# **BIMM112 Syllabus**

#### Eukaryotic Gene Regulation - Sascha H.C. Duttke

Knowing of something or having googled it  $\neq$  understanding. At the end of this course, my promise is that you will have developed a fundamental understanding of eukaryotic gene regulation and the methods that drove these discoveries.

Why is this important? The basis of nearly all biological phenomena (such as development, pluripotency, immunity, behavior, diseases including most cancers, autoimmunity, neurodegenerative diseases and many more) can be traced back to the proper or improper expression of genes. Thus, whether you plan to commence your own journey and explore the yet largely uncharted field of gene regulation, pursue any discipline in life sciences, or aim to go to medical, dental or pharm school... a fundamental understanding of eukaryotic gene regulation will help you.

Course Description	This course explores the mechanisms by which gene activity is regulated in eukaryotes, with an emphasis on transcriptional regulation and chromatin. Topics will include chromatin structure, histone modifications, chromatin dynamics, transcription factors, transcriptional elongation, enhancers, CpG methylation, heterochromatin, and epigenetics.	
Credits	4	
Instructor	Sascha Duttke	sduttke@health.ucsd.edu
ΙΑ/ΤΑ	Anahita Nejatfard Cody Ocheltree Emelda Alchi Lauryn Higginson Matthew Morgan Megan Aubrey Winnie Hui Gong	anejatfa@ucsd.edu cocheltr@ucsd.edu ealchi@ucsd.edu lahiggin@ucsd.edu mrm028@ucsd.edu mmaubrey@ucsd.edu whgong@ucsd.edu

#### Your Team & Course Information

#### **Course Learning Outcomes**

Upon completion of this course, students will be familiar with the major molecular processes that regulate gene expression on the level of transcription and chromatin and be able to integrate current methodological and conceptual advances in the field to their knowledge.

# A Typical Week in This Course includes...

- $\circ$  synchronous lectures T/Th that will be recorded and posted on canvas
- one (or more) synchronous discussion section with your IA (not recorded)
- o one homework assignment (most weeks) that will be posted on Thursdays
- organizing your notes and recap the week. (You will be allowed to use your own paper notes for any exam; Recommendation: keep notes to 2 pages each midterm)

# Things to do at least once in the beginning include...

- o take the integrity pledge
- Read this Course description file [what you're doing right now]

# Synchronous Online Lectures: NEW URL

## Tuesday/Thursday 2:00 – 3:20 PM [Pacific Time]

https://ucsd.zoom.us/j/94325981567?pwd=QjRMUFVpdmxZSiszNIZBZTN0dE5Rdz09

Meeting ID: 943 2598 1567 Password: BIMM112

#### Synchronous Discussion and Q&A Sections:

Day	Time	IA	email
М	9:00 - 9:50 AM	Lauryn Higginson	lahiggin@ucsd.edu
М	10:00 - 10:50 AM	Megan Aubrey	mmaubrey@ucsd.edu
М	11:00 - 11:50 AM	Q&A session w. Megan	mmaubrey@ucsd.edu
М	3:00 - 3:50 PM	Anahita Nejatfrad	anejatfa@ucsd.edu
М	4:00 - 4:50 PM	Emelda Alchi	ealchi@ucsd.edu
Th	5:00 - 5:50 PM	Cody Ocheltree	cocheltr@ucsd.edu
Th	6:00 - 6:50 PM	Q&A session w. Cody	<u>cocheltr@ucsd.edu</u>
F	10:00 - 10:50 AM	Anahita Nejatfrad	anejatfa@ucsd.edu
F	11:00 - 11:50 AM	Winnie Gong	whgong@ucsd.edu
F	12:00 - 12:50 AM	Matthew Morgan	mrm028@ucsd.edu

- Sections start in the second week of instructions (Jan 11th+)
- Discussion section will <u>not</u> be recorded
- Zoom links for the sections will be provided by the IAs

#### **Additional Services:**

TA/IA office or Q&A hour: Mondays 11:00-11:50, Thursdays 6:00 –6:50 PM Sascha's office hour Thursdays at 11:00 AM – 12:00 PM





# Syllabus WS 2021

#### *Note: this syllabus may be updated in the future. Lecture material, Homework & recordings can be found on Canvas*

Date	Details
Tue Jan 5	01 - Introduction and Overview; Fundamentals of Chromatin Structure
Thu Jan 7	02 - Covalent Modifications of the Histones
Mon Jan 11	[Begin of Discussion Sections]
Tue Jan 12	03 - Introduction to Genomics; Analysis of the ChIP Assay
Thu Jan 14	04 - Modern Approaches to the Analysis of Gene Expression
Tue Jan 19	Homework Quiz I due by 1:45pm
	05 - Nucleosome Positioning; Linker Histones; Histone Variants; HMG
	Proteins
Thu Jan 21	06 - CpG Methylation; Heterochromatin
Tue Jan 26	Homework Quiz II due by 1:45pm
	07 - Chromatin Assembly; Prenucleosomes
Thu Jan 28	08 - Analysis of Chromatin Paper
Tue Feb 2	Homework Quiz III due by 1:45pm
	Midterm 1 (2:00 - 3:20pm)
Thu Feb 4	10 - Chromatin Remodeling Factors
Tue Feb 9	11 - The RNA Polymerase II Transcriptional Machinery Simple Kinetics and
	Thermodynamics
Thu Feb 11	12 - The RNA Polymerase II Core Promoter
Tue Feb 16	Homework Quiz IV due by 1:45pm
	13 - Sequence-specific DNA-binding Transcription Factors
Thu Feb 18	14 -Transcriptional Enhancers
Tue Feb 23	Homework Quiz V due by 1:45pm
	15 -Analysis of Transcription Paper
Thu Feb 25	Midterm 2 (2:00 - 3:20pm)
Tue Mar 2	17 - Computational Analysis of Genome-wide Data (*Lecture by Prof.
	Christopher Benner, UCSD School of Medicine)
Thu Mar 4	18 - Role of Nuclear Structure and Chromatin in the Regulation of Gene
	Activity. (*Lecture by Prof. Bing Ren, UCSD School of Medicine)
Tue Mar 9	19 - Guest Lecture 3
Thu Mar 11	20 - Synthesis and Future Perspectives
Tue Mar 18	Final (3:00 – 6:pm) – Starting time TBA

# Grading

Assignment	Weight	Note:
Discussions		"round up bonus" – see below
Homework x 5	5 %	Posted Thursdays, due next Tuesday 15 minutes before class
Midterms x 2	30 %	Tue, Feb 2 <sup>nd</sup> and Thu Feb 25 <sup>th</sup> 2:00 – 3:20m PM
Final Exam	35 %	March 18 3:00 – 4:30 PM
	100%	

#### And for those who prefer information over adventure...

**Homework** can be found on Canvas on most Thursdays following the lecture. It will contain multiple choice questions that can be answered and submitted once. The homework assignment itself is not timed. It needs to be completed 15 minutes prior to the Tuesday lecture. Late submissions will not be possible. *NOTE: The Canvas Syllabus states the DUE DATES, not when it becomes available* – Hence I added the word "due" to the quizzes. Together, the homework assignments will make up **5% of your grade**.

We will have **two midterms** that account for **30%** each and **one Final**, which will account for **35% of your final grade**. In general, if I don't say it in class, it's not on the test. The first midterm will, surprise!, cover the first part of the class (mostly related to chromatin). The second midterm will focus on the second part or the course (mostly related to transcription initiation). Each midterm, ~20-25% of the question will be about the paper that we discuss in class. The final will cover the entire class. Specifics about how far the guest lectures will be tested on will be provided prior to these lectures. *In exceptions, if one midterm cannot be attended, the final will account for 50% and the other midterm for 45%.* 

Our three exams will contain two components and be taken synchronously on Canvas during the lecture time. The first part is 'open notes/books' but *no internet, phones etc...* and is timed – likely 45 minutes. The second part will be in an unlocked canvas screen. While also this part needs to be completed within 30 minute window and by 3:20 PM (for the midterms, finals TBA). It is available from 2:40 Onwards. You can use your notes, pubmed.org / google scholar etc.

The first part of the exam will account for 90% of the grade, which strongly suggest that the second part will be 10%. ...and obviously, all exams must be taken alone and in agreement with the <u>integrity pledge</u> you took. Cheating results in failing the class, no exceptions.

Discussion section attendance is not graded by very strongly recommended. You **should** select a section to attend regularly, but you are not forced to attend a specific one. If you attend all discussion sections (or miss 1 at most), you would qualify for an upward boost in your final grade if you should be just below a borderline. For example, 87.6% (B) would become a B+ (88.0%-89.9%). However, 86.8% would remain a B, even with perfect section attendance. And yes, could BIMM112 - Page 4

attend all nine weekly IA's session if it is rainy in San Diego. But here 'all' really means one session every week for the duration that they are offered.

Exams or final grades are not curved, and I will attempt to communicate your grades with you through canvas. That said, if you notice any mistake or missing grades in the online sheet, please be patient before emailing us immediately as this will be a learning experience for me, too. Be assured we also have a nice traditional excel sheet as backup.

To notify me of difficulties or emergencies please email me at <u>sduttke@health.ucsd.edu</u> and use [BIMM112 URGENT] in the subject.

#### **Grading Scale**

- A+ [top 1% students with highest overall scores on all three exams]\*
  - A 92% to 100% (Combined Best Midterm and Final Exam)
    - A- 90% to 92%
      B+ 88% to 90%
      B 82% to 88%
      B- 80% to 82%
      C+ 78% to 80%
      C 72% to 78%
      C- 70% to 72%
      D+ 68% to 70%
      D 62% to 68%
      D- 60% to 62%
      F <60%</li>

Exams will not be graded on a curve.

\*there will be an award for the student with the highest score



#### **Text/Readings/Other Material**

This course will discuss and suggest a number of primary publications aka. 'papers', in part, as the course was designed to be as close to the current state of well supported science as possible. Thus, much of the material covered has not quite yet made it into a textbook. We will talk more about it but why don't you try to find this paper online, give it look and read the abstract and introduction? It may be complicated now but rewarding to revisit it at the end of the class. And yes, this is just for fun and will not be tested on  $\bigcirc$ . Suggested search tools include:

"Pubmed" <u>https://pubmed.ncbi.nlm.nih.gov/?tool=cdl&otool=cdlotool</u> "google Scholar" <u>https://scholar.google.com/</u> Key papers will also be uploaded to CANVAS.

There is no bona fide textbook to accompany this class. Your notes, the slides and attending the discussion sections should be your primary learning guide. Nevertheless here a few book suggestions:

One good, but somewhat outdated book is Title: Mechanisms in Transcriptional Regulation

Author: Albert J. Courey
Edition: 1st edition (2008)
Publisher: Blackwell Publishing
ISBN: 978-1-4051-0370-1

Or

 Title: Molecular Biology: Principles of Genome Function Authors: Nancy J. Craig et al.
 Edition: 2nd edition (2014)
 Publisher: Oxford University Press
 ISBN: 978-0199658572

#### **Technology Requirements**

Zoom & Canvas. We will not use the iClicker etc in this class...

### UC San Diego's Resources and Expectations:

#### **Overall Course Expectations**

What you can do to support your success in the course:	What I will do to support your success in the course:
Read the syllabus and stay current with course information	Be prepared and bring my enthusiasm for teaching to each session
Keep up with readings and lab assignments, as each one builds on the previous one.	Respond to emails within one working day, and provide timely feedback on assignments / submissions.
Contribute to the learning environment with <u>fairness, cooperation, and professionalism</u>	Establish a learning environment with fairness, cooperation and professionalism, and will take action if these principles are violated.
Treat your classmates, instructional assistants and myself <u>honestly and ethically</u>	Treat you honestly and ethically, and will address any concerns you might have
Commit to excel with integrity <sup>1</sup> . Have the courage to act in ways that are honest, fair, responsible, respectful & trustworthy.	Uphold integrity standards and create an atmosphere that fosters active learning, creativity, critical thinking, and honest collaboration.
Manage your time, so you can stay on track with the course and complete tasks on time	Only assign work that is vital to the course, and will work to meet the standard credit hour allotment for the course.
Communicate with me if you determine that a deadline cannot be met due to extenuating circumstances	Consider requests for adjustments and will make reasonable exceptions available to all students when approved

1. Please read UC San Diego's <u>Policy on Integrity of Scholarship</u> and take the <u>integrity pledge</u>!

# **Resources for Support and Learning**

There are a variety of resources available to students at UC San Diego, which are designed to address needs and enhance the student experience. In this section, the course is connected to the broader university community by services and programs for students. If there are resources specific to the course, school, department and/or topic, be sure to include those here.

Learning and Academic Support	
Ask a Librarian: Library Support	Writing Hub Services in the Teaching + Learning
Chat or make an appointment with a	Commons
librarian to focus on your research needs	One-on-one online writing tutoring and
	workshops on key writing topics
Course Reserves, Connecting from Off-	
Campus and Research Support	Supplemental Instruction
Find supplemental course materials	Peer-assisted study sessions through the
	Academic Achievement Hub to improve success
First Gen Student Success Coaching	in historically challenging courses
Program	
Peer mentor program that provides students	Tutoring – Content
with information, resources, and support in	Drop-in and online tutoring through the
meeting their goals	Academic Achievement Hub
Office of Academic Support &	Tutoring – Learning Strategies
Instructional Services (OASIS)	Address learning challenges with a
Intellectual and personal development	metacognitive approach
support	
Support for Well-being and inclusion	1
Basic Needs at UCSD	Community and Resource Centers
Any student who has difficulty accessing	Office of Equity, Diversity, and Inclusion
sufficient food to eat every day, or who lacks	As part of the <u>Office of Equity, Diversity, and</u>
a safe and stable place to live is encouraged	Inclusion the campus community centers
to contact: foodpantry@.ucsd.edu	provide programs and resources for students
basicneeds@ucsd.edu   (858) 246-2632	and contribute toward the evolution of a
	socially just campus
Counseling and Psychological Services	(858).8223542   <u>diversity@ucsd.edu</u>
Confidential counseling and consultations	
for psychiatric service and mental health	Get Involved
programming	Student organizations, clubs, service
	opportunities, and many other ways to connect
Triton Concern Line	with others on campus
Report students of concern: (858) 246-1111	
	Undocumented Student Services
Office for Students with Disabilities (OSD)	Programs and services are designed to help
Supports students with disabilities and	students overcome obstacles that arise from
accessibility across campus	TRAIL TRANSPOLATION CTATUS AND CLUDIO OF THOMAS



#### **Campus Policies**

UC San Diego policies and statements to include within your syllabus.

- UC San Diego Principles of Community
- UC San Diego Policy on Integrity of Scholarship
- <u>Religious Accommodation</u>
- Nondiscrimination and Harassment
- UC San Diego Student Conduct Code