

# MCB 136 Advanced Physiology

**TEXTBOOKS:** "Vander's Human Physiology" 15th or higher Editions are good reference. Your most useful resource will be the information uploaded by your instructors on the bCourses website: <https://bcourses.berkeley.edu/courses/1512473> Please note that the emphasis in this course is on the material covered in lecture AND in the lecture notes. You are not required to purchase a textbook for this course; however, the instructors will use materials and provide recommended reading from the textbooks below:

1. "Vander's Human Physiology" 15th (or any other Edition)
2. ISBN: 9781259903885 Liqun Luo's "Principles of Neurobiology" 2nd edition;
3. ISBN: 9780815346050

You can use any Physiology textbook such as Silverthorn Physiology. You can use physiology e-book from the UC library: <https://www.lib.berkeley.edu/research-support/books-ebooks>

For Neurophysiology lectures, you can review: Principles of Neural Science, 5th edition by Kandel et al. which is available from the UC library:

<http://neurology.mhmedical.com/book.aspx?bookID=1049>

During the first two weeks of the hybrid instructions, lectures will be recorded and videos of Instructors' lectures will be posted to bCourses for the week that the topics are covered in Discussion sections. For most lectures, the videos will be accessible for only 10 days to allow students to review concepts. Lectures will not be recorded during in-person instructions.

**ADVICE FROM INSTRUCTORS:** A key element in doing well in this class is attending lectures and participating in discussions. It is also imperative that you keep up to date with your studying. Looking at the recommended reading the same day as the lecture and reviewing the uploaded lecture notes after lecture have proven to make an enormous difference in the result. Do not hesitate to ask the instructors questions. Each lecture in turn uses the material in previous lectures. It is easy to get left behind if you do not master the material previously presented. MCB 136 Advanced Physiology 2022 Syllabus will incorporate active learning exercises for some of its lectures, videos or other materials might be assigned prior to the lecture. It is important that you complete these assignments and come well prepared to participate in the class. Please attend and ask questions during office hours- we will be happy to answer them! The best time to ask them is after reviewing your notes - hopefully you will be doing so shortly after each lecture. Email should only be used for administrative purposes, not for questions on course content.

**DISCUSSION SECTIONS:** Sections start meeting the second week of classes (January 24th). Your GSIs are passionate scientists excited about physiology. They are an important resource for you this semester. Attendance & active participation in the Discussion sessions counts towards your grade. Note that you must attend at least seven discussion sessions to pass MCB136. To change your official discussion section, you must find someone to swap with & obtain permission from the faculty instructors. Remember, the first week of discussion sections will be held via Zoom.

**LECTURE MATERIALS:** Official lecture notes are available on bCourses in folders within the */Files* area. Your most useful resource will be the information uploaded by instructors on the bCourses website: <https://bcourses.berkeley.edu/>. Please note that the emphasis in this course is on the material covered in lecture AND in the lecture notes. The current format is hybrid, which means the first two weeks of instructions will be held via zoom and these lectures will be recorded. However, future lectures delivered in person will not be recorded. If an online-only format is implemented due

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to a worsening pandemic situation, lectures will be switched to Zoom and will be recorded. In such case, the videos of Instructors' lectures will be posted to bCourses for the week that the topics are covered in Discussion sections. For most lectures, the videos will be accessible for ~10 days to allow students to review concepts. All course materials are protected by copyright. Lecture notes, worksheets, exams, and assignments are provided for your use only. Downloading, recording or otherwise copying lecture videos is strictly prohibited in this Course. Buying or selling lecture notes, lecture videos, assignments, or other course materials is a breach of the UC Berkeley Code of Conduct. Any student found to violate these policies will be referred to the Center for Student Conduct.

**DIVERSITY STATEMENT:** It is our intention that students from diverse backgrounds and with diverse perspectives will be well served by this course, that all students' learning needs will be addressed, and that the diversity that students bring to this class be viewed as a strength and benefit. We respect the diversity in its broad definition: disability, age, socioeconomic status, ethnicity, gender, sexuality, race, religion, beliefs, and culture. Your suggestions are encouraged and appreciated.

## **COURSE MECHANICS & RESILIENCE:**

The official course syllabus can be found on bCourses:

<https://bcourses.berkeley.edu/courses/1512473> Any changes will be noted on this syllabus.

Lectures, Office hours and Discussion sections will be held in-person after the first 2 weeks on online instructions, unless otherwise noted.

**Campus COVID-19 directives.** We will adhere to current UC Berkeley campus directives aimed at mitigating the spread of SARS-CoV-2. Refusal to comply with campus policies, such as masking indoors, may result in a student being asked to leave the class. Please contact the instructors if you have medical concerns about complying with COVID-19 campus policies. Although we hope that our current in-person instructional model will be maintained through the semester, we recognize that the COVID-19 pandemic continues to evolve. The instructors will keep you informed if campus directives change during the semester.

**Access to technology.** We recognize that power outages and other unforeseen events can interfere with internet access needed for remote sessions if such sessions become a necessity. In the case of the hybrid format, if you experience a loss of connectivity that prevents you from turning in assignments on time, please send your assignment to all instructors as soon as possible via Canvas.

Include:

- 1) your assignment saved prior to the deadline, AND
- 2) an image with a timestamp that documents the problem that prevented your turning in the assignment on time.

In the case of widespread outages, we will provide alternate materials (e.g., lecture videos), reschedule lectures, or cancel lectures. UC Berkeley students in need of hardware or internet access can apply for free loaner laptops and peripherals through Student Tech Services (STS; <https://technology.berkeley.edu/STEP>). STS also provides free software and helpdesk support. They can be reached at 510.642.HELP or [sts-help@berkeley.edu](mailto:sts-help@berkeley.edu). A list of resources is available on their website: <https://studenttech.berkeley.edu/home>

## **COMMUNICATION WITH INSTRUCTORS & GSIs**

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**Course logistics.** Please direct questions and concerns related to course logistics to all Faculty Instructors via Canvas.

**Course content.** Piazza is available for posting questions and answers related to course content only. You are encouraged to check Piazza often, and answer posted questions. Questions and answers will be reviewed daily, Sunday through Thursday by GSIs and faculty. Note that Piazza will be turned off during exams, so please post your questions by 5 PM on Thursday prior to exams. Find our class signup link at: <https://piazza.com/berkeley/spring2022/mcb136>

## **COURSE MECHANICS, ASSESSMENTS & GRADING.**

Quizzes, midterm and final exams will be conducted in-person, in class. Please, bring paper, pen and a calculator on days when quizzes and exams are scheduled. Your answer sheets/exams papers will be collected and grading will be conducted through Gradescope:

<https://www.gradescope.com/courses/357524>

Problem sets will need to be completed and submitted via Gradescope. In case of the hybrid format these assessments will be timed unless otherwise noted by the instructors.

**Quizzes (30 possible points):** In class, 15 min: 2/2, 3/4, 4/13. There are no make-ups or re-grades for these quizzes. Calculators needed for all quizzes and exams. No cell phones. These brief quizzes will be administered at the beginning of some lectures. They are designed to allow students to assess their grasp of key concepts related to that day's lecture topic.

**Problem Sets:** due: 2/11, 3/14, 4/22. Problem Sets are take-home assignments designed to solidify your mastery of quantitative concepts in physiology. Incorrect answers are okay, but you should fully complete and explain your thought process because working through these problem sets will be critical to your success in midterm exams. In fact, some questions will be taken from previous years' exams. You are welcome to discuss problem sets with your study groups and discussion sections; however, each student must turn in their own original work. Students will be given  $\geq 5$  days to complete each problem set:

PS1: Released Feb 4, Due Feb 11, 10:59 AM; PS2: Released Mar 7, Due Mar 14, 10:59 AM;

PS3: Released Apr 15, Due Apr 22 10:59 AM

**Exams:** Midterms in class: 2/18, 3/18, and 4/29. Final Exam in person on 5/10. Makeup Midterm tests will only be given at the discretion of the instructor and for extraordinary documented reasons that require advance notice before the original scheduled time of the test (with the exception of medical emergencies).

## **Grades:**

Your grade will be based on a total of 300 points. We do not use a curve in this course, though the number of points used to determine percentages (and letter grades) may be decreased to work in your favor.

Midterm exams:	50 pts X 3 exams = 150 pts
Final exam:	90 pts
Problem sets:	5 pts X 3 sets = 15 pts
Three Quizzes:	30 pts (10 pts each)
Discussion section participation:	<u>15 pts</u>
Total:	300 pts

**Re-grading:** A fundamental goal of our course is to enable all students to learn and demonstrate their knowledge. To ensure fairness, this course does not allow regrade requests except in the event

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of a procedural error (e.g., incorrect addition of points). If you find such an error, please email all 3 professors via Canvas within 48 hours of receiving the score. Loss of points resulting from student errors, such as those arising from misinterpreting exam instructions, answers that restate the question, or incorrect/incomplete answers, will not be regraded. All answers for each exam question are carefully graded by a single grader. Answers are also reviewed by at least one instructor for fairness. Note that graders are instructed to award points generously for answers that are partially correct. Please do not approach your GSI to review perceived errors in assigning partial credit to exam answers. Note that test papers are routinely photocopied before they are handed back. The Final exam cannot be handed back as it is part of your record, but can be examined on request in the presence of a GSI during the first week of the next semester.

## **COURSE POLICIES**

**DSP Students.** Inform your instructor of any accommodations needed during the first week of the course. Your experience in this class is important to us. If you have already established accommodations with the DSP office please communicate your approved accommodations to us at your earliest convenience so we can discuss your needs in this course.

**Late Work Policy.** Be sure to pay close attention to deadlines. We do not offer alternate dates/times for assignments or assessments. You must take/submit all work on the scheduled date. If you must miss a deadline because of an emergency or a professional school interview, please inform all faculty instructors and your GSI as soon as possible. If your absence is excused, the exam will be dropped and your grade for the course will be based on the remaining exams/assignments.

**Safe, Supportive, and Inclusive Environment.** Whenever a faculty member, staff member, post-doc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process. Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling (510) 642-1988.

The classroom should be a safe and inclusive environment for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call (510) 643-7985, email [ask\\_ophd@berkeley.edu](mailto:ask_ophd@berkeley.edu), or go to <http://survivorsupport.berkeley.edu/>

## **MENTAL HEALTH & BASIC NEEDS.**

If you experience stress, anxiety, or other forms of distress during the semester, we hope to be a resource for you. Please reach out to one of the Professors if you need support.

As a Cal student, you have access to many resources. A summary of these resources can be found at the Center for Support & Intervention's (CSI) website: <https://csi.berkeley.edu/process/>

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**Basic Needs assistance.** Housing, food insecurity and financial instability impact one's ability to thrive in college. UC Berkeley's Basic Needs Center aims to promote justice and belonging for all members of the UC Berkeley community by assisting with basic needs, including emergency

housing and a Food Pantry. See their website for a list of services and resources:

<https://basicneeds.berkeley.edu/services-and-resources>

**Counseling and Psychological Services.** All registered Berkeley students are eligible to use UC Berkeley's Counseling and Psychological Services (CAPS; <https://uhs.berkeley.edu/caps>). You do not have to purchase the Student Health Insurance Plan to use these services. The first five counseling sessions are free for registered Berkeley students. Counselors can provide support in academic success, life management, career and life planning, and personal growth and development.

Please call (510) 642-9494 or stop by the office on the 3rd floor of the Tang Center to make an appointment with a counselor.

- Drop-in counseling for emergencies: Monday - Friday, 10:00AM - 4:30PM
- After-hours counseling: In the case of emergencies at night or on weekends, call (855) 817-5667 for free assistance and referrals. Request to speak with a counselor.
- For emergency support (imminent risk of harm to self or others): Call UCPD: 911 or (510) 642-3333 24-hour Crisis Hotlines:
  - Alameda County Crisis Line: (offers confidentiality, TDD services for deaf and hearing-impaired callers and translation in 140 languages) Call 1-800-309-2131
  - National Crisis Help Line: Call 1-800-273-TALK
  - National HopeLine Network: Call 1-800-SUICIDE

**Please also look out for your peers.** CSI notes that peer support is one of the most important and effective resources for students managing distress or difficult life circumstances. If you see any of the signs below that indicate your classmate might need assistance, please use the resources above, or reach out to your Professors or GSIs.

- Withdrawing from other people
- Changes in weight or eating patterns
- Changes in sleeping patterns
- Fatigue or lack of energy
- Increased anxiety or irritability
- Feeling worthless or hopelessness
- Repeatedly missing class

If you or a peer exhibit concerning behaviors related to personal, physical, and emotional well-being, please file a Care Report for referral to the Center for Support & Intervention (CSI).

Indicators of distress can be found on CSI's website: <https://csi.berkeley.edu/socc-when-to-refer/>

CSI Care Report website:

[https://berkeley-advocate.symplicity.com/care\\_report/index.php/pid760334?](https://berkeley-advocate.symplicity.com/care_report/index.php/pid760334?)

## **ACADEMIC INTEGRITY AND ETHICS**

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**The student community at UC Berkeley has adopted the following Honor Code:** “As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.” The expectation is that you will adhere to this code.

Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student’s exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.

A good lifetime strategy is always to be honest with yourself and keep your integrity solid. Act in such a way that no one would ever imagine that you would consider cheating. To guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not communicate with others during quizzes and exams, unless they are assigned as group projects.

**Collaboration and Independence.** Reviewing lectures and reading materials and studying for exams can be enjoyable and enriching activities to do with your peers. This is recommended; however, unless otherwise instructed, homework assignments and exams are to be completed independently and materials submitted should be the result of one’s own independent work.

**Plagiarism.** UC Berkeley’s Code of Student Conduct defines plagiarism as the use of intellectual material produced by another person without acknowledging its source. Common Examples: 1) Direct copying of passages of works from others directly into homework, essay, term paper, or dissertation without acknowledgment; 2) Using the views, opinions, or insights of another without acknowledgment; 3) Paraphrasing another person’s characteristic or original phraseology, metaphor, or other literary device without acknowledgment. <https://sa.berkeley.edu/citeresponsibly>. Note that assignments might be analyzed using plagiarism detection software.

**Academic misconduct.** Cheating on assignments, plagiarism, and purchasing or selling course materials are common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity.

This course will follow UC Berkeley’s policy on academic misconduct:

<http://bulletin.berkeley.edu/academic-policies/#studentconductappealstext>

In fairness to students who put in an honest effort, students that copy another's answer, use the internet during exams, plagiarize, or engage in other forms of cheating, will be assigned a zero for that entire assignment. The Office of Student Conduct will also be notified.

## **LETTERS OF RECOMMENDATION.**

Any of the three instructors may be asked for a letter of recommendation. So that we may prepare effective evaluations we ask that you do the following: be sure to attend the instructor’s office hours, as well as lectures. Ask your GSI to co-write the letter based on your discussion section participation. Provide both the GSI and Professor a copy of your unofficial transcript, CV and

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finalized personal statement, along with a waiver form/statement from AMCAS, Interfolio, graduate/professional school admissions office, or other letter service providers. Only confidential letters will be provided.

## Online Evaluations Link

Please provide the following link in class: [course-evaluations.berkeley.edu](https://course-evaluations.berkeley.edu)

## Schedule:

Date	Lecture	Topic	Lecturer	Quiz/PS
19- Jan- Wed	1-zoom	Intro to Physiology. Diffusion and osmosis	TM1	
21- Jan- Fri	2-zoom	Channels and Transporters: Principles of Operation	TM2	
24- Jan- Mon	3-zoom	Membrane Potential/Nernst/GHK/ion movements into/out of cells	TM3	
26- Jan- Wed	4-zoom	Graded/Action Potential	TM4	
28- Jan- Fri	5-zoom	Action potential propagation	TM5	
31- Jan- Mon	6-zoom	Synapse/neuromuscular junction	PL1	
2- Feb- Wed	7	Ion channel structure/function and the principles of gating	PL2	Quiz 1
4- Feb- Fri	8	Channelopathies and clinical interventions	PL3	PS1 out
7- Feb- Mon	9	CNS/PNS/ Basic Neuroanatomy	PL4	
9- Feb- Wed	10	Somatic and Autonomic Nervous Systems	PL5	
11- Feb- Fri	11	Sensory 1: phototransduction and eye disorders	PL6	PS1 due
14- Feb- Mon	12	Sensory 2: taste, olfactory, mechano- and temperature sensations	PL7	
16- Feb-Wed	13	BBB/Techniques to probe nervous system	PL8	
<b>18- Feb- Fri</b>		<b>Midterm I (Lectures 1-11)</b>	<b>NA</b>	
<b>21- Feb- Mon</b>		<b>Presidents' Day (no instructions)</b>	<b>NA</b>	
23- Feb-Wed	14	Skeletal Muscle (Molecular basis of contraction)	PL9	
25- Feb-Fri	15	Skeletal Muscle (Regulation and disease)	PL10	
28- Feb-Mon	16	Smooth Muscle and Cardiac Muscle	TM6	
2- Mar-Wed	17	Heart: Anatomy, Physiology and Regulation	TM7	
4- Mar- Fri	18	Blood and Blood Vessels	TM8	Quiz 2
7- Mar- Mon	19	Blood Vessels, Lymphatics and Regulation	TM9	PS2 out
9- Mar- Wed	20	Cardiovascular Regulation	TM10	
11- Mar- Fri	21	Respiration Anatomy, Mechanics and Ventilation	TM11	
14- Mar- Mon	22	Gas Exchange, Transport and Regulation of Respiration	TM12	PS2 due
16- Mar-Wed	23	Integration: CV and respiratory physiology during exercise	TM13	
18- Mar- Fri		<b>Midterm II (Lectures 12-21)</b>	<b>NA</b>	
<b>21- Mar- Mon</b>	<b>S recess</b>	<b>No classes</b>	<b>NA</b>	
<b>23-Mar- Wed</b>	<b>S recess</b>	<b>No classes</b>	<b>NA</b>	

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## Spring 2022 Syllabus

<b>25-Mar- Fri</b>	<b>S recess</b>	<b>No classes</b>	<b>NA</b>	
28-Mar- Mon	24	Reproduction: male and female reproductive systems	PL11	
30-Mar- Wed	25	Reproduction: fertilization, development and infertility	PL12	
1- Apr- Fri	26	Endocrinology I	IS1	
4- Apr- Mon	27	Endocrinology II	IS2	
6- Apr- Wed	28	GI: Mouth to Stomach	IS3	
8- Apr- Fri	29	GI: Digestion and Absorption	IS4	
11- Apr-Mon	30	Metabolism	IS5	
13- Apr- Wed	31	Appetite and Fat Storage	IS6	Quiz 3
15- Apr- Fri	32	Thermogenesis	IS7	PS3 out
18- Apr- Mon	33	Introduction to Renal Physiology	IS8	
20- Apr- Wed	34	Regulation of Fluid and Electrolytes by the Kidney	IS9	
22- Apr- Fri	35	Thirst: Systemic Regulation of Fluid Balance	IS10	PS3 due
25- Apr- Mon	36	Regulation of Organismal pH	IS11	
27- Apr- Wed	37	Regulation of Fluid Pressures	IS12	
29- Apr- Fri		<b>Midterm III (Lectures 21-35)</b>	<b>NA</b>	
2- May- Mon		RRR-Review I (Prof. Machen)		
4- May- Wed		RRR-Review II (Prof. Lishko)		
6- May- Fri		RRR-Review III (Prof. Swinburne)		
10- May-Tue		<b>Final Exam (Lectures 1-37)</b>	<b>NA</b>	