Course: *BIMM 110 - Molecular Basis of Human Diseases*
Instructor: *John Tat, Ph.D.* *johntat@ucsd.edu* *Biomedical Sciences Building, rm 5084 / School of Medicine*
Lecture: *M-Th: 3:30-4:50 pm, Peterson 102*
Office hours: *M, W: 5-6:30 pm, TapEx*

"Success is a combination of grit and wit. So, work hard but also work smart."

"I teach science the way I practice science: evidence-based."

"Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a life time."

"Educators should prepare students intellectually and professionally. So, I won't teach skills that fulfill neither goal."

"Transparency is good."

Abstract: The overall goal of this course is to train scholars to think, communicate, and work like budding biomedical scientists. This effort, in the long run, could help to foster more communication and collaboration among scientists and clinicians, thus expediting biomedical research processes that include delineating the molecular bases of human diseases and developing diagnostic and therapeutic tools. To this end, I will employ active-learning strategies to achieve four teaching/learning objectives:

1. Students will learn about selected human diseases; the genetic, molecular, and biochemicall approaches used to identify the molecular bases for these diseases; and how these techniques have been leveraged to develop successful and potential therapies against these diseases.

2. Students will learn how to critically examine data (quantitative and qualitative) and from the evidence, formulate scientific conclusions related to our examination of selected human diseases.

3. As collateral benefit, students will gain an understanding of why it is necessary to study math, statistics, physics, and chemistry as a part of their biological science education at UCSD, and how life science is inextricably linked to social science.

4. As collateral benefit, students will gain the scientific vocabulary with which they could use to better communicate with scientists and healthcare providers.

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.

IA's name	Section time	Section location	Office hour
Joseph Delly / jdelly@ucsd.edu	A01: 5-5:50 pm; A02: 6-6:50 pm	T-Th, Solis 109	TBD

Self-guided study: While textbooks promote curricular consistency and facilitate content delivery to a wider range of learners, peer-reviewed articles are better at advancing students' critical reading and thinking skill (Collins-Dogrul and Saldaña. *JoSoLT* 2019; 19(2): 88-101)). Also, it makes no sense to purchase an expensive textbook when we do not the time to cover most of the materials. Therefore, we will not have a textbook, but instead rely on primary literature, which are testable materials. I will try (so no guarantees) to post the lecture slide deck and reading materials before each lecture meeting. The class will be podcasted.

Course schedule: I employed **backward design** strategy to develop this curriculum, which follows five internal medicine subspecialties. (This format mirrors medical, pharmacy, and graduate schools' curricula.) Each block generally commences with an anatomical and physiological overview of the system, followed by lectures about diseases specific to that system. While there are some variations when we discuss a disease, the structure will generally follow: (1) basic information, (2) epidemiology, (3) pathophysiology, (4) risk factors, (5) symptoms, (6) diagnostic tools, and (7) treatments. There is a heavy emphasis on molecular mechanisms.

Block 1: Philosophical foundations		*Required readings (materials are testable)*
• Mon, 8/5	Course introduction	
	What is a disease?	1. J.L. Scully. What is a disease? Disease, disability & their definitions *EMBO Rep 2004*
• Tues, 8/6	History of Western medicine	2. F. Gannon. Molecular medicine: trendy title or new reality? *EMBO Rep* 2003
Block 2: Global public health & Infectious Diseases		
• Wed, 8/7	Malaria	3. Are we headed towards for a new era of malaria drug resistance? *Scientist Magazine*, 2019
• Thurs, 8/8	Tuberculosis	
Block 3: Pulmonology		
• Mon, 8/12	Respiratory system	
• Tues, 8/13	Cystic fibrosis	4. Burgel et al. Future trends in cystic fibrosis demography in 34 European countries. *Eur Respir J* 2015; 46:133-141
• Wed, 8/14	Asthma	
Midterm examination		
• Thu, 8/15	Midterm review	
• Mon, 8/19	midterm	

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.

Block 4: Gastroenterology

- Tues, 8/20 Digestive system
- Wed, 8/21 Celiac disease
- Thur, 8/22 Viral hepatitis

Block 5: Endocrinology, Diabetes, & Metabolism

- Mon, 8/26 Endocrine system
- Tues, 8/27 Newborn screening U.S. National Library of Medicine. Help Me Understand Genetics Newborn Screening. 2019
- Wed, 8/28 Diabetes type II

Block 6: Oncology

- Thur, 8/29 Cancer biology
- Tues, 9/3 Breast cancer
- Wed, 9/4 Liver cancer

Final examination

- Thur, 9/5 Final review
- Sat, 9/7 Final exam

Grading system and its rationale: rewarding students for wit (~70%) and grit (~30%) so it is representative of real life.

Type	***Points***	***Notes***
Class attendance / in-class quizzes	40 points	1 point for each attendance check / accuracy needed for quizzes
In-class peer review	30 points	up 8 points possible per discussion question / accuracy graded
Section attendance / solving problems	20 points	2 points possible per section
Midterm exam	70 points	Extra credit points will be available
Final exam	140 points	Comprehensive; extra credit points will be available
Extra credit	2 points	iff ≥90% of students fills out CAPE form
Extra credit	5 points	submission and selection of your final questions
Extra credit	6 points	Opinions about instructor
Extra credit (section representative)	2 points	
Possible	315/300 points	

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.

Grade distribution: The course is not curved since one student's success should NOT depend on another student's misfortune. Instead, 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+	71-74.9%	C+	>66.9%	D	>54.9	F
92-95.9%	A	79-83.9%	B	67-70.9%	C				
88-91.9%	A-	75-78.9%	B-	64-66.9%	C-				

iClicker (>40 opportunities to click in)

iClicker: Students are responsible for registering their iClicker and ensuring the proper functioning of their iClicker. The class frequency is [DA]. Students must self-monitor iClicker integrity. In other words, if you are caught clicking in for other students, then you and the other student(s) will forfeit all 40 iClicker points.

Lecture attendance: The effectiveness of mandatory versus voluntary lecture attendance is still under debate. However, a meta-analysis using data covering ~100 years and ~28,000 student learning outcomes found that attendance is the most important predictor of high grades (Crede et al. *Review of Educ Res*, 2016, *80*(2), 272-295). In light of this study, and to provide an addition source of points for students who are hard-working but might be poor test-takers, occasionally attendance will be taken via the iClicker. The only thing you need to do is click in and credit will automatically be given. However, attendance will be taken randomly so please make an effort to come to class.

In-class quizzes: In-class quizzes are an active-learning method done to gauge students' understanding and to provide feedback for my teaching. Thus, we will employ the iClicker so students can earn credit for solving in-class problems. In-class quizzes will be set up in the format and difficulty of easy and moderate questions described below to help prepare students for their exams. Students must choose the correct answer to receive credit.

In-class group work: In-class discussion questions will be set up in the format and difficulty of advanced questions. Since advanced questions require thoughtful explanations, you, in groups of up to five will develop the response. Every question is worth 7 points. 3 points for accuracy will be graded by the instructor or IA. 4 points will be based on peer-evaluation. In the latter case, all members of the group will grade each other, giving 1-4 points with 0.5 points possible. Your grade will be an average of what your peers give you. This activity replicates how in science and medicine, acceptability is frequently contingent on the opinions of one's peers. Be honest but fair with one another.

Section attendance: IA's help to clarify and reiterate information, give additional tutelage, and provide the instructor with information about

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.

students' work ethics and behavior. To promote the use of this valuable resource, section attendance will be taken and contribute 20 points out of 300 points. Structurally, the majority of section time will be devoted to summarizing the lecture materials, followed by solving practice problems. You will receive 1 point for attending section and up to 1 point (as determined by the IA) for your active participation.

Examinations: Examination is another means to assess students' mastery of the course materials. In terms of exams, foremost, this challenging course is mechanism-heavy; and with so many different biomedical topics being covered, the curriculum makes memorizing a copious amount of information extra burdensome. Second, to replicate the biomedical research setting, this course emphasizes critical thinking and communication clarity, and not factual regurgitation. Third, in the laboratory setting, problems are usually accompanied by (nearly) infinite resources that may be consulted to formulate a solution. Fourth, closed-access examination can breed dishonesty. These four characteristics, therefore, justify examinations being open-book, open-note, and open-Internet. You just cannot verbally speak to other students during examination to minimize distractions. But research have shown that open-book, open-note, and open-Internet do not positively affect test scores (Brightwell et al., *BEE-j* 2004; my unpublished data). So, in theory, students who took good notes and had mastered the critical thinking and communication skills will do well on exams even without foreign aid. Structurally, exams will have three levels of difficulty:

Easy — Assesses students' **comprehension** through **recalling** facts. These questions may be multiple choices or short answers.

> *Don't disparage these questions. The ability to organize facts and quickly recall them to confirm or refute a biomedical hunch is a powerful skill which differentiates an expert from a novice*.

Moderate — Assesses students' **synthesis** of course materials through **analyzing** and **employing** facts to **reply** and/or **derive** the correct answer, or **solve** biomedical problems. These questions may be multiple choices or short answers and contain multiple parts.

Advanced — Assesses students' **application** of knowledge through **analyzing** and **synthesizing** acquired information (sometimes from multiple biological systems) to **predict** and/or **formulate** scientific conclusions. These questions can be hypothetical or philosophical and in nature, which are the starting points of scientific inquiries.

Except in cases of emergency, exams must be taken during the scheduled time. Please contact Dr. Tat ASAP if you feel there is a need to arrange a different examination time. Rescheduling will be granted on a case-by-case basis and the format will be determined by the instructor.

Extra credit opportunities: Students learn better when they have ownership in the direction of the course. Therefore, to encourage and reward active-learning through communal participation, three extra credit opportunities will be given.

CAPE: CAPE is meant to help improve students' learning experience. These results, however, are only meaningful if there is a sizable

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.

sample. To incentivize you, if and only if ≥90% of the registered students completed CAPE, then each person will receive an additional 3 points to their total points possible.

Submission of test questions: Students learn better when they take charge of their learning experience. Thus, students are invited to submit moderate and advanced level questions (and answer key) for the final exam by 08.29.19, 11 pm PST. Extra credit points are awarded if your question(s) is/are selected. Each submission may have to up to three questions. To encourage collaboration, each submission may have up to five authors and each student (group) is limited to one submission. Also, a student's name can only appear on one proposal. If selected, the name(s) of the author(s) will appear next to the question on the final exam. Reasonable modification of your proposal may be needed to make it fit the format of the exam.

Section representatives: I ask for four volunteers to serve as class representatives and meet with me once a week on Friday afternoon (sans the IA). These students represent themselves and their peers in relaying constructive feedback, concerns, etc., so that improvements in the teaching and learning experience could be made right away. Student representatives may receive up to 2 extra credit points.

Academic integrity: The course is designed so that cheating and plagiarism have no clear advantage. Having said that, the instructor reserves 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 Dr. Tat with a current Authorization for Accommodation letter issued by the Office for Students with Disabilities (OSD), which is located in University Center 202 by 08.09.2019. Please do this ASAP so that reasonable accommodations may be found early to facilitate your success.

Final thoughts:

- **Exercise professionalism**: You are adults who are preparing themselves professionally. Moreover, certain social cues should have been learned in grade school, and are expected to be exercised at this age. Therefore, you need to be professional at all times. If I believe that you are harming the learning experience of students, I will ask you to leave the class.

  In the same vein, please be considerate when sending email inquiries, such as whether the question has already answered in the syllabus, or if a question could be better answered in-person, as in concepts that require chalkboard demos. Always include BIMM 110 in your subject heading and always send me emails from your UCSD address.

- Promote equity, diversity, and inclusivity. Everyone deserves a good quality education, especially since they are paying for it. Plus, we all benefit can we can learn from other people.

- This syllabus may be modified at any time to ensure the best learning experience. This syllabus is not a legally-binding document.

© All materials associated with this course are copyrighted and may not be reproduced, uploaded, shared, or used in any way without expressed permission of the author.