

# BIOCHEMISTRY 554 – Nucleic Acids: DNA/RNA Structure and Function

(Spring, 2021-2022)

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**Class meeting:** Mon/Wed, 10:00 am – 11:30 am, LSI 1510

## **Course objectives:**

This course will provide an overview of the mechanisms, regulation and biological roles of transcription, translation, replication, and repair including topics relating to transcriptional control, translational control, cellular pathways that control transcription and translation, structural approaches to study RNA and the latest in genome editing approaches. The course will use primary literature to introduce the latest approaches to study nucleic acid biology. The students will build on communication skills to discuss topics in nucleic acid biology through formal presentation and class participation.

## **COURSE TOPICS AND SCHEDULE**

### **Section A: Transcription, DNA Replication, and Repair**

<b>Date</b>	<b>Topic</b>	<b>Presenters</b>
Jan 10	Lecture on mechanisms of eukaryotic transcription	S. Teves
Jan 12	Genome Stability and Cancer. Why is replication/repair important?	P. Hieter
Jan 17	Transcription initiation	
Jan 19	Transcription pausing and elongation	
Jan 24	Transcription regulation	
Jan 26	Eukaryotic DNA Replication: Reconstitution in vitro	
Jan 31	DNA Repair at the Chromosomal Level: DSBs at Stalled Forks	
Feb 2	DNA mutations as a phenotype in cancer/environmental exposure	

### **Section B: DNA Replication and Repair**

<b>Date</b>	<b>Topic</b>	<b>Presenters</b>
Feb 7	Lecture on Signaling pathways that control translation	E. Jan
Feb 9	Translational regulation – 5' and 3' UTR	
Feb 14	Ribosome Heterogeneity	
Feb 16	Epitranscriptome	
Feb 21	NO CLASS - MIDTERM BREAK	
Feb 23	NO CLASS - MIDTERM BREAK	

## **Course Material**

There is no textbook for this course. All course material will be posted throughout the term via Canvas.

## **Grading and Examination Policies**

Presentation	35%
Class participation	65%

## **Class Format**

1. At the beginning of each section, the instructors will introduce and present major concepts in the field.
2. Instructors will assign a primary research paper on days assigned as student presentations. All students are required to read the assigned research paper before class.
3. Each student, either as solo or with another student, will be assigned as the 'presenter' to lead one of the 9 student presentation days focusing on one research paper.
4. The presenter(s) will provide a 10-15 minute presentation that discusses the background of the paper, and the main question that the paper is addressing.
5. The presenter and/or instructor will then randomly ask one student at a time in the audience to summarize each of the main figures of the paper including providing the question addressed, the rationale for, the result and conclusion. The presenter will lead discussions. The presenter will then lead discussions on the summary of the paper, whether conclusions are supported by the results, the significance of the study, caveats/limitations, and future directions. Students are encouraged to discuss throughout the discussion (participation and insights will be graded).
6. The assigned list of papers will be made available to all students at least a week before each section begins.

## **Presentation and Discussion Guidelines**

1. All students are required to read the assigned paper prior to class meeting.
2. Presenters may use Powerpoint/Keynote slides to help guide their presentation on the background of the research paper. Presentations are worth 35% of final grades, and will be scored according to the rubric below.
3. Summarizing the main figures and in-class discussion will constitute 65% of final grades, and will be scored according to the rubric below.

## Presentation grading rubric

MARK (%)	PRESENTATION RUBRIC
90-100	Very engaged presenter. The oral presentation, visual aids and answers to questions reflect a high level of attention, preparation and understanding of the paper. Has carefully read the paper being presented as well as additional relevant experimental, methods or review papers. Provides a critical assessment of the primary data and clearly understands and communicates the impact of the paper. The presentation shows not only material from the paper being presented but also additional material to clarify, extend or deepen the presentation. The presentation reflects effective teamwork. The presentation is clear, logical, complete and delivered in a dynamic manner and is delivered within the allocated time.
80-89	Engaged presenter. The oral presentation, visual aids and answers to questions reflect a solid level of attention, preparation and understanding of the topic. Has carefully read the paper being presented as well as additional relevant experimental, methods or review papers. Clearly understands and communicates the impact of the paper. The presentation shows not only material from the paper being presented but also additional material to clarify the presentation. The presentation reflects effective teamwork. The presentation is clear, logical, and complete and is delivered within the allocated time.
70-79	Average presenter. The oral presentation, visual aids and answers to questions reflect an adequate level of attention, preparation and understanding of the topic. Has carefully read the paper being presented but has not read additional relevant experimental, methods or review papers. The impact of the paper is described, but not well supported. The presentation shows material from the paper being presented but little if any relevant additional material. The presentation reflects adequate teamwork. The presentation is not always clear, logical, complete or is not delivered within the time allocated.
69 and below	Poor presenter: The oral presentation, visual aids and answers to questions reflect a minimal level of attention, preparation and understanding of the topic. Has read the paper being presented but has not read additional relevant experimental, methods or review papers. The presentation shows material from the paper being presented but no relevant additional material. The presentation reflects ineffective teamwork. The presentation is not clear, logical, or complete and is not delivered within the time allocated.

## Participation grading rubric

<b>MARK (%)</b>	<b>PRESENTATION RUBRIC</b>
90-100	Very engaged participation. Student contributes questions and comments in all classes. The questions and comments are insightful and reflect a high level of attention and preparation. Has carefully read all papers being presented by others and has often read additional relevant materials such as review and methods papers. The questions and comments consistently add to, extend or deepen the discussion. Arrives at class on time and does not miss classes.
80-89	Engaged participation. Student contributes questions and comments in all classes. The questions and comments are often insightful and reflect a solid level of preparation. Has carefully read all papers being presented by others and has sometimes read additional relevant materials such as review and methods papers. The questions and comments consistently add to the discussion and often deepen or extend it. Arrives at class on time and does not miss classes.
70-79	Average participation. Student contributes questions and comments in most classes. The questions and comments are seldom insightful and reflect only an adequate level of preparation. The questions and contributions occasionally add to, deepen or extend the discussion. Has read all papers being presented by others but only superficially. Occasionally comes to class unprepared or late.
69 and below	Poor participation. Student contributes questions and comments in few classes. The questions and comments are not insightful and reflect an inadequate level of preparation. The questions and comments rarely add to the discussion. The student has read a few of the papers being presented by others. Often comes to class unprepared, or late, or is absent without a valid excuse.