



LAND ACKNOWLEDGEMENT

UBC’s Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəyəm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Nucleic Acids - Structure and Function	BIOC 410	3

PREREQUISITES

Either (a) all of **BIOC 303**, **BIOL 335** or (b) **BIOT 380**. (A minimum standing of 65% is recommended in these courses.)

COURSE LOCATION AND TIME

Time (Day(s), Hour)	Room
LECTURES: Mondays, Wednesdays, Fridays 1:00-1:50 pm PST	Wesbrook 201
TUTORIALS (mandatory): Fridays 2:00-3:00 pm OR 3:00-4:00 pm (assigned times based on registration - no switching)	Life Sciences Building 1510

COURSE CHAIR

Course Chair	Contact Details
Eric Jan (Pronouns: he/him/his)	eric.jan@ubc.ca

COURSE INSTRUCTOR(S)

Course Instructor(s)	Contact Details	Office Location	Office Hours



Annie Ciernia (Pronouns: she/her/hers)	annie.ciernia@ubc.ca	DMCBH 4505	TBD or by appointment
Eric Jan (Pronouns: he/him/his)	eric.jan@ubc.ca	LSC 5457	TBD or by appointment
Ivan Sadowski (Pronouns: he/him/his)	sadowski@mail.ubc.ca	LSC 5508	TBD or by appointment

LEARNING OUTCOMES

- i) An understanding of concepts and techniques in DNA and RNA molecular biology
- ii) Analysis of experimental results and application of concepts in experimental design

Learning objectives:

1. Introduction to eukaryotic genomes

2. Introduction to the Eukaryotic Cell Cycle

- a) Review of the eukaryotic cell division cycle
- b) CDCs and CDKs

3. DNA Replication Introduction

- a) DNA polymerases
- b) Origins of replication

4. Replication of Eukaryotic Chromosomes

- a) Genetic identification of replication origins
- b) Biochemical analysis of replication origins (ARS)
- c) The origin of replication complex (ORC)
- d) Licensing and the pre-replicative complex (CDC6 and MCM)
- e) Regulation of DNA replication at the start of S phase
- f) Replication of DNA *in vitro*

5. Overview of DNA repair

6. Transcription initiation

- a) Basal transcription machinery
- b) Chromatin context
- c) Epigenetic regulators

7. Transcription elongation

8. Transcription termination

9. Transcriptional regulation

- a) Activation
- b) Repression



c) Cell type specificity

10. RNA Properties and Structure/Function

- a) Secondary/Tertiary structure, G-quadruplexes
- b) Catalytic RNAs - ribozymes, ribosome
- c) Riboswitches

11. Nuclear Processing of RNAs

- a) Co-transcriptional RNA processing
- b) Quality control - Nonsense-mediated decay

12. Regulation of mRNA Translation

- a) Regulation of translation - signaling pathways and responses
- a) Regulation of translation by RNA structure
- b) Regulatory features in 5'- and 3'-untranslated regions

13. Regulation of Gene Expression by RNAs

- a) miRNAs and regulation of gene expression
- b) RNA interference - functional screens

COURSE OUTLINE

The course is divided into three sections based on topic. Each section will consist of lectures and tutorials. Two mid-terms (15% of final mark) are scheduled on Oct 7 and Nov 7.

Tutorials are held Fridays (see below for schedule) either 2:00-3:00 pm or 3:00-4:00 pm PST. Tutorials are mandatory and will consist of Quizzes/Assignments (10% of final mark). Teaching assistants will discuss answers to quizzes/assignments and provide an introduction for the following week's quiz/assignment.

Term paper assignment (20% of final mark)- will be introduced in the first few weeks of lecture. The assignment will involve reading a research article, summarizing the paper and providing a hypothesis and an experiment design (1000 word limit).

COURSE SCHEDULE

Location: Monday, Wednesday Friday 1:00 - 1:50 pm Pacific Standard Time
IRC Woodward 1

Course Introduction: Sept 7 (Dr. Ivan Sadowski)

Section 1: DNA replication/repair (Dr. Ivan Sadowski) (Sept 9 - Oct 5) (11 lectures)

Lectures: Sept 9, 12, 14, 16, 19, 21, 23, 26, 28, Oct 3, 5

Mid-term Exam #1 (15% of final mark): Oct 7

Section 2: Transcription and Regulation of Chromatin Structure in Eukaryotes - (Dr. Annie Ciernia) (Oct. 12 – Nov 2) (10 Lectures)



Lectures: Oct 12, 14, 17, 19, 21, 24, 26, 28, 31, Nov 2

Mid-term Exam #2 (15% of final mark): Nov 7

Section 3: RNA Properties and Structure/Function (Dr. Eric Jan) (Nov 4 - Dec 7) (12 lectures)

Lectures: Nov 4, 14, 16, 18, 21, 23, 25, 28, 30, Dec 2, 5, 7

Tutorial sessions: Sept 9, 16, 23, Oct 14, 21, 28, Nov 18, 25, Dec 2 (Quizzes/Take home assignments 10% of final grade)

Fridays 2-3 pm OR 3-4 pm PST. LSI 1510 (you will be assigned to a specific room and session based on registration/enrolment, email will be sent, no changing sessions)

COURSE MATERIALS

Course information, including lecture slides and papers, will be posted on Canvas. This course does not use a textbook.

GRADING SCHEME

Exam/Term paper/Quiz/Assignment	Grade Weight
Mid-term Exam #1 - Oct 7	15 %
Mid-term Exam #2 - Nov 7	15 %
Term Paper Progress Report* - Due October 31, noon PST	5%
Term Paper Assignment* - Due Dec 9, noon PST	20 %
Quizzes/Assignments**	10 %
Final Exam - Date TBD (cumulative - 17% Sadowski, 17% Ciernia, 66% Jan)	35 %

*Term paper assignment details and deadlines will be introduced in a separate document. Of note, last day to select a paper September 30 noon PST.

**Each quiz/assignment will be performed during tutorial session and will consist of 1-4 questions, multiple choice and/or short answer. Take-home assignments will be short answer.

GRADING AND COURSE POLICY



If you are sick for a tutorial/quiz, please email the TA and course director as soon as possible. We may accommodate by providing the quiz online but only with legitimate reasons (ie illness). Tutorials will not have video recording capabilities but slides will be posted on Canvas.

If you are sick on a midterm exam day, please email the instructor as soon as you are confident you should not come to the scheduled exam. We would strongly prefer that you contact us to make an alternate arrangement than for you to come to the exam while you are ill. If you do show up for an exam and you are clearly ill, we will make alternate arrangements with you. It is much better for you to email ahead of time and not attend. Alternate arrangements will include an oral midterm exam.

Students with disabilities and ongoing medical conditions have the option to request an accommodation for the course assessments after registering with the Centre for Accessibility. If you are eligible for exam accommodations, you will need to write your exams with the Centre for Accessibility. To book an exam, notify the course chair or instructor by email and register with the Centre for Accessibility at least one week in advance of the midterm date or summer final, or at least 7 days before the start of the examination period for a final in April and December.

If you are ill, please do not attend class.

If you do miss a final exam because of illness: Students who miss a final exam due to illness or extreme personal distress and would like to apply for a deferred exam must submit a request for an academic concession within 48 hours of the missed exam. All appropriate documentation must be submitted within 14 calendar days of the missed exam. In addition the course chair and instructor should also be notified by email within 48 hours to coordinate the deferred exam.

If the instructor is sick: We will all do our best to stay well, but if one of the instructors falls ill then they will not come to class. If that happens, all efforts will be made to communicate that to students in a timely manner prior to class time, usually via an announcement in Canvas. Depending on the situation a substitute lecturer will take over, the lecture may take place over zoom, or the class may be cancelled.

ACADEMIC MISCONDUCT

UBC and the Department of Biochemistry and Molecular Biology take the issue of academic misconduct very seriously; the honest assessment of student learning is key to both the success of the university and success for individual students. Cheating, in any form, undermines the value of a degree and can have serious consequences for your continued academic success. As such it is important to know what your responsibilities are, what constitutes misconduct and how you can avoid it. With some effort and forethought no student should ever have to find themselves facing discipline for academic misconduct; inform yourself as to the expectations placed on you and what your responsibilities are. UBC definition of academic misconduct can be found in the UBC Calendar and additional information is available in this UBC resource link.

What consequences can arise from academic misconduct?

The severity of the discipline can range from a letter of reprimand or a zero on the assignment in question all the way to expulsion from the University. Perhaps the most common outcome in these cases are grades of zero in the course in which the misconduct occurred.



EQUITY DIVERSITY AND INCLUSION (EDI) POLICIES

It is our goal that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and diversity that the students bring to this class be viewed as a resource, strength and benefit. We make a commitment to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. We will foster a climate within the classroom where students of diverse backgrounds and identities feel comfortable sharing their opinions and experience with varied topics throughout the class. We (like many people) are learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable or if you observe a situation where someone else is made to feel uncomfortable, please talk to us about it. This includes concerns about any class-related interactions that lead to feelings of exclusion or marginalization. We welcome and encourage your feedback on how we can better cultivate a sense of inclusion in our course. This can be done through meetings, email or anonymous feedback through canvas. We aim to do our best to address each situation as it arises and effect meaningful changes moving forward. For more information visit our [departmental EDI webpage](#).

STUDENT RESOURCES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the [UBC Senate website](#).

Mental Health Resources

In case you are struggling with mental health, or are feeling stressed or anxious, [UBC Counselling services](#) provides information about a number of resources for students to use. Additionally, UBC students receive [mental health coverage of up to \\$1500](#) under the AMS Health & Dental Plan (more information about coverage [here](#)).

[Here2Talk](#) is available for BC post-secondary students to talk with trained counsellors 24/7 (via voice call or text messages). If you are a student living in UBC residence, [Counsellors in Residence](#) can also be a valuable resource to provide mental health support. If you have a UBC email address, [Therapy Assistance Online \(TAO\)](#) is a free online resource that provides tools to manage stress, relationship problems, substance use, etc.

COVID RELATED POLICIES

For UBC's latest response to COVID-19, please visit covid19.ubc.ca. For our in-person meetings in this class, it is important that all of us feel as comfortable as possible engaging in class activities while sharing



an indoor space. Non-medical masks that cover our noses and mouths are a primary tool to make it harder for COVID-19 to find a new host. The higher the rate of vaccination is in our community overall, the lower the chance of spreading this virus. You are an important part of the UBC community. Please arrange to get vaccinated if you have not already done so. **If you're sick, it's important that you stay home – no matter what you think you may be sick with (e.g., cold, flu, other).**

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