

SYLLABUS: BIMM 110 MOLECULAR BASIS OF HUMAN DISEASE

Instructor: John Tat, Ph.D. **Email:** johntat@health.ucsd.edu
Lecture time: Mon-Thurs: 6:30-7:50 PM PST on Zoom (recurring Zoom link: <https://uchealth.zoom.us/j/81603979024>)
Instructor's Office hours: Monday and Wednesday after class until 8:30 PM PST
Midterm exam: Due on Canvas by 10:59 PM PST on Monday, July 17, 2023
Final exam: Due on Canvas by 10:59 AM PST on Saturday, August 5, 2023

Instructional Assistants

Graduate IA
 Anne Marie Berry **Email**
ambery@ucsd.edu

Anne Marie's section time **Recurring section Zoom link**
 A01: 9 AM-10:50 AM PST <https://ucsd.zoom.us/j/98624067546?pwd=eDR0RjdndWJvSHFkTnhQWIMrUVMxUT09>
 A02: 11 AM-12:50 PM PST <https://ucsd.zoom.us/j/99096492626?pwd=cVxYa0cvMnhCcmhURnBheVdMSTVRZz09>

Anne Marie's office hour **Recurring office hour Zoom link**
 Thursday, 9 AM PST <https://ucsd.zoom.us/j/96349405958?pwd=bkkvUkNnUTZFMVA5K3FpN0ozZGhhdz09>

Undergraduate IA
 Ishrak Ramzan **Email**
iramzan@ucsd.edu

Ishrak's section time **Recurring section Zoom link**
 A03: 1 PM-2:50 PM PST <https://ucsd.zoom.us/j/95514986172?pwd=d1JXVXVEbE85a2tsK1RRN0lXcEpmQT09>

Ishrak's office hour **Recurring office hour Zoom link**
 Tuesday, 7:50 PM PST <https://ucsd.zoom.us/j/96450439487?pwd=NWQ1bkpleGRrUHZ3SG0vQXJTeWhudz09>

Specific aim. We will examine the molecular bases and clinical aspects of selected human diseases. By the end of this course, students will have gained the theoretical foundations, critical thinking skills, and teamwork skills preparing them for higher education in the health professions and research, or to join the biopharmaceutical industry. 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 bases 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 develop critical thinking skills by examining quantitative and qualitative data, and use scientific data to formulate conclusions.
3. Students will learn how to communicate and work with each other, developing their interpersonal communication skills.

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

Integrated nature of the course. BIMM 110's prerequisites are BICD 100 Genetics, BIBC 100/102 Biochemistry, and BIMM 100 Molecular Biology, or their equivalence. Many students will also have completed their general and organic chemistry, calculus, physics, and writing series. I will use this background to provide a more complex presentation of human diseases. While they are not expected to be experts in the said arenas, students should not be strangers to them when they appear in BIMM 110. Students will also need to take the initiative to learn on their own and/or apply what they know on many occasions. Taken together, these two features will add to the difficulty of BIMM 110.

Videocasting. Lectures and discussion sections will be recorded. Recordings are posted on the course's Canvas site.

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

Reading materials. We will not use a textbook, but instead rely on primary literature. All reading materials are posted 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. 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 students 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 many medical, pharmacy, and biomedical PhD curricula. Each unit starts with an anatomical and physiological overview of a system and then followed by lectures on diseases specific to that system. Teaching tidbits for each disease will normally follow this pattern: (1) general information, (2) epidemiology, (3) molecular bases, (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. This 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 are testable as homework or exam questions

Unit 1: Philosophical foundations

- Mon, 7/3 Prologue
- Mon, 7/4 **No class**

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
- Independence Day**

Unit 2: Pulmonology

- Wed, 7/5 Respiratory system
- Thur, 7/6 Asthma

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

Discussion sections meet at scheduled time on Friday, July 7, 2023

Homework #1 due by 10:59 PM on Friday, July 7, 2023 on Canvas

- Mon, 7/10 Cystic fibrosis

4. Willis et al. Failure to thrive in a 14-month old child. *LabMed*. 2003;7(34)

Unit 3: Global Health & Infectious Diseases

- Tues, 7/11 Infectious diseases
- Wed, 7/12 Malaria
- Thurs, 7/13 Tuberculosis

5. No reading
6. O'Neill et al. A tetraoxane-based antimalarial drug candidate... *Nat Commun*. 2017. 24(8):15159
7. Mondal et al. In-vivo studies on Transitmycin... *PLoS ONE*. 2023Mar 3;18(3):e0282454.

Discussion sections meet at scheduled time on Friday, July 14, 2023

Homework #2 due by 10:59 PM on Friday, July 8, 2022 on Canvas

- Mon, 7/17 Midterm (no class) Exam released at 6:30 PM PST and due on Canvas at 10:59 PM PST on Monday, July 17, 2023

Unit 4: Endocrinology and metabolism

- Tues, 7/18 Endocrine system 8. Watamura. Endocrine system. Encyclopedia of Infant & Early Childhood Dev, 2008; 450-459
- Wed, 7/19 Newborn screening 9. Ney et al. Glycomacropeptide supports growth and reduces [Phe]. *J Nutr.* 2008; 138(2):316-22
- Thurs, 7/20 Diabetes type II 10. Goyal and Jialal (StatPearls, 2021) Diabetes mellitus type 2

NO HOMEWORK THIS WEEK SO IA CAN GRADE MIDTERM EXAM*Unit 5: Gastroenterology*

- Mon, 7/24 Digestive system 11. <https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works>
- Tues, 7/25 Peptic ulcers 12. Abdel-Baki et al. Irigenin...for management of H. pylori infection. *Sci Rep.* 2022 Jul 6;12(1):11457
- Wed, 7/26 GERD 13. Claret and Hachem. Gastroesophageal reflux disease (GERD). *Missouri Medicine.* 2018
- Thurs, 7/27 Celiac disease 14. Trasciatti et al. Effect of oral cholecalciferol...: *J Steroid Biochem Mol Biol.* 2022 Mar 4;220:106083

Discussion sections meet at scheduled time on Friday, July 28, 2023**Homework #3 due by 10:59 PM on Friday, July 28, 2023 on Canvas***Unit 6: Oncology*

- Mon, 7/31 Cancer biology 15. Hanahan and Weinberg. Hallmarks of cancer: the next generation. *Cell.* 2011 Mar 4;144(5):646-74
- Tues, 8/1 Lung cancer 16. Jones and Baldwin. Recent advances in the management of lung cancer. *Clin Med.* 2018
- Wed, 8/3 Breast cancer 17. Kim et al. The antiasthma med...suppresses breast cancer stem cells. *Molecules.* 2020. 25:6028
- Thurs, 8/4 Epilogue 18. No reading

Extra credit: CAPE due by 8 AM PST on Friday, August 4, 2023**Discussion sections meet at scheduled time on Friday, August 4, 2023**

Final examination released at 11 PM PST on Friday, August 4, 2023, due by 10:59 AM PST on Saturday, August 5, 2023 on Canvas

Grading system and its rationale. Many professors evaluate students by test scores alone. While efficient, this method makes an “A” almost

unattainable for students who might have good work ethics but are poor test-takers. In short, grading by exam alone neither acknowledges nor rewards the fact that good scholarship requires both wit and grit. In the short run, this method makes taking any class risky. In the long run, this method does not professionally prepare our graduates. To address this issue, I designed my grading system to reward both wit (~71%) and grit (~29%).

Type	Points	Notes
Weekly homework	~25 points each (x3)	~75 points total
Midterm exam	~65 points	
Final exam (post midterm materials only)	~130 points	
Extra credits/efforts (can boost grade by ~5%)		
CAPE	1-5 points	1 pt. iff ≥90% of students fills out CAPE form; 5 pts iff 100% evaluations
Midterm exam survey	2 points	
Final exam survey	2 points	
Section attendance	5 points	1 pt. per week
Possible	284/ ~270 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."

Mastery/Excellent		Proficiency/Good		Developing/Fair		Poor		Fail	
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 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 five students from the same section. This is another active learning activity designed to promote collaboration and inclusivity. If you chose the group option, you need to compose your group *only* from the people in your section. Students from different sections cannot co-author assignments to avoid statistical anomalies when assigning letter grades. If a submission was co-authored by students from different sections, then that assignment, without exception, 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 a 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 moderate and advanced questions. However, Al Batross and An Chovy responded slowly and did not ask for help in a 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. Group work will alleviate some stress stemming from the summer session's rapid pace. Also, collaboration and sharing credit are common features in the research community where a publication may have several co-authors with each author's contributions stated explicitly (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 a 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 five students from the same section.

Examinations are summative assessments evaluating 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 information regurgitation. Third, real-world problems are usually accompanied by (nearly) infinite resources that may be used to formulate a solution. Fourth, closed-access examinations 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 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, all students will have at least twice the amount of time needed to complete each exam.

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

Easy	Assess students' <u>comprehension</u> through <u>recalling</u> information; these are multiple-choice or true-false questions.
Moderate	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, or short answers with multiple parts. They may require students to make scientific justifications.
Advanced	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 in nature.

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

Extra credit opportunities.

Section attendance. The IA will give out extra credit for section attendance. Students can receive up to 5 additional points on top of the 270 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 5 additional points on top of the 270 possible points.

Exam survey. On the midterm and final exams, we will have the opportunity to fill out a quick survey on how you feel about the course. Completing both surveys can you (or your team) up to 4 additional points on top of the 270 possible points.

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 7, 2023. Your education is very important to me. Please do this ASAP so reasonable accommodation may be found early to facilitate your success.

Final thoughts. You always need to act professionally. If you harmed 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 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. Always include BIMM 110 and section number in your email subject heading and send it from your UCSD email address.

All submissions must be typed, Arial size 11 or Times New Roman size 12, black ink. Submission not in this format will be rejected.

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 each other.

Final as of June 29, 2023