PCB 3713C – Cellular and Systems Physiology

Syllabus Policy

You are solely responsible for reading and following the instructions, guidelines and schedules in this syllabus, and for checking the e-Learning announcements at least weekly for announcements regarding any changes. Not having read the information in this syllabus or the announcements will not constitute an excuse for missing an assignment or deadline.

Course Description

How cells, organs, and higher level systems are integrated and coordinated in the functions of humans and other animals. Emphasis will be placed on the use of model organisms, mathematical models and the physical sciences to understand the mechanistic basis of normal physiology and dysfunction. 4 credits.

Prerequisites

One semester of general biology (BSC 2010), two semesters of general chemistry (CHM 2045 and CHM 2046, or CHM 2047, CHM 2051 or CHM 2096), and two semesters of general physics (PHY 2048 and PHY 2049, or PHY 2053 and PHY 2054, or PHY 2061), all with a minimum grade of C.

Corequisite

None

Instructors

COURSE INSTRUCTOR

David Julian, Ph.D.
Associate Professor, Department of Biology
Office hour: TBD in BAR 123

COURSE GRADUATE TAS

Joni Wright, M.S.
Ph.D. candidate in Zoology, Department of Biology
Office hour: Tuesdays, p. 7: 1:55-2:45PM in BAR 310 and by appointment

Course Schedule

Lecture/Active-Learning Sessions: MWF, period 6 (12:50 p.m. - 1:40 p.m.) in CSE E220
Discussions:

Day	Period	Room	Section
M	7	UST 105	0023
T	6	UST 105	0027
W	7	CBD 216	003G
R	6	UST 105	004D

Course Fee

None.

Course Objectives

At the end of the course, students should be able to:

- Explain physiological mechanisms of humans and representative model organisms by applying basic principles of physics, chemistry and engineering.
- Describe the fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems in humans and other animals.
- Explain the basic mechanisms of homeostasis by integrating the functions of cells, tissues, organs, and organ systems.
- Effectively solve basic problems in physiology, working independently and in groups.
- Apply knowledge of functional mechanisms and their regulation to explain the pathophysiology underlying common diseases.
- Generate hypotheses about physiological processes, design experiments to test these hypotheses using mathematical models of complex physiological systems, and then analyze, interpret and report experimental results.
- Use primary literature readings to understand basic physiological principles and mechanisms.
- Read and critically evaluate the design, results and conclusions of experiments published in primary physiology literature
- Interpret and knowledgeably discuss primary literature among peers

Required Course Materials, Software and Hardware

Primary Course Textbook

Vander's Human Physiology: The Mechanisms of Body Function, 13th edition. Eric P. Widmaier, Hershel Raff, and Kevin T. Strang. Published 2014.

You **must purchase the special electronic edition**, listed as "Connect Plus for Vander's Human Physiology", ISBN 9780077510237. This is a subscription that will be valid for 18 months. Note that this textbook is also required for BME 4409, Quantitative Physiology (although that course currently requires only a subset of the chapters).

Other Free, optional Textbook Resources

Ganong's Review of Medical Physiology, 24th edition, by Barrett, Boitano, Barman and Brooks (McGraw-Hill Companies, Inc.) 2012.

This textbook is available free to UF students online via www.accessmedicine.com. You must be on a campus computer, using VPN, or using off-campus library access procedures *while* reading the book online.

Color Atlas of Physiology, 6th edition, by Despopoulos and Silbernagel (Thieme, NY), 2009.

This textbook is available free to UF students for reading on your own computer using the iOffline viewer or online at the UF Health Science Center Library via the Thieme Electronic Book Library. You must be on a campus computer, using VPN, or using off-campus library access procedures *while* reading the book online. The online option is less convenient than reading it with the Offline viewer, but the images look better.

Classroom Response System

We will use a classroom response system to both aid and assess your understanding of the course material. You will be able to participate using a laptop, iPad or other tablet, or smartphone. During the first week of classes you will receive information on registering for this service.

DIAGRAMMING AND COLLABORATION SOFTWARE

We will use the Creately online diagramming application to collaboratively develop "system control maps" of physiology processes. You will be provided instructions on how to register for this application.

DIGITAL LESSONS

All non-textbook course readings and lessons will be accessible from the Canvas website (https://elearning2.courses.ufl.edu).

COMPUTER REQUIREMENT

To participate in the active learning questions in the lecture session and the control map creation in the discussion sessions, you must bring a computing device that can access the internet wirelessly. This device may be a laptop or tablet. Smartphones may suffice for the lecture sessions, but are not recommended.

To complete the tutorials outside of class, you must have a computer that runs the Windows operating system. As of December 2014, all of the simulations also run on Intel-based Macs running Boot Camp or VMware.

The course instructor will not provide any computer support. You may be able to get assistance from the UF Computing Help Desk, but in the past, most students have gotten the best support from other students in the course via discussion posts.

SIMULATION SOFTWARE

All of the simulation software packages used in the course are publicly available for your use. You must download and install each package in order to participate in the course activities outside of class.

- Nernst-Goldman Simulator
  A simple simulation of resting membrane potential and action potentials in neurons using the Hodgkin-Huxley model: http://www.nernstgoldman.physiology.arizona.edu/.
- Nerve
  A web-based simulation of nerve action potentials and action potential propagation (with a squid model): http://nerve.bsd.uchicago.edu/nervejs/MAP.html.
- SWIMMY
  A simulation of a complex neural network in a fish. The software was developed at UCLA, based on NEURON software developed primarily at Duke University. The software can be downloaded from http://mdcune.psych.ucla.edu/modules/swimmy.
- HumMod
  HumMod Modeler is a detailed, customizable simulation of human physiology that utilizes over 5,000 physiological variables. The software was initially developed at the University of Mississippi Medical Center. The project is http://hummod.org/. Note that this course uses a custom version of the simulation that will be available from a link on the course home page. **Do not** use the version of the simulation that is available from the HumMod site.

Activities and Assessments

The class content will include textbook reading, adaptive learning tools, pre-recorded lessons, in-class lessons, in-class active learning questions, experiments using physiological simulations, writing and peer-review of research reports, and discussions of classic primary literature.

ONLINE TEXTBOOK AND LEARNSMART STUDY MODULES

As you go through the assigned online textbook readings, you will complete adaptive assessments tool to help you learn the reading material. Completion of the readings and adaptive assessments will generally require a minimum of 2-3 hours per week.

ACTIVE LEARNING QUESTIONS:

On most class sessions you will be asked to work with your classmates to answer questions, which may include solving problems. You will use a classroom response system to provide your answers.

SIMULATIONS

You will complete 10 tutorials that use computerized mathematical simulations to explore systems physiology. These tutorials have embedded questions that gauge and reinforce your comprehension of key physiology concepts. Each tutorial will typically require 2-4 hours to complete.

RESEARCH REPORTS AND PEER REVIEW

You will individually complete two research reports during the term. For each report, you will be provided with a research problem about a physiological phenomenon. You will typically do the following:

1. Develop an hypothesis for the assigned problem.
2. Design and conduct an experiment to test your hypothesis using the physiology simulation software.
3. Collect and analyze the data.
4. Craft a clear, well-supported draft report explaining the answer to the question.
5. Submit your draft report for peer review.
6. Participate in peer reviews of other student draft reports.
7. Revise your draft report based on reviewer feedback.
8. Back-evaluate your reviewer feedback.
9. Submit your report.
10. Participate in peer reviews of other student reports.
11. Back-evaluate the reviewer feedback you received on your report.

Your report must be formatted according to the detailed instructions provided for each report, which will be posted on the course home page. Reports that are not formatted correctly will receive a score of zero. You are welcome to work on your report with other students in the course, but the final product must represent your own work. Completion of each research report, including the peer review process, will typically require 12 hours. The total grade will be determined from the following criteria:

- **Review Grade** - a combination of the Accuracy and Helpfulness grades, which are then curved, after which any Reviewing Late Penalties are subtracted.
- **Accuracy -** correlation of your own ratings to mean ratings by others on same documents.
- **Helpfulness** - how helpful the author thought your comments were via back evaluation.
- **Reviewing Late Penalty** - penalty for submitting reviews during the grace period (based on how the instructor created the course).
- **Writing Grade -** average score given by reviewers which is then curved, and then any Writing Late Penalties are subtracted.
- **Writing Late Penalty** - penalty for submitting document during the grace period.
- **Task Grade** - accounts for the percentage of assigned reviews and back-evaluations that were done. It represents only your reviewing activities, which is then curved.
- **Weighting –** How each category is weighted. The breakdown is 40% reviewing, 40% writing, and 20% task.
- **Overall** - The sum of all of the weighted grades

RESEARCH PAPER DISCUSSIONS

At four times during the semester, the Discussion Groups will read and discuss classic physiology research papers. In the week prior to the discussion the TA will provide an introduction to the paper, focusing on research approaches and techniques that are probably unfamiliar.

Discussion Participation. You are expected to read and analyze the assigned research paper before attending the associated discussion meeting. You will receive participation points reflecting the quality and extent of your participation in the discussion.

Pre-discussion Quiz. At the beginning of each discussion session you will be given a pre-discussion quiz.

Preparation for each research paper discussion will typically require 3 hours.

EXAMS

There will be a midterm exam and a final exam. These will consist mostly of problem-based, multiple choice, fill-in-the-blank, ordering and numeric (calculation) questions. The midterm will cover all course material through week 8, will consist of approximately 30 questions, will be administered during a normal lecture session (50 minutes in duration), and will be worth 200 points. The final exam will cover all course material from the entire term but will focus primarily on the last half of the course. It will consist of approximately 50 questions, will be administered during the final exam period (2 hours duration), and will be worth 300 points. Both exams are closed-book and you may not use notes, but you will be expected to utilize the physiology simulation software to answer some of the questions.

Time Commitment

The UF College of Liberal Arts and Sciences assumes that you will devote 3-4 hours per week per credit-hour to each course during the regular fall and spring semesters. Because this course is 4 credits (including the Discussion session), you should therefore expect to devote 12-16 hours per week to this course, of which only four hours per week will be spent in class (including the Discussion sessions). Therefore, you are responsible for budgeting about 2/3 of the time you will spend on this course. If you find yourself spending more than 16 hours per week on average, discuss this with your course instructor to see if you can refine your work and study habits. If you find yourself spending less than 12 hours per week on average, you should recognize that you may have difficulty fully learning and comprehending the material in this time, which will probably be reflected in poor performance on the various assessments, causing you to receive a lower overall course grade.

Grading

ASSESSMENTS

Assessment Type	Quantity	Points	Subtotal	Pct of Total	Time (est.)
Textbook Assessments	18	variable	**140**	13%	54 h
Active Learning Questions	100	1	**100**	9%	41 h (in class)
Simulation Tutorials	10	10	**100**	9%	30 h
Simulation Research Reports	2	50	**100**	9%	30 h
Paper Discussion Participation	4	10	**40**	4%	4 h (in class)
Pre-Discussion Quiz	4	5	**20**	2%	12 h (prep.)
Map Develop. Participation	8	5	**40**	4%	8 h (in class)
Final System Control Map	1	50	**50**	5%	10 h (prep.)
Midterm Exam	1	200	**200**	18%	1 h
Final Exam	1	300	**300**	28%	2 h
Total			***1090***	100%	*192 h*

GRADE DISTRIBUTION

Point Range (%)	Letter Grade
93.33 or higher	A
90-93.32	A-
86.66-89.99	B+
83.33-86.65	B
80-83.32	B-
76.66-79.99	C+

Point Range (%)	Letter Grade
73.33-76.65	C
70-73.32	C-
66.66-69.99	D+
63.33-66.65	D
60-63.32	D-
< 60	E

Grades will not be assigned by a curve, but the grade cutoffs may be adjusted downward. In other words, if your final point accumulation is 93.33%, then you are guaranteed to receive an A. This means there is no upper limit to the number of "A" grades that can be given out.

Note that a "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. More information on grades and grading policies is here: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

EXTRA CREDIT

There will be no opportunities for extra credit.

Communication

Updates and changes to the course schedule, this syllabus, and any other aspects of the class content and structure will be communicated to you via announcements on the course e-Learning site. You are responsible for checking this site regularly for announcements.

COMMUNICATING ELECTRONICALLY WITH THE INSTRUCTOR AND GRADUATE TEACHING ASSISTANTS

There are two primary modes of electronic communication for this class -- the discussion forum and Canvas mail. To ensure that your questions are answered as promptly as possible, please follow the communications guidelines below:

Discussion Forum: Use the discussion forum on the course website for questions/answers about the course. You are strongly encouraged to respond to your peers if you know the answer or can provide guidance. The course Graduate TAs will monitor this area, but they may not be able to read every posting and therefore this should **not** be used to communicate with the instructors.

Canvas Mail to the Instructors: Direct email to Dr. Julian or to your TA should be used only for messages that are **private** in nature. Use the Mail tool in Canvas for all such direct email. If you use any other email tool, it may be filtered as spam or otherwise not be seen by your instructors. If your message or question is not private in nature, you should instead use the discussion forum.

Course Policies

ACADEMIC HONESTY

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code http://www.dso.ufl.edu/sccr/process/student-conduct-honorcode/) specifies a number of behaviors that are in violation of this code and the possible sanctions.

Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

POLICY RELATED TO ABSENCES AND MAKE-UP WORK

Requirements for class attendance and make-up exams, assignments, and other work are consistent with university attendance policies: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

If you must miss an assignment or exam due to an allowable scheduled absence (for example, to participate in a sanctioned university function), you must notify the instructor as soon as the event is scheduled or during the first week of classes. If you miss an assignment or exam due to an allowable but unscheduled absence (e.g., illness), you must contact the instructor as soon as possible. In the case of illness, you must provide a signed note from your primary care provider indicating that you were unable to complete the assignment or take the exam on the day(s) in question.

USING ELECTRONIC DEVICES IN CLASS

You are welcome to make audio recordings of the lectures for your personal use, but you may not make video recordings. You may not distribute or upload any recorded material from this class to sites other than the course Canvas site (much of the course material is copyrighted).

As noted above, you are required to bring a laptop, tablet computer or smartphone with wireless Internet access to the lectures to utilize the classroom response system. Note that there is no course policy against using these electronic devices in class for other purposes. However, if the instructor perceives your activities to be a distraction to any other members of the class, you will be warned that you are being disruptive. Multiple disruptions will be considered grounds for the assignment of a failing grade.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

COURSE EVALUATION PROCESS

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Course Schedule (subject to change)

Assignments are due at 11:59 p.m. on the date indicated on the course e-Learning site schedule

Wk #	Week of	Lecture Topic	Textbook & LearnSmart	Discussion Activity	Simulation Tutorial	Research Report
1	Jan 05	Introduction, Homeostasis	Chap. 1-2	No Discussion Meeting	--	--
2	Jan 12	Cell Structure and Cellular Metabolism	Chap. 3	Intro to Discussion	--	--
3	Jan 19[1]	Cellular Transport and Communication	Chap. 4-5	No Discussion Meeting	T1 Membrane Potential	--
4	Jan 26	Neurons and Nervous System	Chap. 6	Map Development 1, and Intro to Paper 1	T2 Synapses	--
5	Feb 02	Senses and Behavior	Chap. 7-8	Paper 1 Discussion	T3 Fight or Flight	--
6	Feb 09	Muscles and Movement	Chap. 9-10	Map Development 2, and Intro to Paper 2	T4 Internal Receptors	--
7	Feb 16	Endocrine System	Chap. 11	Paper 2 Discussion	T5 Endocrine Ctrl of Glucose	R1 Draft
8	Feb 23	Immune System, Midterm	Chap. 18	Map Development 3	--	R1 Draft Reviews
Midterm, Friday Feb 27 (normal lecture time, location TBA)						
Spring Break February 28 – March 7						
9	Mar 09	Cardiovascular Structure	Chap. 12	Map Development 4, and Intro to Paper 3	T6 Cardiac Output	R1 Final
10	Mar 16	Cardiovascular Function	Chap. 12	Paper 3 Discussion	T7 Gas Exchange	R1 Final Reviews
11	Mar 23	Respiratory System	Chap. 13	Map Development 5	T8 Ventilation	--
12	Mar 30	Kidneys, Salt and Water Balance	Chap. 14	Map Development 6, and Intro to Paper 4	T9 Renal Function	R2 Draft
13	Apr 06	Digestion and Nutrition	Chap. 15	Paper 4 Discussion	T10 Homeostasis	R2 Draft Reviews
14	Apr 13	Regulation of Metabolism	Chap. 16	Map Development 7	--	R2 Final
15	Apr 20[2]	Reproduction	Chap. 17	Complete System Integration Map	--	R2 Final Reviews
Final exam: **Wednesday, April 29, 12:30-2:30 p.m.,** location TBA[3]						

1. January 19 is a holiday (Martin Luther King Jr. Day).
2. Last day of classes is April 22, Reading Days are April 23-24.
3. Final exam schedule code 29C.