PCB3713C Cellular & Systems Physiology, Spring 2021

Syllabus Policy

You are solely responsible for reading and following the instructions, guidelines, and schedules in this syllabus, and for checking the e-Learning site 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), and two semesters of general chemistry (CHM 2046 or CHM 2047 or CHM 2051 or CHM 2096) and two semesters of general physics with calculus (PHY 2049 or PHY 2061), all with a minimum grade of C.

Corequisite

None

Course Schedule

Tuesdays and Thursdays, periods 5-6 (11:45 AM – 1:40 PM)
Section 004D (16790): in-person section, meet in room CSE E231
Section 25HD (16791): remote section, meet via Zoom link on eLearning page

Instructors

Course Instructor

David Julian, Ph.D. (Physiology)
Associate Professor, Department of Biology
Pronouns: he/him
Student hour: Mondays and Wednesdays, period 7 (12:45 PM -1:30 PM)
Student hour location: use the Zoom link on the course eLearning site
Contact: via Canvas messaging

Course Graduate TAs

Luke Chandler
Ph.D. student, Department of Biology
Pronouns: he/him
Student hour: by appointment for case report project
Contact: via Canvas messaging

Keon Wimberly
Ph.D. student, Department of Biology
Pronouns: he/him
Student hour: by appointment for case report project
Contact: via Canvas messaging

Course Undergraduate TAs

Brianna Pawlyshyn, BME student
Pronouns: she/her

Lucas Budd, BME student
Pronouns: he/him

Course Fee

There is no course fee and no required course textbook, but you will need to purchase subscriptions for Top Hat ($20) and JustPhysiology.com ($15). Instructions for purchasing these subscriptions are below.

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 dynamic models of physiological systems, and then analyze, interpret, and report experimental results.

Course Materials, Software, and Licenses

Textbook

No textbook is required, but *Boron & Boulpaep Concise Medical Physiology* is highly recommended (published 2021, ISBN: 9780323655309). It is available for purchase as a **paperback (Links to an external site.)** ($89.99), and as an **eTextbook (Links to an external site.)** to purchase ($71.99) or to rent ($16.75).

Active Learning System

We will be using Top Hat Pro (**www.tophat.com (Links to an external site.)**) for class participation. You will be able to submit answers to in-class questions online using your computer (and via Apple or Android smartphones and tablets, but these will likely be irrelevant for most in-class activities). For instructions on how to create a Top Hat account and enroll in Top Hat Pro, refer to the invitation sent to your UF email address or consult Top Hat's Getting Started Guide (**https://bit.ly/31TGMlw (Links to an external site.)**).

1. If you already have a Top Hat account, follow the link within the course eLearning site or go to **https://app.tophat.com/e/168769 (Links to an external site.)** to be taken directly to this course. If you are new to Top Hat, go to **https://app.tophat.com/register/student (Links to an external site.)** and search for this course with the join code 168769.
2. Top Hat Pro requires a paid subscription. Each subscription is per student, not per course, so if you already have a current Top Hat subscription for a different course, you will already have the necessary access for this course. If you do not have a current subscription, you can purchase a one-semester subscription for $20. A list of all available subscription options is here: **tophat.com/pricing (Links to an external site.)**.
3. Should you require assistance with Top Hat at any time you can contact their Support Team directly by email (support@tophat.com), the in-app support button, or by calling 1-888-663-5491. Specific user information may be required by their technical support team when troubleshooting issues.

Physiology Simulation System

We will use JustPhysiology to conduct physiology experiments. The subscription is $15. JustPhysiology is a web application based on the HumMod simulation engine, which has a mathematical model of human physiology that utilizes over 12,000 physiological variables. The model was initially developed at the University of Mississippi Medical Center.

To subscribe, go to **https://justphysiology.com (Links to an external site.)**, and register using **your UF email address** (do not use a personal email address) and use the provided discount code. Note that the subscription can currently only be paid using PayPal. If you don’t use the discount code your subscription cost will be higher.

Note that UF subscriptions are discounted. Dr. Julian is associated with HC Simulation LLC (the company that produces JustPhysiology) but will receive no financial benefit from subscriptions associated with this course.

Peer-Review System

We will use the Peerceptiv peer-review system for the case report. There is normally a subscription fee, but we will have free access this semester. To set up your account at **https://go.peerceptiv.com/ (Links to an external site.)**.

If you attempt to self-register without using the instructions in the activation email, you will receive an on-screen message indicating that an account already exists with your email address. In that case, or if you no longer have access to the activation email, use the Forgot Password link to access your account.

Other Content

All other required digital content will be accessible from the course eLearning site (**https://elearning.ufl.edu (Links to an external site.)**).

Optional Resources

Osmosis Videos and High-yield Notes

Some students have found the Osmosis (Links to an external site.) medical education platform useful for learning physiology. This is a web and mobile-based resource that provides instructional videos and annotatable high-yield notes to supplement the videos. The content is primarily targeted to medical students, but many of the basic sciences and physiology videos are appropriate for this course. The Osmosis content is completely optional for this course, but if you prefer to learn from videos, you may find it helpful. Our course has a reduced subscription cost ($39.80). A printed copy of the High Yield Physiology Notes is available for $19.99 at **https://books.osmosis.org/ (Links to an external site.)**. The content is identical to the high yield notes that are available online as part of the Osmosis subscription, but if you prefer to have a bound, hard copy, this is less expensive than printing out color copies of the notes yourself.

Activities and Assessments

The class content will include textbook reading, in-class lessons, in-class problem-based learning (“active learning” questions), experiments using physiological simulations, and writing and peer-review of case reports.

Tutorials

You will be given the opportunity to complete tutorials throughout the course. These are self-paced and should be completed outside of the class meeting times (i.e., as “homework”). The

tutorials include clips of the Osmosis videos, experiments for you to perform in JustPhysiology, and knowledge-check questions interspersed throughout.

Problem-based Learning

During most class sessions, you will participate in problem-based learning (PBL), during which you will be asked to work with your classmates to answer questions and solve problems. You will use the active learning system to submit your answers.

Case Report Project

You will individually complete a case report during the term. For this report, you will be provided with a research problem about a physiological phenomenon. You are welcome to work on your proposal and reports with your classmates, but the final product must represent your own work. You will be expected to do the following:

1. Develop a hypothesis or differential diagnosis for the assigned problem or case.
2. Design an experiment that uses the physiology simulation software to test your hypothesis or that uses treatments to test your differential diagnosis.
3. Submit a short proposal to conduct your experiment or treatment. This will be evaluated by the teaching assistants.
4. After the proposal is approved, conduct your experiment or treatment, collect and analyze the data, and draw conclusions from the results.
5. Craft a clear, well-supported first-draft report.
6. Submit your draft report. This will be scored through peer review and by the teaching assistants.
7. Complete peer reviews of other students' draft reports.
8. Provide feedback on the peer reviews you received on your draft report.
9. Revise your draft report based on the peer reviews and teaching assistant comments. This may involve designing and running new experiments.
10. Submit your final report for peer review. This will be scored through peer review and by the teaching assistants.
11. Complete peer reviews of other students' final reports.
12. Provide feedback evaluations on the peer reviews you received on your final report.

Your proposal, draft case report and final case report must each be submitted as a PDF file and must be formatted according to the instructions provided for each, which will be posted on the course home page. Proposals and reports that are in a file format other than PDF or that are not formatted correctly may receive an automatic score of zero.

The proposal must be submitted as an assignment in Canvas. The draft and final case reports must be submitted through Peerceptiv and as an activity in Canvas. The proposal and all case reports, peer reviews, and feedback evaluations are due at 21:00:00 Eastern time on the date indicated in the syllabus schedule. The timestamp for every submission is based on the clock of the server, not the clock of the computer you are using. Local problems with your computer or

your internet access will not be grounds for extending the deadline, so don't wait until the last few minutes to complete any submission.

The total grade for each case report 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.
- **Writing Grade -** average score given by reviewers which is then curved, and then any Writing Late Penalties are subtracted.
- **Task Grade** - accounts for the percentage of assigned reviews and feedback 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 weighted grades

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 session 12, will consist of approximately 40 questions, will be administered during a normal lecture session (115 minutes in duration), and will be worth 100 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 also consist of approximately 40 questions and will be worth 100 points, but it will be administered during the final exam period (2 hours duration). Both exams will be closed book and you will not be allowed to use notes, but you may be expected to utilize the physiology simulation software to answer some of the questions. Students taking the exam remotely must use Honorlock.

Grading

Assessments

Assessment Type	Quantity	Points	Subtotal	Pct of Total
Tutorials and PBL	~100	1	100	25%
Case Report	1	100	100	25%
Midterm Exam	1	100	100	25%
Final Exam	1	100	100	25%
Total			400	100%

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+
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 assigned.

A “C-” is not a qualifying grade for critical tracking courses at UF. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). 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 (Links to an external site.)**

Extra Credit

There will be no opportunities for extra credit.

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. This course is 4 credits, so you should therefore expect to devote 12-16 hours per week to this course (for a total of 180-240 hours over the semester), of which only 4 hours per week will be spent in class. Therefore, you are responsible for budgeting more than 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 activities and assessments, causing you to receive a lower overall course grade.

Activity	Minimum Time (Hours)
Lectures/problem-based learning	56
Viewing videos and reviewing notes	80
Case report	40
Midterm exam	2
Final exam	2
Total	180

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

Direct Canvas Mail to the Instructors: Direct email to Dr. Julian or to the graduate teaching assistants should be used for messages that are private in nature or otherwise not appropriate to be posted to the Discussion Forum. 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 instructor or graduate teaching assistants.

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 (Links to an external site.) 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.

Class Participation

- This course consists of an online section and an in-person section. These are synchronous, which means that some students in our class and the instructor will be participating from the assigned classroom, while others will be participating remotely via videoconferencing. The instructor will make every effort to incorporate both cohorts of students in the course equally and simultaneously, but this is a learning process for all of us, so we will need to be patient. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Policies for In-person Participation

- In response to COVID-19, all persons who are physically in the classroom must always wear approved face coverings over their nose and mouth, must always maintain physical distancing of at least six feet, and must utilize designated seating locations. If anyone in the classroom fails to follow any of these rules, the in-person class session will be immediately terminated and the person or persons violating the rules will be reported to the Office of Student Conduct and Conflict Resolution.
- In-person students are expected to clean their spaces (desks, chairs) at the end of every class period. Sanitizing supplies are available in the classroom.
- In-person students must bring a headset (or earbuds) with a microphone to every class session for use with the classroom computers. This must have a 3.5 mm (1/8 inch) plug to allow it to work with the classroom computers.
- Students who have signed up for the in-person section but would prefer to attend a specific session remotely are free to do so, but they must notify the instructor in advance.

Policies for Remote Participation

- Students participating remotely are expected to participate fully and actively in all synchronous group work.

- When working collaboratively with other students during a class session, you are required to participate via audio and you are strongly encouraged to also use video.
- When participating via video, your visible attire should be appropriate for attending a class and respectful to the other students.
- You may use a simulated video background, but this must not contain any material that may be distracting, disturbing, or offensive to any participants in the classroom.

Policy on Absences and Make-up Work

- Requirements for class attendance and make-up exams, assignments, and other work are consistent with **university attendance policies (Links to an external site.)**.
- If you are experiencing COVID-19 symptoms, use the UF Health screening system and follow the instructions to determine whether you can attend class. Information on COVID-19 symptoms and notification procedures are: https://coronavirus.ufhealth.org/screen-test-protect/covid-19-exposure-and-symptoms-who-do-i-call-if/ (Links to an external site.). Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Refer to the above link for more information on the university's attendance policy.
- If you must miss an assignment or exam due to an otherwise 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 and unpredictable absence (e.g., illness), you must contact the instructor as soon as possible. In the case of illness unrelated to COVID-19, 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.

Late Work

- Late work will not be accepted unless it is the direct result of an allowable but unscheduled and unpredictable absence (e.g., illness), as defined above, at the discretion of the instructor.

Campus Resources

Health and Wellness

- *U Matter, We Care*: If you or someone you know is in distress, please contact **umatter@ufl.edu**, 352-392-1575, or visit **U Matter, We Care website (Links to an external site.)** to refer or report a concern and a team member will reach out to the student in distress.

- *Counseling and Wellness Center*: Visit the **Counseling and Wellness Center** (Links to an external site.) website or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center*: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the **Student Health Care Center** (Links to an external site.) website.
- *University Police Department*: Visit the **UF Police Department** (Links to an external site.) website or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the **UF Health Emergency Room and Trauma Center** (Links to an external site.) website.

Academic Resources

- *E-learning technical support*: Contact the **UF Computing Help Desk (Links to an external site.)** at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- ***Career Connections Center*** (Links to an external site.): Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- ***Library Support*** (Links to an external site.): Various ways to receive assistance with respect to using the libraries or finding resources.
- ***Teaching Center*** (Links to an external site.): Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- *Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.
- *Student Complaints On-Campus*: visit the **Student Honor Code and Student Conduct Code (Links to an external site.)** website.
- *On-Line Students Complaints*: view the **Distance Learning Student Complaint Process (Links to an external site.)**.

Accommodations for Students with Disabilities

Students who experience learning barriers and would like to request academic accommodations should connect with the **Disability Resource Center (Links to an external site.)** (DRC). Once registered with the DRC, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure during the first week of classes or within one week of receiving their accommodation documentation from the DRC, whichever is later.

Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available

at **www.gatorevals.aa.ufl.edu/students/ (Links to an external site.)**. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via **www.ufl.bluera.com/ufl/ (Links to an external site.)**. Summaries of course evaluation results are available to students at **www.gatorevals.aa.ufl.edu/public-results/** (Links to an external site.).

Procedure for Conflict Resolution

As per UF policy, any classroom issues, disagreements, or grade disputes should be discussed first between the instructor and the student. If the problem cannot be resolved, please contact the Undergraduate Coordinator or the Department Chair. Be prepared to provide documentation of the problem, as well as all graded materials for the semester. Issues that cannot be resolved departmentally will be referred to the University Ombuds Office (**www.ombuds.ufl.edu (Links to an external site.)**; 392-1308) or the Dean of Students Office (**www.dso.ufl.edu (Links to an external site.)**; 392-1261).

Course Schedule (subject to change)

All case report project activities are due at 21:00:00 (9:00 PM) on Friday unless indicated otherwise.

Week	Session	Date	Topic (Chapter Number)	Case Report
1	1	11-Jan	Introduction General concepts and foundations (1)	
	2	14-Jan	Cell structure (2) Signal transduction (3) Gene expression (4)	

2	3	19-Jan	Transport of solutes and water (5) Resting membrane potential (6)	
	4	21-Jan	Action potentials (7) Synaptic transmission (8)	
3	5	26-Jan	Muscle cells (9) Nervous system organization (10) Neurons (12)	
	6	28-Jan	Neuronal synapses (13) Autonomic nervous system (14)	
4	7	2-Feb	Sensory transduction (15)	
	8	4-Feb	Central nervous system (16)	
5	9	9-Feb	Cardiovascular system organization (17) Blood (18)	
	10	11-Feb	Blood vessels (19, 20)	
6	11	16-Feb	Cardiac electrophysiology (21)	Proposal
	12	18-Feb	The heart as a pump (22) Special circulations (24)	
7	13	23-Feb	Regulation of MAP and cardiac output (23) Control of the cardiovascular system (25)	

		25-Feb	Spring recharge day (no class meeting)	
8	14	2-Mar	**Midterm Exam**	
	15	4-Mar	Respiratory system organization (26) Mechanics of ventilation (27)	
9	16	9-Mar	[No class meeting; asynchronous] Acid-base regulation (28) Oxygen and carbon dioxide transport (29) Gas exchange (30)	Draft report
	17	11-Mar	Lung ventilation and perfusion (31) Control of ventilation (32)	
10	18	16-Mar	Urinary system organization (33) GFR and RBF (34)	Draft report reviews
	19	18-Mar	Renal electrolyte transport (35, 37) Organic molecule transport (36)	
11	20	23-Mar	Urine concentration and dilution (38) Renal acid and base transport (39) Integration of salt and water balance (40)	Draft report feedback evals
	21	25-Mar	Gastrointestinal system organization (41) Gastric function (42)	
12	22	30-Mar	Pancreatic and salivary glands (43) Intestinal fluid and electrolyte movement (44)	

	23	1-Apr	Nutrient digestion and absorption (45) Hepatobiliary function (46)	
13	24	6-Apr	Endocrine system organization and control (47) Endocrine regulation of growth and body mass (48)	Final report
	25	8-Apr	Thyroid gland (49) Adrenal gland (50)	
14	26	13-Apr	Endocrine pancreas (51) Parathyroid glands and vitamin D (52)	Final report reviews
	27	15-Apr	Sexual differentiation (53) Male reproductive system (54) Female reproductive system (55)	
15	28	20-Apr	Review	Final report feedback evals (due 21 April but may be submitted until 23 April without a late penalty)
		22-Apr	Reading day (no class meeting)	
		27-Apr	**Final Exam**, 4/27/2021, 7:30 - 9:30 AM	