INSTRUCTOR:

Dr. Fernando Galvez  
Assistant Professor of Biological Sciences

216 Life Sciences Building (Office)  
208, 210, 213 Life Sciences Building (Laboratory)

Tel. 578-0599  
Email: galvezf@lsu.edu

Lecture Times:  
Tuesday and Thursday, 3:10-4:30 pm (2 lectures/week), 038 Allen Hall

Office Hours:  
4:45-6:00 p.m. on Tuesday and Thursday, or by appointment, LSB 216

Course Description:  
This course will cover advanced principles of comparative animal physiology, with an emphasis on the responses of non-adapted animals to changes in the environment, and will compare these responses to animals adapted to those environments. The study of animal physiology is interested in the function of animals, from the interaction of organ systems, down to the action of individual molecules. We will examine the adaptations that some animals have developed at these different levels of biological organization to allow them to tolerate environmental extremes. Typical stressors that we will cover include salinity, water limitation, hypoxia, altitude, depth, temperature extremes, exercise, and pollution. Many of these environmental stressors are relevant to the Gulf Coast region, and we will discuss issues of local relevance whenever possible to illustrate how the environmental stressors, including anthropogenic disturbances, are likely to adversely impact on local animal populations. The physiological systems that will be discussed include gas exchange, circulation, osmoregulation, metabolism, thermoregulation, and the endocrine, and neural control of these systems. The course will also touch briefly on behavioral components for surviving and/or adapting to environmental extremes.
Course Mechanics:

- All Powerpoint slides of the lectures and any assigned readings will be posted on Moodle before the class. You can access Moodle from your PAWS account. Although every attempt will be made to post course notes before lecture, do not expect to find the notes on Moodle until the night before a lecture. These notes are no substitute for coming to lecture!
- If you use an email account other than your PAWS account, please make sure that PAWS mail is forwarded to that account. All class correspondence from me will go to your PAWS account.
- If you have questions about the material, please bring them to office hours or make an appointment. Questions by e-mail or phone will be answered very briefly. (Trust me, what can take 45 minutes to explain via email can usually be done in 10 minutes face to face.)

Required Course Textbook:


I will occasionally use figures from scientific manuscripts or from other text books to complement the material provided in our course book. These materials may include:

You are responsible for knowing the required reading from the course textbook and lecture notes. Although you will be responsible for understanding the information conveyed in figures from other text books, you are not responsible for reading any additional information from these books. However, you are welcome to borrow these books on a very short-term basis if you would like to peruse the material.
Lecture Schedule (Tentative):

<table>
<thead>
<tr>
<th>Lect #</th>
<th>Class Date(s)</th>
<th>Topics Covered</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug. 26</td>
<td><strong>Introduction to course; Foundations of Physiology</strong>&lt;br&gt;Why study comparative physiology. Levels of biological organization, homeostasis of the internal milieu, time frames, evolutionary processes Chapt. 1</td>
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<tr>
<td>2, 3, 4, 5, 6</td>
<td>Aug. 28, Sept. 9, 11, 16, 18</td>
<td><strong>Physiological responses to temperature</strong>&lt;br&gt;Basis for heat transfer with the environment, biochemical, physiological and behavioral effects of temperature. Strategies in thermal biology (endothermy versus ectothermy), Adaptations to extreme environments such as freeze tolerance: Chapt. 9. Implication of Global warming. We will also review elements of metabolism, enzyme kinetics, and plasma membrane and composition: Chapt. 2 (p. 39-46)</td>
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<tr>
<td>7, 8, 9, 10</td>
<td>Sept. 23, 25, 30, Oct. 2</td>
<td><strong>Circulation and respiration</strong>&lt;br&gt;Properties of gases in the environment (Chapt. 21); Design and evolution of respiratory surfaces: Chapt. 22 (pp. 547-572) and circulatory systems (Chapt. 23, pp. 581-609); control of ventilation (pp. 559-575); Gas transport in blood and at gas-exchange surfaces, regulation of pH</td>
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<td>11*</td>
<td>Oct. 7</td>
<td><strong>Midterm Exam #1 (3:10-4:30 PM)</strong></td>
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<td>12, 13</td>
<td>Oct. 9, 14</td>
<td>Adaptations in marine mammals to a diving lifestyle Circulatory adjustments, oxygen storage capacity, metabolism, aerobic dive limit): Chapt. 24.</td>
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<tr>
<td>14, 15, 16, 23</td>
<td>Oct. 16, 21, 23</td>
<td><strong>Aerobic and anaerobic forms of metabolism</strong>&lt;br&gt;Energy metabolism and metabolic rates: Chapt. 5; Mechanisms of ATP production, metabolism during oxygen deficiency, metabolism during exercise. Chapt. 6</td>
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<td>17, 18, 19, 20</td>
<td>Oct. 28, 30; Nov. 4, 6</td>
<td><strong>Solute, water and nitrogen balance</strong>&lt;br&gt;Properties of water, movement of water and solutes across membranes, solute regulation in freshwater and seawater vertebrates, nitrogenous waste excretion in animals: Chapt. 26, 27, 28</td>
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<tr>
<td>21*</td>
<td>Nov. 11</td>
<td><strong>Midterm Exam #2 (3:10-4:30 PM)</strong></td>
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<td>Nov. 13</td>
<td><strong>No Class</strong></td>
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<tr>
<td>22, 23, 24</td>
<td>Nov. 18, 20, 25</td>
<td><strong>Nervous and endocrine integration</strong>&lt;br&gt;Patterns and evolution of nervous systems, introduction to sensory systems, endocrine physiology, integration of mineral balance, biological clocks; endocrine disruptors.</td>
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<td>Nov. 27</td>
<td><strong>Thanksgiving holiday- No Class</strong></td>
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<tr>
<td>25</td>
<td>Dec. 2</td>
<td><strong>Nervous and endocrine integration (continued)</strong></td>
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<td>27</td>
<td>Dec. 4</td>
<td><strong>Review</strong></td>
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<td>Dec. 12</td>
<td><strong>Final Examination (Comprehensive) 2-hour in class exam (7:30-9:30 AM)</strong></td>
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Grading:

- **Midterm exam #1**: 20% of total
- **Midterm exam #2**: 20% of total
- **Term Paper**: 20% of total
- **Final exam**: 40% of total

Total: 100% of total

**Letter grade conversion** is as follows:

- A: 87.5 - 100%
- B: 75.0 - 87.4%
- C: 62.5 - 74.9%
- D: 50.0 - 62.4%
- F: below 50%

Examinations:

- **Midterm and final exams** will be a combination of multiple choice, short answer and essay questions.
- **Midterm exam #1** will be held on **Oct. 7, 2008** and cover material from Aug. 26-Oct. 2, 2008. **Midterm exam #2** will be held on **Nov. 11, 2008** and cover material from Oct. 9-Nov. 6, 2008.
- The **Final exam** will be held on **Friday, Dec. 12, 2008 (7:30-9:30 AM)** and cover material from the entire year.
- **If you have a disability** that may have some impact on your work in this class and for which you may require accommodations, please see a staff member in the Office of Disability Services (112 Johnston Hall) so that such accommodations can be considered. Students that receive accommodation letters, please meet with me to discuss the provisions of those accommodations as soon as possible.

**Missing a Midterm or Final Examination:**

**Missing an exam must be approved by me before the exam**, or in the case of an emergency, documentation must be provided in a timely manner.
Term Paper:

Term paper deadlines:

October 14, 2008: Provide instructor with a topic or list of topics for the term paper for approval.
Oct. 21, 2008: Provide instructor with list of references that you will include in paper.
Nov. 18, 2008: Term paper due.
Nov. 26, 2008: The instructor will complete marking of the term paper. Students can make appointments to pick up the paper from LSB 216 at any time after 12 PM. Students will have the opportunity to correct their term paper and resubmit it on Dec. 4, 2008 for reevaluation.
   ▪ For students choosing not to resubmit their term paper, the entire grade will be based on the quality of the term paper submitted on Nov. 18, 2008.
   ▪ For students choosing to resubmit their term paper, 75% of the grade for the term paper assignment will be based on the grade given for the Nov. 18, 2008 submission. The remaining 25% of the grade will be based on the quality of the term paper following revisions.

Failure to meet ANY of these deadlines will result in a 10% deduction in the grade PER DAY.

The topic of the paper will be developed by the student through consultation with the instructor. The paper can focus on any aspect of Comparative Physiology, although it is best if the topic be one that is controversial or unresolved. You will need to review at least 3-5 research papers from the primary scientific literature, of which, I can help in determining suitable topics and/or papers. The written assignment needs to include each of the following four sections: (1) a short introduction (up to 2 pages) providing general background information on the topic, and clearly disseminating the relevant biological question; (2) a discussion section providing a critical analysis of the relevant topic, thoroughly examining the assumptions made by the authors in their research papers, and supporting or refuting the findings of each study. This section, which will be the bulk of the term paper, should attempt to evaluate the quality of the data and the conclusions drawn by the authors; (3) a description of the future directions and experiments should be included that proposes new avenues of research, or new methods for evaluating existing information; (4) and finally, a References section, listing all of the literature cited in the term paper. All sources, including the primary literature articles need to be included in the references section. The paper needs to be cited using a proper scientific style.

The term paper represents 20% of the total mark for the course, and will be graded out of 100 points as follows:

- Introduction- 20 points
- Discussion- 45 points
- Future directions- 25 points
- References- 5 points
Although you are encouraged to discuss your assignment with others in the class, it is expected that the actual research papers you reference will be different and that the final completed work will be your own. This assignment will be due at the start of class on November 18, 2008. The assignment will consist of an **8-10 page (undergraduate student)** or **12-page (Honor’s option undergraduate students & graduate students)** double-spaced (maximum) paper. The paper should be formatted as follows: 27 typed lines/page, 12-point font, 1 to 1.25-inch borders. In addition, up to 8 individual figures can be included in the report to complement the written text. Failure to comply with this formatting style will lead to a deduction of **at least 10% of the total mark**. Figures, which are strongly recommended, will not be counted towards the total page limit. In addition to a printed copy, you will be asked to supply an electronic text copy, which can be e-mailed to me at galvezf@lsu.edu.

**Note that handing in the same material in two separate courses is considered Academic Dishonesty, and that such offenses will be handled accordingly.** Due to the number of students in the course, the term paper will not serve as extra credit for other undergraduate students.