California State Polytechnic University, Pomona

Animal Physiology
ZOO 428 / ZOO 428L
Winter 2016
Course Syllabus

General Course Information

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Information</th>
<th>Days</th>
<th>Meeting Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Physiology, Lecture</td>
<td>ZOO 428</td>
<td>Monday, Wednesday, and Friday</td>
<td>8:00 – 9:05 A.M.</td>
<td>98P 2-007</td>
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<tr>
<td>Animal Physiology, Lab (Section 1)</td>
<td>ZOO 428L</td>
<td>Monday</td>
<td>6:00 – 8:50 P.M.</td>
<td>8-35</td>
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<tr>
<td>Animal Physiology, Lab (Section 2)</td>
<td>ZOO 428L</td>
<td>Wednesday</td>
<td>6:00 – 8:50 P.M.</td>
<td>8-35</td>
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<tr>
<td>Animal Physiology, Lab (Section 3)</td>
<td>ZOO 428L</td>
<td>Friday</td>
<td>12:00 – 2:50 P.M.</td>
<td>8-35</td>
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- Access course materials on Blackboard
- For general course information, see: [http://www.cpp.edu/~seskandari/animal_physics.html](http://www.cpp.edu/~seskandari/animal_physics.html)

Professor:
Sepehr Eskandari, Ph.D.
Professor, Biological Sciences Department
Chair, Academic Senate
Office: 8-33A and 98-P2-11
Office Hours:
Monday, Wednesday, Friday: 10:00 – 11:00 AM (98-P2-11)
Tuesday, Thursday: 4:00 – 5:00 PM (8-33A)
My schedule is also available online: [http://www.cpp.edu/~seskandari/schedule.html](http://www.cpp.edu/~seskandari/schedule.html)
Phone: (909) 869-4182
Fax: (909) 869-4078
E-mail: seskandari@cpp.edu
Web: [www.cpp.edu/~seskandari/](http://www.cpp.edu/~seskandari/)

Laboratory Instructor:
Rachel V. Sanchez, B.S., M.S.
Office: 8-33B
Office Hour:
Thursday, 2:00 – 4:00 PM
Friday, 11:00 AM – 12:00 PM
Phone: (909) 869-3575
Fax: (909) 869-4078
E-mail: rvsanchez@cpp.edu

Course Objectives:
To familiarize students with the principles and basic facts of Animal Physiology and with some of the laboratory techniques and equipment used in the acquisition of physiological data. The emphasis will be on mammalian physiology but there will be some coverage of other vertebrate taxa. The course will focus on organ-system physiology, however, cellular and molecular mechanisms will be discussed in
order to present a current view of physiological principles. Furthermore, emphasis will be placed on nervous, muscular, cardiovascular, respiratory, renal, digestive, and endocrine physiology. Where appropriate, basic chemical and physical laws will be reviewed in order to enhance and to promote student understanding. The laboratory component of the course is designed to reinforce the topics discussed in lecture, as well as to familiarize students with some of the laboratory techniques and equipment used in the acquisition of physiological data.

**Student Learning Outcomes:**

Upon successful completion of lecture portion of this course, the students will be able to describe, identify, and/or explain:

- The various physiological organ-systems and their importance to the integrative functions of the human body.
- Body fluid compartments and the ionic composition of body fluids.
- Movement of water and solutes between the fluid compartments.
- The concept of homeostasis, including set point, negative and positive feedback loops, and compensatory responses.
- Structure of biological membranes. Function of biological membranes including the role of membrane proteins in catalysis, recognition, and transport.
- Intracellular and extracellular communication systems.
- Organization structural and functional organization of the nervous system, including the central and peripheral nervous systems, the autonomic nervous system, and the enteric nervous system.
- The resting membrane potential.
- The action potential, action potential propagation along the axon.
- Chemical messenger molecules of the nervous system, including classical and non-classical neurotransmitters.
- Synaptic neurotransmission.
- Basic principles of sensory physiology.
- Vision physiology.
- Hearing physiology.
- Structure and function of skeletal muscle, including excitation-contraction coupling, sliding filament mechanism, force generation, and isometric versus isotonic contractions.
- Structure and functions of the cardiovascular system, including the mechanical and electrical properties of cardiac muscle function.
- Excitation-contraction coupling in cardiac muscle.
- Reflex regulation of blood pressure.
- Structure and functions of the respiratory system, including lung volumes, gas exchange, and gas transport in blood.
- Regulation of ventilation.
- Structure and functions of smooth muscle, including excitation-contraction coupling in smooth muscle.
- Principles of hormone action, including structure, mechanism of release from endocrine cell, mode of transport in blood, mechanism of action in target cells, and systemic effects of important hormones.
- Functions of the endocrine system with focus on classic endocrine glands, including the hypothalamus and the pituitary glands, thyroid and parathyroid glands, adrenal glands, endocrine pancreas.
- The renin-angiotensin-system.
- Structure and functions of the kidney nephrons, including glomerular filtration, tubular reabsorption, tubular secretion, and excretion.
• Transport of water, ions, and organic molecules across the tubular epithelia.
• Renal clearance.
• Urinary concentrating mechanisms.
• Acid-base balance.
• Motility, secretion, digestion, absorption in the gastrointestinal system.

Upon successful completion of the laboratory portion of this course, the students will be able to describe, identify, explain, perform, and/or measure:
• Basic principles of analog and digital data acquisition.
• The important sections of a scientific paper (e.g., Abstract, Introduction, Methods, Results, Discussion, References), and how a laboratory report should be written in this format.
• Extracellular action potentials, and action potential conduction velocity.
• Spinal monosynaptic and polysynaptic reflexes.
• Computer simulations of the membrane potential, action potential, and synaptic neurotransmission.
• Skeletal muscle mechanics, and the electromyogram (EMG).
• Cardiac cycle and the electrocardiogram (ECG).
• Effect of autonomic neurotransmitters on the function of myogenic heart.
• Regulation of arterial blood pressure.
• Regulation of ventilation.
• Mammalian renal function and chemical analysis of urine.

Required Course Materials:
• Any textbook of physiology (human, medical, or animal physiology) published within the last five years will be appropriate. If you are unsure about a given title, please check with Dr. Eskandari.
• Eskandari Lecture Notes on Physiology. To obtain these notes, the laboratory exercises, as well as other supplementary materials, please visit the course documents page on Blackboard.
• Access to the internet to take online quizzes on Blackboard.

Prerequisites:
BIO 211/211L
BIO 310

Schedule of Lectures, Quizzes, and Exams:
See the attached Combined Lecture and Laboratory Schedules. For the most up-to-date information, please visit the course documents page on Blackboard.

Course Information and Grading System:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Points</th>
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<tbody>
<tr>
<td>10 Online Quizzes (25 points each)</td>
<td>250</td>
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<tr>
<td>7 Laboratory/Activity Reports (25 points each)</td>
<td>175</td>
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<tr>
<td>Histology and Physiology Report</td>
<td>100</td>
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<tr>
<td>Exam I: Midterm Exam</td>
<td>300</td>
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<tr>
<td>Exam II: Midterm Exam</td>
<td>300</td>
</tr>
<tr>
<td>Exam III: Final Exam</td>
<td>300</td>
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<tr>
<td>Attendance (see below)</td>
<td>50</td>
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<tr>
<td>Extra Credit: Critique of Course Contents</td>
<td>Up to 25</td>
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1. **Course Materials on Blackboard.** Students must use Blackboard to access all course materials, as well as to complete online quizzes. In addition, limited general course information (e.g., course syllabus) is posted here: [www.cpp.edu/~seskandari/animal_physiology.html](http://www.cpp.edu/~seskandari/animal_physiology.html).

2. **Online Quizzes.** Students are required to complete 10 online quizzes (25 points each) via Blackboard. These quizzes will be composed of multiple-choice, true/false, as well as short answer questions. Quizzes will be based on materials covered in lecture and may also contain information covered in the laboratory component of the course. The quiz due dates are set to be on Fridays. The quizzes may contain materials covered on Friday of that week. Online quizzes become available online 48 hours before their due date. They may not be taken before or after this 48-hour window. Quizzes that are not completed by the due date will receive a score of zero.

3. **Laboratory Reports.** There will be 7 reports based on laboratory activities/exercises carried out during the laboratory part of the course (totaling 175 points; see the Combined Lecture and Laboratory Schedule). Some of these reports simply require completing the worksheets provided. Others require written narrative reports. For the appropriate format of these written reports, see the Guide to the Laboratory/Discussion Report or your laboratory instructor. In addition, there is a Histology/Physiology report (100 points). Laboratory reports must be submitted in-class on the indicated due dates (see Due Dates at the end of this document). Reports that are not submitted by the due date will receive a score of zero. A student may not submit a report for a laboratory exercise in which he/she did not participate.

4. **In-Class Exams.** There will be three in-class exams (two midterm exams and a final exam) each worth 300 points. Midterm exams will not be cumulative (they will cover the material since the previous midterm exam or beginning of the course). At the time of the regularly scheduled "Final Exam" (during the final exam period), you will take the third exam (i.e., the final is not comprehensive). Midterm exams will be taken during the student’s laboratory period. The three exams will be composed of a mixture of several types of multiple-choice questions, fill in the blank questions, calculation problems, short essays, and will include at least one long essay question. Midterm questions may also include quantitative problems based on formulae and relationships discussed in lecture and in lab. Actual old exams used in previous quarters are posted on the course documents page on Blackboard.

5. **Attendance.** Attendance is mandatory for both lecture and lab. A student cannot submit a laboratory report for a laboratory exercise that the student did not attend. Lecture and/or laboratory attendance will be recorded on two unannounced occasions (25 points each for a total of 50 points). If you have to miss class, please be sure to communicate your reasons to Dr. Eskandari prior to being absent.

6. **Extra Credit: Critique of Course Contents (optional).** This activity is optional. Extra credit points may be obtained by providing meaningful critiques of Eskandari Lecture Notes on Physiology. I will appreciate any comments from you regarding the quality, clarity, and/or organization of these notes. I will offer one point for every original, well thought out, and constructive criticism, or correction of spelling, grammar, and/or sentence structure. All of these suggestions must be accumulated throughout the quarter in one file (preferably a Microsoft Word file) and submitted electronically to me via email (seskandari@cpp.edu) at the end of the quarter by the indicated deadline (see Due
Dates at the end of this document). Please include “ZOO 428 Extra Credit” in the subject line of your email. A maximum of 25 extra credit points may be obtained.

Grading Scale:
Students will receive the same grade in the laboratory and lecture parts of the course. The grade will be based upon the percentage of the total possible points, which the student has earned. The class curve will be taken into account but the cutoff points will not be higher than the following: A - 90%; B - 80%; C - 70%; D - 50%. Depending on class performance, the A, B, and C "cut-offs" may be as much as several percentage points lower depending upon the class curve, but the D "cut-off" will not be lower than 50%. Plusses and minuses (e.g., A–, B+, etc.) will also be assigned.

Make-up Policy:
For compelling reasons, quizzes and exams may be made-up. Students should contact Dr. Eskandari prior to the regularly scheduled quiz/exam if at all possible.

Note to Students with Special Needs/Considerations:
I am always open to hear from students who have special needs or require special considerations. As much as is possible and is within my scope of authority, I will do my best to provide help to and accommodate students with special needs or students who require special considerations. Many conditions and circumstances may be viewed as requiring special considerations, but the following are a few examples: students who work excessive hours, students with difficult medical conditions, students with demanding and inflexible schedules (e.g., student athletes, reserved officers, student veterans), students with difficult family issues, members of the LGBT community, students who experience unexpected events (e.g., car accident), etc. If you feel you need to discuss any such issues with me, please do not hesitate to approach me.

Information Regarding the Use of Animals for Teaching Purposes:
This is an Animal Physiology course. The course attempts to introduce students to the discipline of physiology by examining physiological organ-systems, as well as the molecular principles that underlie higher level integrative bodily functions. The laboratory component of the course serves to emphasize and reinforce the topics discussed in lecture. Most of the laboratory exercises in this class use reductionistic models, computer simulations (e.g., neuronal action potential), and/or use student subjects for non-invasive measurements of physiological parameters (e.g., the electrocardiogram). In some cases, however, it is not possible to effectively teach physiological principles by these methods. Therefore, a few laboratory exercises use invertebrate species (crabs and earthworms) in order to demonstrate the importance of the physiological principles being discussed. Every effort is made to ensure humane treatment of these animals. Invertebrate animals are not covered species; i.e., they are not covered by the Animal Welfare Act of 1966, Animal Welfare Act Regulations, and the Health Research Extension Act of 1985 (HREA). Therefore, the use of these animals in teaching and/or research does not require authorization by the Institutional Animal Care and Use Committee (IACUC) at Cal Poly Pomona.

Some students find it difficult to take part in the experiments in which animals are used. These students should meet with me as soon as possible. In cases in which the student does not wish to participate in these experiments, alternative exercises may be assigned instead. If you think that you may have difficulties with the animal experiments, please talk to me as soon as you can.

For information regarding responsible use of animals in teaching and biomedical research, please visit the web sites of the following societies/organizations:
- American Physiological Society (www.the-aps.org)
- Federation of American Societies for Experimental Biology (www.faseb.org)
- Society for Neuroscience (www.sfn.org)
- American Association for Laboratory Animal Science (www.aalas.org)
- Association for Assessment and Accreditation of Laboratory Animal Care International (www.aaalac.org)
- IACUC.org (www.iacuc.org)

E-Mail Policy:
In addition to in-class discussions and the course web site, all information communicated to you regarding this class will be sent to your Cal Poly Pomona e-mail address. You are strongly urged to check your Cal Poly Pomona e-mail on a regular basis (in addition to checking the course web site) in order to see the most recent announcements. If you do not use your Cal Poly Pomona e-mail address on a regular basis, be sure to have your Cal Poly Pomona mail forwarded to your favorite e-mail address.

Department Statement on Cheating and Plagiarism:
CHEATING AND PLAGIARISM ARE VIOLATIONS OF UNIVERSITY POLICY AND ARE CONSIDERED SERIOUS OFFENSES. THE BIOLOGICAL SCIENCES DEPARTMENT TAKES ALL INCIDENCES OF ACADEMIC DISHONESTY SERIOUSLY AND ACTS ACCORDINGLY.