



Lectures: BIOL 367 Molecular Biology *Mon & Wed 11:45AM - 1:00PM 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.

Course prerequisites:

Instructor:

Aashiq H. Kachroo (Assistant Professor)

Department of Biology, Center for Applied Synthetic Biology

Office: L-GE 330.11 Tel: 514-848-2424 Ext. 2493

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

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_winter_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)

We will be discussing most recent relevant publications in top-tier journals, understanding experiments while also critically evaluating the conclusions. The participation in these sessions is strongly encouraged. The publications to be discussed will be posted a week earlier. The details will be described in our first class.

Lecture slides will be posted at [here](http://www.kachroolab.org/classes/BIOL367_winter_2018.html) (http://www.kachroolab.org/classes/BIOL367_winter_2018.html) as a .pdf file few hours after the scheduled lecture. **The password for all the PDF files is biol367.** You will also find assignments, grades and additional announcements on moodle or [here](http://www.kachroolab.org/classes/BIOL367_winter_2018.html) (http://www.kachroolab.org/classes/BIOL367_winter_2018.html) throughout the semester.

Class Attendance:

Attendance at lecture and discussion sections is **strongly encouraged**, particularly if you would like to do well in the course. Please note that discussion activities and quizzes comprise up to 25% of your final 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 and quizzes given during the lecture period (respectively), homework assignments, discussion activities and a final exam. The lowest score of the three lecture-period exams will be dropped. Grades will be calculated as below:

| | |
|---|------|
| Mid-semester exams (best 2 scores of 3) | 35% |
| Quizzes (best 2 scores of 3) | 15% |
| Homework assignments (all 3 counted) | 15% |
| Discussion activities (all 3 counted) | 10% |
| 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 C or higher (> 63%). 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!

Homework: Homework assignments are designed to help you read and understand most recent scientific journal articles and supplement what you are learning in class. **Homework #1 is worth 3% of your grade, Homework #2 is worth 5% and Homework #3 is worth 7%.**

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 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 discussion activities since they directly impact your grades. If you wish to change your discussion section, please see Karamat for permission **a week before the date of discussion**.

Discussion activities:

Discussion activities are group activities. We will distribute the entire class in two main groups (1 & 2). Group 1 & 2 each will be sub-grouped in ~10 students per sub-group. The homework assignment discussion performance will contribute to an entire subgroup. You will work as a team to perform well in the discussion activities. Additionally, discussion activities will also help you towards the preparation of the homework assignments.

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> |
|--------------------|----------------|---|---------------------------------------|
| Mon. Jan 08 | 1 | Introduction to the course & molecular biology | -- |
| Wed. Jan 10 | 2 | DNA & Genes | Ch. 2 & 3 |
| | | Homework assignment #1 | |
| Mon. Jan 15 | 3 | DNA replication Pt.1 | Ch. 20 |
| | | Tutorial: Group 1 discussion activity #1 | |
| Wed. Jan 17 | 4 | DNA replication Pt. 2 & PCR | Ch. 20 & Ch. 4 |
| | | Tutorial: Group 2 discussion activity #1 | |
| Mon. Jan 22 | 5 | DNA recombination Pt. 1 | Ch. 22 |
| | | Homework #1 Due Jan 22 | |
| Wed. Jan 24 | 6 | Restriction enzymes & novel cloning methods (30min) & Quiz #1 (35 min) | Ch. 4 & Ch. 5 |
| Mon. Jan 29 | 7 | DNA recombination/Genome editing & CRISPR-Cas9 and other enzymes | -- |
| | | Homework assignment #2 | |
| Wed. Jan 31 | -- | MIDTERM-EXAM #1 (60min) | -- |
| Mon. Feb 5 | 8 | Prok gene structure and mechanism of transcription | Ch. 6 & 7 |
| | | Tutorial: Group 1 discussion activity #2 | |
| Wed. Feb 7 | 9 | Transcription regulation: Lambda Phage | Ch.8 & A Genetic Switch by M. Ptashne |
| | | Tutorial: Group 2 discussion activity #2 | |
| Mon. Feb 12 | 10 | Prok transcription: Regulation Pt. 1 | Ch. 7 & 8 |
| | | Homework #2 Due Feb 12 | |
| Wed. Feb 14 | 11 | Prok transcription: Regulation Pt. 2 | Ch. 7 & 8 |
| Mon. Feb 19 | 12 | Prok transcription: Global regulation (30min) | Ch. 9 |
| | | Quiz #2 (35min) | |
| Wed. Feb 21 | 13 | Prok transcription: Global regulation (35min) | Ch. 9 |
| | | &/or RECAP (25min) | |
| Mon. Feb 26 | -- | MIDTERM-EXAM #2 (60min) | -- |
| Wed. Feb 28 | 14 | Eukaryotic transcription Pt. 1 | Ch. 10 |
| Mon. Mar 5 | 15 | Euk Trxn: Transcription factors Pt. 1 | Ch. 11 |
| Wed. Mar 7 | 16 | Euk Trxn: Transcription factors Pt. 2 | Ch. 12 |
| | | Homework assignment #3 | |
| Mon. Mar 12 | 17 | Euk Trxn: Transcription factors Pt. 3 | Ch. 12 |
| | | Tutorial: Group 1 discussion activity #3 | |
| Wed. Mar 14 | 18 | Euk Trxn: Chromatin structure | Ch. 13 |
| | | Tutorial: Group 2 discussion activity #3 | |
| Mon. Mar 19 | 19 | RNA processing Pt. 1 (30min) | Ch. 14 & 15 |
| | | Quiz #3 (35min) | |
| Wed. Mar 21 | 20 | RNA processing Pt. 2 | Ch. 15 & 16 |
| | | Homework #3 Due Mar 21 | |
| Mon. Mar 26 | 21 | Translation Pt. 1 | Ch. 17 & 18 |
| Wed. Mar 28 | 21 | Translation Pt. 2 | Ch. 18 & 19 |
| Mon. Apr 2 | -- | Holiday | -- |
| Wed. Apr 4 | 22 | MIDTERM-EXAM #3 (60min) | -- |
| Mon. Apr 9 | 23 | Genomics and genome engineering | Ch. 24 & 25 |
| Wed. Apr 11 | 24 | Functional genomics | -- |
| Mon. Apr 16 | 25 | Guest lecture or RECAP | -- |
| Wed. Apr 18 | -- | FINAL EXAM (65min) | -- |

Tutorials and Discussion Section Meet Times:

Tutorials: BIOL 367 Molecular Biology Mon & Wed 2:45PM - 4:00PM at CC 320 Loyola campus.
(To be updated)

Quizzes and Discussion activities:

| Dates | Group | Topic | Suggested readings |
|--------------|----------------|-------------------------------|-------------------------------|
| Mon. Jan 15 | Discussion - 1 | Homework assignment #1 | Homework assignment #1 |
| Wed. Jan 17 | Discussion - 2 | Homework assignment #1 | Homework assignment #1 |
| Mon. Jan 22 | | | |
| Wed. Jan 24 | | | |
| Mon. Jan 29 | Discussion - 1 | Quiz 1 answers | -- |
| Wed. Jan 31 | Discussion - 2 | Quiz 1 answers | -- |
| Mon. Feb 5 | Discussion - 1 | Homework assignment #2 | Homework assignment #2 |
| Wed. Feb 7 | Discussion - 2 | Homework assignment #2 | Homework assignment #2 |
| Mon. Feb 12 | | | |
| Wed. Feb 14 | | | |
| Mon. Feb 19 | | | |
| Wed. Feb 21 | | | |
| Mon. Feb 26 | Discussion - 1 | Quiz 2 answers | -- |
| Wed. Feb 28 | Discussion - 2 | Quiz 2 answers | -- |
| Mon. Mar 5 | | | |
| Wed. Mar 7 | | | |
| Mon. Mar 12 | Discussion - 1 | Homework assignment #3 | Homework assignment #3 |
| Wed. Mar 14 | Discussion - 2 | Homework assignment #3 | Homework assignment #3 |
| Mon. Mar 19 | | | |
| Wed. Mar 21 | | | |
| Mon. Mar 26 | Discussion - 1 | Quiz 3 answers | -- |
| Wed. Mar 28 | Discussion - 2 | Quiz 3 answers | -- |
| Wed. Apr 4 | | | |
| Mon. Apr 9 | | | |
| Wed. Apr 11 | | | |
| Mon. Apr 16 | | | |