



Lectures: BIOL 367 Molecular Biology *Mon & Wed 10:15AM - 11:30AM at HB 130 Loyola campus*

Background:

Molecular biology is broadly defined as the field that focuses on studying biology at the molecular level in a living cell largely aiming to understand DNA, RNA, and protein synthesis, structure and regulation. The purpose of this course is to explore the fundamentals of molecular biology. My aim, throughout the semester, will be to understand and learn about the molecular mechanisms of replication, transcription, and translation focusing on the regulation of key processes, experiments, and techniques. While we will rely on text books to understand these principles, we will also study some recent publications in molecular biology so that you may gain an appreciation of current areas of research and how these fundamental principles are further verified, new processes discovered while also learning how these basic principles are challenged. This course will cover the topics of DNA replication while also learning about novel genome engineering processes (like CRISPR-Cas9) involving DNA transactions like site-specific recombination. We will learn about transcription, RNA processing, translation, epigenetics and several other key biological processes.

Instructor: Aashiq H. Kachroo (Assistant Professor)

Department of Biology, Center for Applied Synthetic Biology

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Email: aashiq.kachroo@concordia.ca (preferred way of communication)

Office hours*: Office hours: Monday 1:30p-2:30p in GE 110.01 seminar room at Concordia Loyola campus.

**Note that my office hours are meeting as a 'group'. If you prefer to talk to me one-one about a grade or any personal issues concerning the course, just email me and we can schedule a date for the meeting.*

About me: I am a faculty member in the Department of Biology and Center for Applied Synthetic Biology at Concordia University. I have a broad background in genetics and evolution with specific training and expertise in systems biology approaches and technology development. The long-term goal of my research program is to understand the evolutionary principles governing the conservation of gene function across deeply diverged organisms like humans and yeast. Yeast is the most well-studied organism on the planet. We systematically humanize yeast to understand the properties that allow swapping genes among organisms while simultaneously humanizing yeast such that the critical processes involved in disease are more human-like at the molecular level.

Teaching Assistant: Mohammad Karamat, graduate student

Office: SP 501.02

Office hours: To be modified soon

Tel: NA

Email: karamat@live.ca

Course material availability: Course material will be available at the following sites:

http://www.kachroolab.org/classes/BIOL367_fall_2018.html (preferred)

Announcements will be posted here:

<https://moodle.concordia.ca/moodle/course/view.php?id=101567>

Course materials:

Suggested Textbooks:

Book 1: [The Eighth Day of Creation: Makers of the Revolution in Biology](#) (historical perspective)Book 2: [Molecular Biology by Robert F. Weaver](#) (official text book)Book 3: [Molecular Biology of the Gene](#) by Watson, J. et al. (alternate text book)

Lecture slides will be posted at [here](http://www.kachroolab.org/classes/BIOL367_fall_2018.html) (http://www.kachroolab.org/classes/BIOL367_fall_2018.html) as a .pdf file few hours before the scheduled lecture. **The password for all the PDF files is 367_fall.** You will also find assignments, grades and additional announcements on moodle or [here](http://www.kachroolab.org/classes/BIOL367_fall_2018.html) (http://www.kachroolab.org/classes/BIOL367_fall_2018.html) throughout the semester.

TOP HAT:

We will be using the **Top Hat** (www.tophat.com) classroom response system in class for lectures, quizzes and attendance. You will be able to submit answers to in-class questions and I will take attendance via Apple or Android smartphones and tablets, laptops, or via text message (SMS). You can register for **Top Hat** [here](https://app.tophat.com/register/) (<https://app.tophat.com/register/>). **Top Hat** will require single course price or a subscription. There are multiple options and it costs ~\$26 CAD for 1 term subscription (4 months). The course code for BIOL367 is: **634188**

Class Attendance:

Attendance at lecture and discussion sections is **strongly encouraged**, particularly if you would like to do well in the course. I will use Top Hat to measure your attendance. Please remember attendance along with several surprise in class quizzes correspond to ~20% of your grade.

A note on participation:

Questions are welcome and strongly encouraged! And believe me, there are no silly questions in science. Additionally, for me, students who understand the basics will often ask lot of relevant questions, thus, in the process, identifying those who are really paying attention in the class. Please always feel free to email me suggestions or comments about the class at any time especially if certain concepts are difficult to grasp.

Grading:

Your course grade will be based on exams, quizzes, surprise quizzes and participation throughout the duration of the course. Grades will be calculated as below:

Mid-semester exams (best 2 scores of 3)	40%
Quizzes (best 2 scores of 3)	15%
Surprise quizzes (all counted)	15%
Top Hat in class quizzes and attendance	5%
Comprehensive final exam	25%
Overall	100%

Grades will be assigned as follows: A⁺ = 90-100%, A = 85-89%, A⁻ = 80-84%, B⁺ = 77-79%, B = 73-76%, B⁻ = 70-72%, C⁺ = 67-69%, C = 63-66%, C⁻ = 60-62%, D⁺ = 57-59%, D = 53-56%, D⁻ = 50-52%, F = < 50.

1. If you need to miss a mid-semester exam (due to sickness, athletic commitments, or other personal reasons) your missed exam automatically becomes the dropped score, and no excuse is needed.
2. If you miss another exam, please come see me. You will need a letter from a physician and/or a compelling reason to receive consideration.

3. Students who arrive late to an exam will not be given additional time, and anyone arriving after another student has already finished the exam will not be permitted to take the exam and will be assigned a grade 0.

Don't want to take the Final Exam? You have an option. Take all three mid-semester exams, and achieve a B or higher (> 70%). Your lowest exam score will then be counted in place of the Final Exam. Please note that if you sit for the Final Exam, I will automatically count it as 25% of your grade and drop your lowest mid-semester exam score, regardless of how you do on the Final Exam!

Re-grade policy: You are responsible for ensuring that your grades reflect the scores that you have secured on your exam paper, and that the points on your exam have been added correctly. If you find a mistake, please see Karamat immediately. If you take issue with how a short answer question was graded, **please submit your exam paper with an attached sheet explaining why your answer deserves more points by comparing your answer with the exam key and/or lecture material**. You must have written your exam in ink (non-erasable) and submit your exam for re-grade within ONE WEEK after it has been returned to you. Please submit re-grade requests to Karamat. Karamat and I will then assess the merit of your answer.

Academic Integrity:

Ethical conduct is expected at all times. Unethical conduct (cheating on exams, quizzes, etc.) may result in an automatic failing grade in the course and/or academic probation. Please see the Concordia U policy [here](https://www.concordia.ca/students/academic-integrity/offences.html) (<https://www.concordia.ca/students/academic-integrity/offences.html>).

Class Conduct:

Be considerate of others! Any distracting behavior (unnecessary talking, texting, web surfing) is not acceptable in the class. You are free to leave the class and do so outside!

Students with Disabilities:

All procedures outlined [here](http://www.concordia.ca/students/accessibility.html) (<http://www.concordia.ca/students/accessibility.html>) and [here](http://www.concordia.ca/content/dam/common/docs/policies/official-policies/PRVPAA-14.pdf) (<http://www.concordia.ca/content/dam/common/docs/policies/official-policies/PRVPAA-14.pdf>) will be followed in this course. Please provide proper documentation at the **beginning** of the semester.

Tutorials:

Tutorial sessions are designed to review and enhance material. You will have problems, quizzes and/or other activities to prepare you for the exam. The quizzes are not meant to be as difficult as the exams, but serve to encourage preparation. Attendance for the duration of the Tutorial section class is expected for quizzes and problem-solving activities since they directly impact your grades. If you wish to change your tutorial section, please see Karamat for permission **a week before the date of discussion**.

Exams and quiz policy:

All exams will be open book. Avoid any unethical behavior during the entire course particularly during exams.

<u>Dates</u>	<u>Lecture</u>	<u>Topic</u>	<u>Suggested Readings</u>
Wed. Sep 05	1	Introduction to the course & history of molecular biology	--
Mon. Sep 10	2	DNA, RNA & Proteins	Ch. 2 & 3
Wed. Sep 12	3	DNA replication Pt. 1	Ch. 20
Mon. Sep 17	4	DNA replication Pt. 2 & PCR	Ch. 20 & Ch. 4
Wed. Sep 19	5	DNA recombination & Methods in molecular biology	Ch. 4, 5 & 22
Mon. Sep 24	6	Recombinant DNA technology Pt. 1	Ch. 4 & 5
Wed. Sep 26	7	Restriction enzymes & novel cloning methods (30min) & Quiz #1 (35 min) [Lectures 1 - 6]	Ch. 4 & 5
Mon. Oct 1	8	DNA recombination/Genome editing & CRISPR-Cas9 and other enzymes	--
Wed. Oct 3	--	MIDTERM-EXAM #1 (60min) [Lectures 1-8]	--
Wed. Oct 10	9	Prok. gene structure and mechanism of transcription	Ch. 6 & 7
Mon. Oct 15	10	Transcription regulation: Lambda Phage	Ch.8 & A Genetic Switch by M. Ptashne
Wed. Oct 17	11	Prok transcription: Regulation Pt. 1	Ch. 7 & 8
Mon. Oct 22	12	Prok. transcription: Regulation Pt. 2 (30 min)	Ch. 7 & 8
Wed. Oct 24	13	Special topic - Writing genomes Quiz #2 (35 min) [Lectures 8-12]	--
Mon. Oct 29	--	Prok transcription: Global regulation & Eukaryotic transcription Pt. 1	Ch. 9 & Ch. 10
Wed. Oct 31	14	Eukaryotic transcription continued Pt. 1	Ch. 9 & Ch. 10
Mon. Nov 5	--	MIDTERM-EXAM #2 (60min) [Lectures 9-14]	--
Wed. Nov 7	15	Euk Trxn: Transcription factors Pt. 1	Ch. 11
Mon. Nov 12	16	Euk Trxn: Transcription factors Pt. 2	Ch. 12
Wed. Nov 14	17	Euk Trxn: Chromatin structure	Ch. 13
Mon. Nov 19	18	RNA processing Pt. 1 (30min) Quiz #3 (35min) [13-17]	Ch. 14 & 15
Wed. Nov 21	19	RNA processing Pt. 2	Ch. 15 & 16
Mon. Nov 26	20	Translation Pt. 1	Ch. 17 & 18
Wed. Nov 28	21	Translation Pt. 2	Ch. 18 & 19
Mon. Dec 3	--	MIDTERM-EXAM #3 (60min) [Lectures 15-21]	--
Tue. Dec 4	--	Summary, Recap, Q&A	--
TBA	--	FINAL EXAM (TBA min)	--

Tutorials and Discussion Section Meet Times:

Tutorials: BIOL 367 Molecular Biology Tue 1:15PM - 2:30PM & Tue 2:45PM - 4:00PM at CC 204 Loyola campus. (To be updated). Do not assume there are no activities on dates left blank, they will be filled as we progress.

Problem sets, Quizzes:

<u>Dates</u>	<u>Group</u>	<u>Topic</u>	<u>Suggested readings</u>
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