Instructor: Dr. Aashiq Kachroo, Assistant professor and Tier 2 Canada Research Chair in Systems and Synthetic Biology. Department of Biology, Center for Applied Synthetic Biology, Concordia University.
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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 discover principles that allow swappability and simultaneously engineer yeast with critical human processes involved in disease such that yeast are more human-like at the molecular level. Website: http://www.kachroolab.org

Description:

This course presents an overview of current biotechnological techniques, including recombinant DNA technique, plant tissue culture, and plant transformation. We will discuss novel genome editing tools with an emphasis to engineer genetically modified organisms (GMOs) in agriculture as well as the issues/challenges of their applications in crop production. The course uses original research articles as the primary reading material and enhances the students' skills in the use and analysis of primary literature.

Prerequisite: BIOL 367 with B or above

Course structure: Each week, the part of the lecture on Thursday introduces an area of plant genetics, plant genetic or genome editing techniques or at least one genetic/ biotechnological approach. At least one recent article will be covered in the second part of the lecture to cover our current understanding of that problem and research approaches used at the forefront of the field. We will also see how modern techniques are allowing genetic analyses in plants as a whole or in plant cell lines. These technologies have a potential to improve the quality and quantity of food sources for better nutrition and sustainability.

Zoom link for Lectures:

[redacted]

Course material: We will be using the TopHat (www.tophat.com) classroom response system in class for lectures, quizzes, attendance etc. 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/). Top Hat will require a single course price or a subscription. There are multiple options and it costs ~$26 CAD for 1 term subscription (4 months) + another $10 for TopHat tests. The course code for the course is [redacted] TopHat registration needs to be done no sooner than [redacted].
The course material will also be provided via my lab website here (http://www.kachroolab.org/classes/BIOL485_winter_2022.html). The course website will provide links to review and research articles in the scientific literature. **No textbook is assigned.** Reading assignments will be announced in lectures, on the Moodle site and on the course website. All the files shared with the class will be password protected. The password is '[redacted].

Office hours: Every Monday 1:30p-2:30p at zoom (**link**).

**Note that my office hours are meeting as a 'group'. Please send an email ahead of time if you would want to meet at the office hours. If you prefer to talk to me one-one about a grade or any personal issues concerning the course, email me, and we can schedule a date for the meeting.*

Grading: Your course grade will be based on quizzes, research article review and presentations, fellowship proposals and participation throughout the duration of the course. Grades will be calculated based on the following scores.

EXAM TYPE	Grade %	DATE
Quizzes (2 of 3)	40%	*Via TopHat*
Fellowship Proposal (Take Home)	25%	*April 07, 2022*
Project deadline (Take Home)	25%	*March 10, 2022*
In-class quizzes & attendance	10%	*Via TopHat*
No Final Exam	X	**NO FINAL EXAM**
OVERALL GRADE	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.

Note:

1. **Only 2 of 3 quizzes will count towards the final grade.** The lowest scored quiz will be dropped. If you miss one of the quizzes (due to sickness, athletic commitments, or other genuine reasons), it automatically becomes a dropped score. **All the quizzes will be taken via TopHat. QUIZZES include 15 Multiple choice questions and will be for 40 minute duration. All QUIZZES will be taken on TopHat.**
2. Students who arrive late to a quiz 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.
3. **There is no Final exam.**

4. **All exams are on TopHat.**
5. **Re-grade policy:** You are responsible for ensuring that your grades reflect the scores that you have secured, and that the points on your quizzes have been added correctly. If you find a mistake, please see me immediately. If you take issue with how your fellowship proposals or presentations were graded, please submit a sheet explaining why you deserve more points. Re-grade application should be submitted within **ONE WEEK** after the grades have been provided to you.
6. Submissions of the Fellowship Proposal should be done as e-files directly to google drive folder, at the latest, on the day following the deadline. **The penalty for late submission: 10% of the assignment score/day.**
7. The take-home project will focus on your understanding of plant genomes. How would you obtain the information about a specific plant gene? What is the pattern of expression of this gene in plants? If you want to clone this gene for expression in bacteria, what would your approach be? Is it an essential gene in plants? Can you create a knockout line of this gene in plants? How would you do that using CRISPR-Cas9? And finally, what is your overall interest in this gene or set of genes. The project can be linked to the fellowship proposal that will be due (**TBA**).

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

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 TopHat to check your attendance. Please remember attendance along with several in-class quizzes correspond to 10% of your grade.

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!

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).

Students with Disabilities: All procedures outlined here (http://www.concordia.ca/students/accessibility.html) and here (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.

Software: We will use benhcling (https://www.benchling.com) to learn about DNA, RNA and protein sequences. Our online benching project is active (BIOL485, Concordia University, Montreal, Canada). Invites will be sent soon.

Course material copyright: No one can share the lecture slides & videos, exams, quizzes, and other material provided via TA sessions on any websites or social media. Anyone who fails to abide by the rule will face severe repercussions like elimination from the course.

Important dates: *The dates and the lecture info is subjected to change*

Dates	Lecture	Topic
Thu. Jan 6	1	Introduction to the course - brief outline of the structure and grading scheme.
Thu. Jan 13	2	Methods used to study plant genomes. Part 1
Thu. Jan 20	**3**	**Methods used to study plant genes, genomes, proteome. Part 2. Pick your gene for the project.**
Thu. Jan 27	4	Plant metabolites; their identification and their use
Thu. Feb 03	5	Genome/Metabolic engineering in plants
Thu. Feb 10	**6**	**Plant protection against herbivores and pathogens & QUIZ #1 (35 min) [Lectures 1-5]**
Thu. Feb 17	7	Plant response to Stress
Thu. Feb 24	**-**	**Crop improvement & novel plant-based food (impossible burger!), GMOs**
Thu. Mar 03	**8**	**No Lecture**
Thu. Mar 10	**9**	**Environmental and health impact of modern agriculture. & Project submission deadline**
Thu. Mar 17	**-**	**Paper discussion-2 & QUIZ #2 (Covering Lectures 6-9 & paper discussion-1)**
Thu. Mar 24	**-**	**Lecture & Paper discussion-2 & 3**
Thu. Mar 31	**-**	**Paper discussion-2 & 3 & QUIZ #3 (Covering Paper discussion-2 & 3)**
Thu. Apr 07		**Fellowship submission deadline Fellowship submission deadline**