6010) Spring 2015

Instructor: Dr. Theresa J. Grove
Office: BC 1099
Office hours: Monday 11:00-12:30pm; Friday 9:00-10:30; or by appointment
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Course goals and objectives:

- 1) Examine the physiology of fishes including the adaptive significance of physiological processes in fishes adapted to different environments.
- 2) Learn about the latest findings in physiology of fishes in the primary literature.
- 3) Learn some of the techniques that are used to study fish physiology.
- 4) Continue to gain experience analyzing and interpreting experimental data.
- 5) Continue to practice scientific writing to learn to clearly, succinctly and professionally express yourselves.

Textbook: Required: Ecological and Environmental Physiology of Fish, Eddy and Handy, 2012 (paperback isbn: 978-0199540952). Note: this book can also be purchased as a hard back or ebook from Amazon. Supplemental reading will be given in class.

Grades: Grades will be based on:

Lecture Exams (4 at 100 points each, lowest grade dropped)	300 points
Lab exams (1 at 50 points)	50 points
Discussion and Lecture/Lab Assignments	~100points
Graduate students: Grant Proposal	100 points
Cumulative Final	100 points

Grade Scale: A 90-100%
B 80-89%
C 70-79%
D 60-69%
F < 60

If you need help come see me early-on in the semester. Do NOT wait until the end of February!

Class Timing: This class is only held during the first half of the semester. To meet the required number of minutes lecture is Monday and Wednesday 8:00-10:50. I will give you a ~10 minute break halfway through lecture. Lab is held Tuesday and Thursday 2:00-4:50. The information you are expected to learn is the same as during a "regular" semester. Remember, this is an elective; you chose to take this course. Be prepared for the first half of your semester to be extremely busy because you are doubling-up on this course, and look forward to the second half of the semester when you will have this course completely finished.

Slides: I will post slides on Blazeview no later than 5:00pm the day before lecture. Students are responsible for taking notes because the slides that are posted will not have all the information. I will not give students access to my "complete" slides. If you miss a class it is your responsibility to get the notes from another student.

Exams: Four lecture exams (excluding the final) will be given throughout the semester. Each exam will be 100 points and will consist of a variety of types of questions that will include (but aren't limited to) matching, multiple choice, labeling, fill in the blank, and essay. It is the instructor's prerogative to accept (or not accept) an excuse for a missed exam. If an absence is approved, the instructor reserves the right to change the format of the exam. A lab exam will be given to test your understanding of techniques and concepts you learn in lab and will include primary literature you read. You will be able to drop the lowest lecture exam grade; however the final will not be dropped.

Discussion and lecture/lab assignments: Students will earn your points based on your ability to answer questions on primary literature you read. Prior to discussing primary literature in lecture or lab you will be required to submit 3 well-thought out questions on the literature you read prior to the discussion. Other assignments including data analysis will be assigned throughout the semester. **Generally, no late assignments and no emailed assignments will be accepted!**

Grant Proposal: Graduate Students are required to write a grant proposal examining an aspect of physiology. They will follow NSF guidelines for a preliminary proposal through BIO-IOS (<http://www.nsf.gov/pubs/2013/nsf13600/nsf13600.htm>). Because of the time of this course, this proposal is due March 27 at 3:00pm.

Final: The final will be cumulative in a format similar to the other exams. The date of the final is March 9.

Attendance Policy: Attendance to lecture is highly recommended because if you miss one lecture you are missing one week's worth of information from a "regular" semester. Attendance to lab is required. If you miss a lab I reserve the right to determine what constitutes an excused or unexcused absence. To name a couple of examples of unexcused absences, scheduled appointments or leaving town, except for University related activities (e.g. you are on a sports team or are presenting at a conference), do not constitute excused absences. "Not feeling well" will only work one time as an excused absence; any additional "not feeling well" absences will be counted as unexcused.

Labs cannot be made up; therefore do not miss a lab. I also reserve the right to determine what constitutes an excused absence from lab. If you miss 2 labs (excused or unexcused) you will not be able to earn higher than a C for your final grade. If you miss 3 labs, you cannot earn higher than a D. If you miss more than 3 labs you will earn an F for the course.

Conduct: Arrive on time to lecture and lab. If it seems like there is a significant number of students arriving late to lecture and/or lab, I will start locking doors at 5 minutes after the scheduled start time, and the door will not be opened for a late arrivers. Turn off cell phones during lecture and lab; there is no reason you should be texting or calling anyone. Don't talk during lecture; if you don't understand something or didn't hear something ask. Unless it's an emergency (and texting does not constitute an emergency) do not get up in the middle of lecture, leave and come back. Do not to ask to get up and leave the room during an exam, unless it is an emergency.

Lab Rules: Use common sense when working in the lab, and if you have any questions, ask!

- Bring a notebook to lab to write down your data.
- Be on time for lab. Instructions, clarifications and changes in protocols will be given at the beginning of lab, and I will not repeat myself just because you are late.

- No eating or drinking in the lab at any time. Some of the chemicals we will be using are toxic or mutagenic.
- Clean up after yourself. Remove all labels/tape from the glassware, rinse and place in the tub by the sink.
- If you break something or think you may have broken something, please tell me. Accidents happen. It's a bigger problem if you do not tell me because I won't be able to fix or replace whatever is non-functional. If you have any questions about using a piece of equipment, it's always better to ask.

Access Office for Students with Disabilities: If you are registered with the Access office and are eligible for special testing or some other learning process, please be sure to let me know. If you are a student with disabilities and have not registered with the Access office, please do so and notify me if you intend to use their services. The Access office is located in 1115 Nevins Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

Tentative Lecture Schedule: Note: this is a VERY tentative schedule and will most likely be adjusted throughout the semester. Below are the chapters that will be covered. A lot of material will be covered over the next two months, and I cannot stress enough that every day you should go over your notes to learn the information presented in lecture.

January

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| 12 | Introduction to water as a habitat and changing climates | Ch. 1.1-1.4 |
| 14 | Evolution and Diversity of fishes | Ch. 1.1-1.9 |
| 19 | Martin Luther King Holiday | |
| 21 | Energy budgets and digestion | Ch. 2.1-2.3, handout |
| 26 | Exam 1 (8:00-9:15 am): covers material through January 21
Respiration and cardiovascular system (9:30-10:50 am) | Ch. 2.4 |
| 28 | Respiration and cardiovascular system (cont'd)
Oxygen Sensing and Aquatic and Aerial Respiration | Handout |

February

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| 2 | Oxygen Sensing and Aquatic and Aerial Respiration (cont'd)
Gill Function: Transport, Acid-Base Regulation, Nitrogen Excretion | Ch. 2.5 and handout |
| 4 | Gill Function (cont'd) | |
| 9 | Exam 2 (8:00-9:15 am): covers material through February 4
Endocrine System and Reproduction (9:30-10:50 am) | Ch. 2.6, handout |
| 11 | Endocrine System and Reproduction (cont') | |
| 16 | Nervous and Sensory Systems | Ch. 2.7, handout |
| 18 | Hematopoiesis and Immunity | Ch. 2.8, handout |
| 23 | Exam 3 (8:00-9:15 am): covers material through February 18
Life in Extreme Environments | Ch. 3.1-3.7, handout |
| 23 | Life in Extreme Environments (cont'd) | |
| 25 | Physiology of Social Stress | Handout |

March

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| 2 | Catch-up and Review | |
| 4 | Exam 4 (8:00-9:15a.m.) | |

Tentative Lab Schedule: The labs scheduled may change.

January

- 13 Introduction to the lab and model organisms---handout papers on Antarctic fish and mangrove killifish
- 15 Discussion of the model organisms
- 20 Antarctic fish atria homogenization and protein assay
- 22 Independent work to prepare for SDS-PAGE to examine myoglobin expression in atria
- 27 SDS-PAGE of standards and atrial protein and transfer for western blot analysis
- 29 Develop western blot and discussion of literature

February

- 3 Quantify myoglobin using densitometry
- 5 Present and discuss data
- 10 Literature discussion and experiment design to examine protein expression differences
- 12 Mangrove killifish tissue homogenization and sample preparation
- 17 Continue with mangrove killifish sample preparation and IEF of mangrove killifish proteins

- 19 Independent work to prepare for 2D gel electrophoresis
- 24 Run second dimension of 2D gels
- 26 Data analysis

March

- 3 Present and discuss data
- 5 **Lab Exam**