MICROBIOLOGY 405
Molecular Biotechnology and Synthetic Biology
Course Outline: Fall 2022

Classroom: Cornett A121
Time: Monday and Thursday (11:30am – 12:50pm)
Thursday: office hours 1:30 – 2:30 pm

Textbook: There is no text book for this course

Course Coordinator / Instructor: Dr. Aditya Mojumdar (he/him), Petch 270
Office hours: By appointment
email: amojumdar@uvic.ca

Prerequisites: Completion of MICR200A, MICR200B, BIOC300A, BIOC300B

We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day.

Software and communication platforms: The primary website for the course will be on Brightspace. Lectures will be available on Brightspace. Groups will meet with me in class to work on group projects during scheduled times. Any online communication outside of Brightspace will utilize Zoom, with details to accessing this platform to be available within the Brightspace site. Additional notifications will be made through Brightspace as necessary.

First Scheduled Lecture of course: This will be in Cornett A121, and at that time we will discuss the structure of the class.

Course Organization and Marking:
The course is organized as a "flipped lesson". Some of the basic concepts will be included in the traditional lecture/seminar given by me and the student groups. The lecture/seminar topics are listed below and are divided into sections.

You will be divided into groups and each group will present twice during the course as specified in the class schedule. The two presentations include –

1. A seminar topic (10 min for each group presentation).
2. A research on a biotech company including the technology they use and their products (20 min for each group presentation).

The seminar topics will be assigned to you in a way that the 1st seminar topic will be presented by group 1, the 2nd seminar topic by group 2, and so on. You can choose any Biotech company of your liking from the list (to avoid overlaps it will be in 1st come 1st serve fashion) and let me know by **9.00pm Monday, October 03, 2022**. The PowerPoint slides needs to be submitted as PDF on Brightspace by **9.00pm Wednesday, October 05, 2022** (see the due dates).

All lectures are available as PDFs at the MICR405 Brightspace site. You are expected to view the PDF lectures on your own. The lectures are divided into groups to help you know what material will be covered in which assessment.

See course calendar for your group's formal meeting dates. I will attend all the formal meeting dates and note students' attendance and participation. **Attendance and Participation in class is mandatory and contributes to your group presentation mark.**
Your group might want to meet outside of these times, as possible for your collective schedules. You can meet up in person or you may set up your own online conferencing sessions for these meetings that I will not attend.

The Final assignment is meant to be an "intellectual laboratory" where you try out the methods described in the course in a creative way to solve real world problems. This year, you will be highly encouraged to come up with ideas that contribute in understanding and/or curing any type of cancer or any rare genetic disease. A reasonable effort in the assignment should result in a good grade that will help buffer a poor assessment or group presentations grade.

Due dates and weighted values of exams, assignments and presentations:

Assessment type	**Weight**
In-class Assessment 1	10%
In-class Assessment 2	10%
Group Presentation 1 – Seminar Topic	15%
Group Presentation 2 – Biotech company	25%
Final Assignment	40% (**Due date is Monday December 6, 2022**)

Assessment type	**Due date**
In-class Assessment 1	Monday, September 19, 2022
In-class Assessment 2	Monday, October 24, 2022
Biotech company selection (1^{st} come 1^{st} serve basis)	9.00pm Monday, October 03, 2022
PDF submission of Group Presentation 1 (Seminar Topic)	All groups - 9.00pm Wednesday, October 05, 2022
PDF submission of Group Presentation 2 (Biotech company)	All groups - 9.00pm Saturday, November 12, 2022
Final Assignment submission	11.00pm Monday December 5, 2022

describe all figure in your presentations, PDFs and final assignment clearly, so that you and other students could read and understand

Completion of all components (in-class assessments, group presentations and final assignment) are required to complete the course and receive a passing grade.

Class #	Date	Topic	Presenter
1	Sep 08 (Thurs)	Section 1: Introduction	A.M.
2	Sep 12 (Mon)	Section 2: Cloning, PCR, Plasmids & Vectors	A.M.
3	Sep 15 (Thurs)	Section 3: cDNA library & Sequencing	A.M.
4	Sep 19 (Mon)	In class Assessment 1 – topics from Section 1, 2 and 3	
5	Sep 22 (Thurs)	Groups 1 to 5 meeting	
6	Sep 26 (Mon)	Groups 6 to 9 meeting	
7	Sep 29 (Thurs)	Groups 10 to 13 meeting	
8	Oct 03 (Mon)	Groups 14 to 17 meeting	
9	Oct 06 (Thurs)	Section 4: Genome Assembly	Student Groups 1-5
	Oct 10 (Mon)	Thanksgiving	
10	Oct 13 (Thurs)	Section 5: Elements of genetic circuits	Student Groups 6-9
11	Oct 17 (Mon)	Section 6 and 7	Student Groups 10-13
12	Oct 20 (Thurs)	Section 8	Student Groups 14-17
13	Oct 24 (Mon)	In class Assessment 2 – topics from Section 4 to 8	
14	Oct 27 (Thurs)	Groups 1 to 5 meeting	
15	Oct 31 (Mon)	Groups 6 to 9 meeting	
16	Nov 03 (Thurs)	Groups 10 to 13 meeting	
17	Nov 07 (Mon)	Groups 15 to 18 meeting	
	Nov 10 (Thurs)	Reading Break	
18	Nov 14 (Mon)	Group presentation 2	Student Groups 1-3
19	Nov 17 (Thurs)	Group presentation 2	Student Groups 4-6
20	Nov 21 (Mon)	Group presentation 2	Student Groups 7-9
21	Nov 24 (Thurs)	Group presentation 2	Student Groups 10-12
22	Nov 28 (Mon)	Group presentation 2	Student Groups 13-15
23	Dec 01 (Thurs)	Group presentation 2	Student Groups 16-17

Lecture topics

Section 1. Introduction
What is Biotechnology?
Products of Biotechnology
History of Biotechnology

Section 2. Cloning, PCR, Plasmids & Vectors
Gene Cloning
Polymerase Chain Reaction (PCR)
Gel electrophoresis
Plasmids
Cloning Vectors

Section 3. cDNA library & Sequencing
Creating a cDNA library
Sanger sequencing
Next generation sequencing
  Illumina, Roche 454 and Ion torrent

Student group seminar topics

Section 4. Genome Assembly

1. Enzyme independent cloning – Restriction free, LIC
2. DNA assembly – Biobricks, Golden Gate
3. In vitro genome assembly methods – F-PCR, Gibson, SLIC
4. In vivo genome assembly methods – TAR
5. Bacterial Genome Engineering – Suicide plasmids, Lambda red, Clostron

Section 5. Elements of genetic circuits

6. Natural and synthetic promoters; attenuation and termination.
7. Codons and codon usage, Operons, RBSs and their relevance to biotechnology
8. siRNA and ribo-blocks and their relevance to biotechnology
9. TetR regulation of genes

Section 6. Recombineering and Genome engineering

10. Recombineering for eukaryotes – CRISPR-based engineering
11. Recombinases used in genome engineering.

Section 7. Producing and expressing proteins

12. Recombinant protein expression
13. Bioreactors and Metabolic Engineering

Section 8. Examples of applications

14. Proteins with Un-natural amino acids
15. Recombinant antibody display – Nanobodies
16. Recombinant vaccines
17. Nanopore sequencing

UVic Grading Scheme

A+	90 -100	B+	77 - 79	C+	65 - 69	F	< 50
A	85 - 89	B	73 - 76	C	60 - 64	N **	< 50
A-	80 - 84	B-	70 - 72	D	50 - 59		

** N grades

Students who have completed the following components will be considered to have completed the course and will be assigned a final grade: **In-class Assessments, Group Presentations, Final Assignment**.

Everything counts towards the marks/grades **: Attendance, Participation, Submission of PDFs on time, In-class Assessments, Group Presentations, Submission of Final Assignment on time.**

Failure to complete one or more of these elements will result in a grade of "N" regardless of the cumulative percentage on other elements of the course. An N is a failing grade, and it factors into a student's GPA as 0. The maximum percentage that can accompany an N on a student's transcript is 49.

DEPARTMENT INFORMATION AND POLICIES

1. The Department of Biochemistry and Microbiology upholds and enforces the University's policies on academic integrity. These policies are described in the current University Calendar. All students are advised to read this section.

2. Cell phones, computers, and other electronic devices must be turned off at all times during live class sessions unless being used for the purpose of connecting and engaging with the class.

3. No recordings of live lectures are permitted without permission of the instructor. However, many courses will be recorded by the instructor for accessibility for students unable to attend. If you do not wish to be recorded, contact your instructor to determine if alternative arrangements can be made. Attendance and engagement in the classroom is an integral part of the learning process and cannot be substituted with recordings. It is at the instructor's sole discretion whether they provide a recording or give permission to students to record a lecture. There is no obligation to do so nor is there any expectations about the quality of the recordings. Nor should students assume a lecture will be recorded as instructors may withdraw access to recordings or permission to record. It is the responsibility of students who miss lectures to catch up in the material through extra readings, and obtaining notes from fellow students. Students who miss several lectures due to illness should contact their instructors to discuss options.

4. Students and instructors are expected to assess their health daily and avoid campus if they are ill.

5. Course materials, such as notes, problem sheets, quizzes, examinations, example sheets, or review sheets, may not be redistributed without the explicit written permission of the instructor.

6. Students are expected to be available for all exams. Instructors may grant deferrals for midterm examinations for illness, accident, or family affliction. Although students do not require documentation, students must contact their instructor and BCMB office (biocmicr@uvic.ca) with the reason for their absence within 48 hours after the midterm exam. The Department will keep a record of the absences. It is the responsibility of the student to ensure all required components are complete, and to arrange deferred exams/assignments with the instructor, which normally should occur within one week of the original exam date.

7. The Department of Biochemistry and Microbiology considers it a breach of academic integrity for a student taking a deferred examination to discuss the exam with classmates. Similarly, students who reveal the contents of an examination to students taking an examination are considered to be in violation of the University of Victoria policy on academic integrity (see current University Calendar). Students must abide by UVic academic regulations and observe standards of scholarly integrity (no plagiarism or cheating). Online exams must be taken individually and not with a friend, classmate, or group, nor can you access notes, course materials, the internet, or other resources without the permission of the instructor. You are prohibited from sharing any information about the exam with others. Use of unauthorized electronic devices and accessing the internet and class material during exams is prohibited unless permission is granted by the instructor. Instructors may use Browser Lockdown Software to block access during classes and exams.

8. **Deferral of a final exam** must be requested with an Academic Concession form and submitted directly to Undergraduate Records. Deferred final exams for fall term courses will be arranged by the instructor. Deferred final exams or spring term courses will be arranged through Undergraduate Records and must be written before the end of the summer term as stipulated in the University Calendar.

9. Requests for review/remark of a midterm exam must be made within one week of the exam being returned.

10. The instructor reserves the right to use plagiarism detection software or other platforms to assess the integrity of student work.

11. Supplemental exams or assignments will not be offered to students wishing to upgrade their final mark.

12. Anonymous participation in online classes is not permitted without permission of the instructor.

Important note about COVID-related stress
The current pandemic is placing added stressors- financial, mental, and physical- on everyone. Your wellbeing is of foremost importance. If you are experiencing difficulties coping, the University has resources to help. Please reach out to Counselling Services, the Centre for Academic Communication, or Learning Assistance Program for assistance.

Centre for Accessible Learning
Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, approach the Centre for Accessible Learning (CAL) as soon as possible in order to assess your specific needs. https://www.uvic.ca/services/cal/index.php

Course Experience Survey (CES)
We value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to us regarding the course and our teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to your CES dashboard. You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. We will remind you nearer the time but please be thinking about this important activity.

Code of Conduct
Information about student code of conduct can be found here. https://www.uvic.ca/services/advising/advice-support/academic-units/student-code-of-conduct/index.php

BMSS blog
Current announcements, events and award information can be found here.
https://onlineacademiccommunity.uvic.ca/bmss/