

## **BIMM 110 Syllabus**

**Course:** *Molecular Basis of Human Disease*      **Instructor:** *John Tat, Ph.D.*      **Email:** *johnntat@health.ucsd.edu*  
**Lecture:** *Mon-Thurs: 3:30-4:50 PM in Warren Lecture Hall 2111*  
**Instructor's Office hours:** *Mon-Wed: after class until 6 PM*      **Class representative meeting:** *Thurs after class until 6 PM*  
**Midterm exam:** *Due by 5 PM on Monday, July 11, 2022 on Canvas*  
**Final exam:** *Due by 11 AM on Saturday, July 30, 2022 on Canvas*

IA	Email	Section time	Section location	Office hour
Caitlin Murphy	c9murphy@ucsd.edu	A01: 9 AM-10:50 AM	Center 217A	2:15-3:15 PM on Mondays, Mandeville Coffee Cart
Caitlin Murphy	c9murphy@ucsd.edu	A02: 11 AM-12:50 PM	Center 217A	2:15-3:15 PM on Mondays, Mandeville Coffee Cart

### **My Teaching Philosophy:**

***“Success is a combination of grit and wit. So, work harder but also work smarter.”***

***“I teach science the way I practice science: evidence-based.”***

***“Educators should prepare students intellectually and professionally. I won’t teach skills that fulfill neither goal.”***

***“Transparency is good.”***

***“You paid a lot of dollars for a good college education. I will make sure your excellent learning is worth every penny.”***

**Specific aim.** My educational goals are to train students to think, work and communicate like budding scientists. A way to achieve this vision is teaching, such as BIMM 110, a course examining the basic mechanisms and clinical aspects of selected human diseases. My specific aim for BIMM 110 students is that they will gain the theoretical background and critical thinking and teamwork skills that will prepare them for future careers in research or biotechnology/pharmaceutical. Using a backward design, I set up three learning outcomes to achieve my aim:

1. Students will learn about selected human diseases; the genetic, molecular, biochemical, cellular, and physiological approaches used to study the molecular basis of these diseases; and how these techniques have been leveraged to develop successful and potential preventative, diagnostic, and therapeutic strategies to address these diseases.

2. Students will learn how to critically examine quantitative and qualitative data, and use evidence to formulate scientific conclusions related to our examination of selected human diseases.
3. Students will learn how to communicate and work with each other, especially to complete major assignments i.e., homework and exams.

I will deliver curriculum through a combination of direct instructions and heuristic approaches. I can modify the curriculum at any time in order to deliver the best learning experience. This syllabus is not a legally-binding document.

***Integrated nature of the course.*** Prerequisites for BIMM 110 are BICD 100 Genetics, BIBC 100 (or 102) Biochemistry, and BIMM 100 Molecular Biology, or their equivalence. Prior to taking these biology courses, many students will have already finished their general chemistry, math, physics, writing series, plus a few organic chemistry and laboratory courses. I will use this background to provide a more in-depth and complex presentation of human diseases. While they are not expected to be experts in these areas, students should not be strangers to them when they appear in BIMM 110. Also, to enhance the active learning and critical thinking components of BIMM 110, students will need to take the initiative to learn on their own and/or apply what they know on many occasions. These features will add to the difficulty of the course.

***Videocasting.*** Lectures and discussion sections are recorded. They are accessible at [podcast.ucsd.edu](http://podcast.ucsd.edu).

***Trigger warning.*** Health topics are sensitive, personal, and sometimes even political. Discussions about health topics can feel offensive, especially when these topics are coupled with disparities caused by biological, socioeconomic, gender, language, and other factors. Please know these offenses are unintentional, and I ask for your forgiveness and grace.

***Reading materials.*** While textbooks promote curricular consistency and facilitate content delivery to a wider range of learners, peer-reviewed articles are better at advancing critical reading and thinking skills (Collins-Dogrul and Saldaña. *JoSoLT* 2019; 19(2): 88-101)). Therefore, we will not have a textbook, but instead rely on primary literature. I will post all reading materials on Canvas.

***Optional attendance.*** The effectiveness of mandatory class attendance is still under debate. A meta-analysis using data covering ~100 years and ~28,000 student learning outcomes found attendance to be the most important predictor of high grades (Crede et al. *Review of Educ Res*, 2016, 80(2), 272-295). Similarly, IA-led discussion sections help to clarify and reiterate information, give additional tutelage, and provide me with information about a student's work ethics and behaviors. Extra efforts showcasing scholarly commitment may sometimes be used to justify rounding up a student's grade when it is within 0.5%. However, BIMM 110 participants usually have junior or senior standing. They should decide for themselves whether attendance is necessary for their education. Therefore, lecture and discussion section attendance are optional.

**Course schedule.** This curriculum follows five internal medicine subspecialties (except for Unit 1). This format mirrors the medical, pharmacy, and many biomedical PhD curricula. Each unit starts with an anatomical and physiological overview of a system, followed by lectures on diseases specific to that system. Teaching tidbits for each disease will generally follow this pattern: (1) general information, (2) epidemiology, (3) pathophysiology, (4) risk factors, (5) signs/symptoms, (6) diagnostic tools, and (7) current and/or potential treatments. There is a heavy emphasis on biological mechanisms. Studying the teaching tidbits in this pattern will help students form the conceptual framework of molecular medicine. The framework will help students to understand how small details come together to build the big pictures, and to master the course materials.

### Schedule

### Required readings (materials are testable as homework or exam questions)

#### Unit 1: Philosophical foundations

- Mon, 6/27 Prologue

1. J.L. Scully. What is a disease? Disease, disability & their definitions. *EMBO Rep* 2004
- F. Gannon. Molecular medicine: trendy title or new reality? *EMBO Rep* 2003

#### Unit 2: Pulmonology

- Tues, 6/28 Respiratory system
- Wed, 6/29 Asthma
- Thur, 6/30 Cystic fibrosis

2. Harkema et al. Respiratory System. *Fundamentals of Toxicologic Pathology*, 2018, pp 351-361
3. Johnson & Theurer. A stepwise approach...*American Family Physician*. 2014. 89(5):359-366
4. Willis et al. Failure to thrive in a 14-month old child. *LabMed*. 2003;7(34)

### Homework assignment #1 due by 5 PM on Friday, July 1, 2022 on Canvas

#### Unit 3: Global Health & Infectious Diseases

- Mon, 7/4 No Class
- Tues, 7/5 Infectious diseases
- Wed, 7/6 Malaria
- Thurs, 7/7 Tuberculosis

5. Stefan Riedel. Edward Jenner and the history of smallpox vaccination. *BUMC Proc*. 2005;18:21-25
  6. O'Neill et al. A tetraoxane-based antimalarial drug candidate... *Nat Commun*. 2017. 24(8):15159
  7. Liu et al. Mutations in Rv1258c cause resistance in *tuberculosis*. *Front Microbiol*. 2019; 10: 216
- You will be tested on the Liu et al. paper on the midterm. Read it carefully.*

### Homework assignment #2 due by 5 PM on Friday, July 8, 2022 on Canvas

- Mon, 7/11 **Midterm (no class)** None; **midterm due by 5 PM on Monday, July 11, 2022 on Canvas**

#### Unit 4: Endocrinology and metabolism

- Tues, 7/12 Endocrine system 8. Watamura. Endocrine system. *Encyclopedia of Infant & Early Childhood Dev*, 2008; 450-459

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- Wed, 7/13 Newborn screening 9. Ney et al. Glycomacropeptide supports growth and reduces [Phe]. *J Nutr.* 2008; 138(2):316-22
- Thurs, 7/14 Diabetes type II 10. O'Neal and Luther. Dawn phenomenon. *StatsPearl.* 2021

### **NO HOMEWORK THIS WEEK SO IA CAN GRADE MIDTERM EXAM**

#### *Unit 5: Gastroenterology*

- Mon, 7/18 Digestive system 11. <https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works>
- Tues, 7/19 Celiac disease 12. Trasciatti et al. Effect of oral cholecalciferol...: *J Steroid Biochem Mol Biol.* 2022 Mar 4;220:106083
- Wed, 7/20 Peptic ulcers 13. RJLF Loffeld et al. Peptic ulcer disease: a vanishing disease! *J Gastric Dis & Therapy.* 2016;2(4)
- Thurs, 7/21 Viral hepatitis 14. Song and Kim. Diagnosis of hepatitis B. *Ann Transl Med.* 2016;4(18):338

**Extra credit: submit your proposed final exam questions by 5 PM on Thursday, July 21, 2022 on Canvas**

**Homework assignment #3 due by 5 PM on Friday, July 22, 2022 on Canvas**

#### *Unit 6: Oncology*

- Mon, 7/25 Cancer biology 15. Hanahan and Weinberg. Hallmarks of cancer: the next generation. *Cell.* 2011 Mar 4;144(5):646-74
- Tues, 7/26 Lung cancer 16. Jones and Baldwin. Recent advances in the management of lung cancer. *Clin Med.* 2018
- Wed, 7/27 Breast cancer 17. Yasuda et al. Estrogen & stress-induced DNA damage in Breast Canc. *Gene Environ.* 2017. 39:10
- Thurs, 7/28 Epilogue

**Extra credit: submit your opinion of instructor and course by 5 PM on Thursday, July 28, 2022 on Canvas**

**Extra credit: CAPE due by 8 AM on Friday, July 29, 2022**

**Final examination due by 11 AM on Saturday, July 30, 2022 on Canvas**

***Grading system and its rationale.*** Many professors evaluate students by test scores alone. While highly efficient, this method makes an “A” almost unobtainable for students who might have good work ethics but have poor test-taking skills. It also disadvantages students who may have good work ethics and are great test-takers, but may have had a bad testing day. In short, grading via examination alone neither acknowledges nor rewards the fact that good scholarship requires wit and grit. It also misrepresents scholarship as nothing more than test scores. In the short run, this method makes taking any class risky. In the long run, this method does not prepare our graduates professionally. Indeed, while good grades open

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up job opportunities, keeping a job requires combining intellect with hard work. Thus, my grading system rewards both wit (~75%) and grit (~25%).

<b>Type</b>	<b>Points</b>	<b>Notes</b>
Weekly homework	~25 points each (x3)	~75 points total
Midterm exam	~75 points	Extra credit points will be available
Final exam	~150 points	Comprehensive; extra credit points will be available
<b>Extra credits (can boost grade by ~7%)</b>		
CAPE	1-3 points	1 pt. iff ≥90% of students fills out CAPE form; 3 pts iff 100% evaluations
Section/lecture attendance	5 points	Given out randomly (see below)
Midterm extra credit	2 points	
Final extra credit	2 points	
Extra credit	2 points	Up to 2 pts. submission and selection of your final questions
Extra credit	4 points	Up to 3 pts. for instructor/course feedback
Extra credit (section representative)	4 points	See below
Possible	322/ ~300 points	

**Grade distribution.** The course is not curved since one student's success should not depend on another student's misfortune. Your letter grade is based on point accumulation. So, collaborations are highly recommended since everyone could potentially earn an "A." My teaching experiences show a positive correlation between a student's willingness to work with others and their letter grade.

<b>Mastery/Excellent</b>		<b>Proficiency/Good</b>		<b>Developing/Fair</b>		<b>Poor</b>		<b>Fail</b>	
96-100+%	A+	84-87.9%	B+	72-75.9%	C+	>63.9%	D	>53.9	F
92-95.9%	A	80-83.9%	B	68-71.9%	C				
88-91.9%	A-	76-79.9%	B-	64-67.9%	C-				

**Ungraded in-class quizzes.** In-class quizzes via iClicker are a type of formative assessment, i.e., ongoing evaluations enabling students to monitor their own learning, conducted to gauge students' understanding and provide feedback on my pedagogy. In-class quizzes are set up in the format of easy, moderate, and advanced questions (described below) to help students prepare for their exams.

**Group work option.** On all assignments, students may submit as individuals or in groups of up to four students from the same section. This is another active learning activity to promote collaboration and inclusivity. If you chose the group option, you need to compose your own groups from

the people in your section. Students from different sections cannot co-author assignments to avoid statistical anomalies when assigning grades. If a submission was co-authored by students from different sections, then that assignment will receive zero points. Students may change groups for each assignment. As long as every member reports their name, PID, and justification (see below) on the submission, they will be credited. The IA and I will not regulate your groups.

**Credit justification on group work.** For everyone to receive the same full mark on a submission, co-authors must write a paragraph on the assignment's cover page justifying why every team member deserves equal credit. If the justification is missing for a group member, that member automatically loses 20% from whatever the full mark may be. Also, if your team feels a member should not receive full credit, decide as a team what percentage of the total points that person should receive and justify why. Below is an example justification:

“John Smith and Jane Doe handled all the easy questions and significantly helped with the moderate and advanced questions. Al Batross and An Chovy were assigned the moderate and advanced questions. However, Al Batross and An Chovy responded slowly and did not ask for help in timely manner. Their answers also did not address the prompts. We were forced into a time crunch and did not have enough time to review the test before submitting. Therefore, we agreed, and demonstrate so through our signatures, that while John Smith and Jane Doe should receive full credit, Al Batross and An Chovy would only get 75% of the credit.”

**Rationale for the group work option.** The group work option will alleviate some stress stemming from the summer session's rapid pace. Also, collaboration and sharing credit are common features in the research community. For example, a publication may have several co-authors, with each author's contributions explicitly stated (Casadevall et al. *J Clin Invest.* 2019;129(6):2167-2168). Therefore, the group option teaches science the way science is practiced professionally.

**Homework** is another formative assessment. It will have easy, moderate, and advanced questions to prepare students for their exams. While students may submit as individuals, they are highly encouraged to submit as groups of up to four students from the same section. Other strong requirements are: (1) each student's name can only appear on one submission, and (2) no late submission will be accepted.

**Examinations** are summative assessments enabling me to assess students' mastery of BIMM 110. My philosophy on making testing effective, equitable, and fair is as follows. First, since we will cover many biomedical topics, memorizing a copious amount of information will be very burdensome. Second, to replicate the scientific research setting, this course emphasizes critical thinking and communication clarity, and not trivia regurgitation. Third, real-world problems are usually accompanied by (nearly) infinite resources that may be used to formulate a solution. Fourth, closed-access examination can engender dishonesty. These four characteristics justify my examinations being open-book, open-note, and open-Internet. In fact, since I began teaching in 2013, all of my exams have been open-resource as this approach has not been shown to inflate test scores if an exam was well designed (Brightwell et al., *BEE-j* 2004; my unpublished data).

At the appointed time, a Word Document will appear on Canvas. Although the midterm can be completed in 1.5 h and the final exam in 3 h, students will have at least 6 h to work on an exam before submitting it on Canvas. Students may submit as individuals or in groups of up to four students from the same section. Other strong requirements are: (1) each student's name can only appear on one submission, and (2) no late submission will be accepted.

**My evaluation ladder** has three levels of difficulty, adapted from the 2001 revision of Bloom's taxonomy on the hierarchy of learning.

- |                 |  |
|-----------------|--|
| <b>Easy</b>     | Assess students' <u>comprehension</u> through <u>recalling</u> information; these questions may be multiple-choices or true-false.   |
| <b>Moderate</b> | Assess students' <u>analysis</u> of the course materials through <u>synthesizing</u> and <u>applying</u> information to <u>derive</u> the correct answer. These questions may be multiple-choices, true-false, and/or short answers with multiple parts. They may require students to make scientific justifications.  |
| <b>Advanced</b> | Assess students' <u>application</u> of current knowledge and/or <u>creation</u> of new knowledge through <u>evaluating</u> , <u>interpreting</u> , <u>synthesizing</u> , and <u>applying</u> course materials and peer-reviewed data to <u>formulate</u> and/or <u>predict</u> scientific conclusions. These questions are short answers with multiple parts and can be hypothetical or philosophical and in nature. |

**Turnitin.** All assignments will be submitted onCanvas where they will be checked by Turnitin for academic integrity. If submitting as a group, only the group's spokesperson has to submit. As long as everyone's names, PID's, and justification are there, you will receive credit.

**Extra credit opportunities.** I believe students learn better when they have ownership in the direction of the course. Thus, I give out extra credits to encourage and reward active learning through inclusive participation.

**Lecture and section attendance.** The IA or I will give out extra credit for attendance on random days throughout the session. Students can receive up to 5 additional points on top of the 300 possible points.

**CAPE** is designed to help UCSD improve its educational system. CAPE survey results are only meaningful if there is a sizable sample. If and only if 100% of the class completed CAPE, then each person will receive 3 additional points on top of the 300 possible points.

**Submission of test questions.** Students can submit questions (and answer key) for the final exam. Each submission may have to up to two questions and four co-authors from the same section. Each student (group) is limited to one submission. Also, a student's name can only appear on one proposal. Submit your proposal on Canvas by 5 PM on Thursday, July 21, 2022. No late submission will be accepted.

Exam topics are first come, first served. In other words, if two people (or groups) submitted the same questions, the person (or group) who emailed me first will get the credit. It is therefore advantageous to submit as a group and as early as possible to avoid getting scooped. Up to 2 extra credit points are awarded if your question(s)/key is selected. Modification of your question(s) may be needed to make it fit my exam's format. Also, the name(s) of the author(s) will appear next to their question(s) on the final exam.

**Section representatives.** Two volunteers (one from each section) are asked to serve as class representatives. They will meet with me weekly on Thursday at 5 PM (sans the IA). These students represent their section in relaying feedback, concerns, etc., so that improvements in the learning experience can be made right away. Student representatives can receive up to 4 extra credit points. Interested persons please email me your résumé and a blurb on why you would make a good representative by 5 PM on Wednesday, June 29, 2022.

**Opinion of instructor/course.** CAPE is a Likert Scale and therefore unable to capture qualitative data that will help me to become a better instructor. To obtain your feedback, I would like for you to provide your truthful and detailed perception of my teaching. The prompts will be provided towards the end of the course. You may submit the extra credit essay in groups of up to four students from the same section. Submit your essay on Canvas by 5 pm PST on Thursday, July 28, 2022. No late submission will be accepted.

**Academic integrity.** The course is designed so that cheating and plagiarism have no clear advantage. Having said that, I reserve the right to determine what is academically (dis)honest. All cases of dishonesty will be brought before the Office of Academic Integrity for arbitration.

**Special accommodations.** Students needing accommodations must provide me with a current Authorization for Accommodation letter issued by the Office for Students with Disabilities (OSD), located in University Center 202, by July 1, 2022. Per university's policy, July 1<sup>st</sup> is also the last day to drop Summer Session I courses for a full refund. Your education is very important to me. Please do this ASAP so reasonable accommodations may be found early to facilitate your success.

**Final thoughts.** You always need to act professionally. If you harm the learning experience of other students, I will ask you to leave the class. Along this line, no trolling is allowed. Also, sometimes even when unprompted, students will share with the class their personal experiences with human diseases. Please to be sensitive and respectful if this happens.

Please be considerate when sending email inquiries. Check if the question has already been answered in the syllabus, or if a question can be better answered in office hours (e.g., concepts that require chalkboard demos). Always include BIMM 110 and your section number in your subject heading, and always send correspondence from your UCSD email address to avoid getting filtered out by UCSD Health Sciences' spam filter.

Please work with me to promote and perpetuate diversity, equity, and inclusivity. Everyone deserves a high-quality education. Plus, we all benefit when we can learn from other people.