

BIOE 202: Cell and Tissue Engineering Lab

Credit hours: 2

Semester: Fall 2023

Prerequisite: MCB 150, BIOE 206

Canvas: <https://canvas.illinois.edu/courses/37073>

Gradescope: <https://www.gradescope.com/courses/558652>

Instructor

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Teaching Assistants

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Office hours

Wednesdays, 6-7 pm (virtual)

Class meeting time and location

Lecture (all sections): Fridays 1:00-1:50 pm Everitt Lab 2310

Lab section AB1: Mondays 11:00 am - 2:50 pm Everitt Lab 3109

Lab section AB2: Mondays 3:00 pm - 6:50 pm Everitt Lab 3109

Required materials

- Laboratory coat.
- Notebook – We will be using electronic notebooks for official recording and analysis of experimental details and results. We will provide printouts of experimental protocols for your use during lab. You may record results, observations, calculations, etc., on these printouts or you may wish to bring your own paper notebook to take notes that you will later transfer to your electronic notebook for grading. More details on e-notebooks will be provided in class.

Textbook – recommended (not required)

- *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, 6th Edition (2022); Bernard R. Glick and Cheryl L. Patten

Course Description

Students will explore the field of cell and tissue engineering, with a focus on understanding and mastering the quantitative molecular and cellular techniques used in modern biomedical research. Lectures and laboratory exercises will expose students to the design principles and engineering approaches used to address critical needs in human health. Students will gain a detailed understanding of the cellular and molecular biology fundamentals that underlie research approaches, including methods for manipulating nucleic acids and proteins; strategies for studying gene expression; bacterial and mammalian cell culture; and imaging and measurement systems to quantify cellular and molecular function. Critical analysis of laboratory results will be facilitated through lectures, in-lab instruction, quizzes, lab reports, and exams.

Course Objectives

- Strengthen and expand fundamental knowledge of cellular and molecular biology basics.
- Gain hands-on experience with cellular and molecular methodologies used in diagnostic and research labs, including:
 - Culturing, quantifying, and using bacterial and mammalian cells in experiments.
 - Using experimental techniques to manipulate, quantify, and analyze DNA, proteins, and cells.
 - Analyzing, interpreting, and troubleshooting quantitative data from molecular biology experiments, including use of related software programs (e.g., ImageJ).
 - Documenting experimental procedures and recording data using electronic lab notebooks.
 - Identifying and interpreting experimental controls, replicates, and sources of experimental error.
 - Designing an experimental procedure.

- Preparing figures.
- Writing technical reports.
- Following good laboratory practices, including laboratory safety.

Course grades

Grade distribution:

Laboratory notebook	5%
Prelab quizzes	15%
Lab reports	30%
Practical	20%
Final exam	30%

Grading policies

- **Late assignments:** For lab reports, a 10% reduction in points will be applied to any late assignment submitted up to 24 hours after the deadline, a 50% deduction will be applied for submissions received 24-48 hours after the deadline, and no credit will be given for assignments not submitted by 48 hours past the deadline. For other assignments, no submissions will be accepted after the deadline.
- **Regrades:** After grades are posted, there will be a 3-day window in which you will be able to submit regrade requests. Regrade requests may result in a lower grade.
- **Final grades:** At the end of the semester, numerical grades will be converted to a letter grade. Numerical grades will not be rounded up to calculate the letter grade.

Final grade scale for course (%):

A+ 97 – 100	B+ 87 – 89.99	C+ 77 – 79.99	D+ 67 – 69.99	F < 60
A 94 – 96.99	B 84 – 86.99	C 74 – 76.99	D 64 – 66.99	
A- 90 – 93.99	B- 80 – 83.99	C- 70 – 73.99	D- 60 – 63.99	

- **Attendance:** Attendance in your lab section is mandatory. The penalty for the first unjustified absence will be an automatic 25% reduction in the grade for the corresponding lab report. The penalty for the second unjustified absence will be an automatic 75% reduction in the grade for the corresponding lab report. The penalty for a third unjustified absence will be a failing grade for the course. Students who arrive late to lab will not be allowed to participate and will receive a grade penalty for an unjustified absence. Absences will only be excused if they are verified (e.g., by a note from the Dean of Students). For absences known in advance, you must inform the instructor at least one week in advance of the planned missed lab and you will be required to complete a written make-up assignment related to the material covered in lab which will be due by the last day of instruction.
- **Extra credit:** There is no extra credit in this course.

Schedule (subject to change)

WEEK	DATE	TOPIC		ASSIGNED	DUE
1	Aug 21	No Lab – Complete DRS Safety Training			
	Aug 25	Lecture	Course Overview: Introductions, Safety Briefings, Review of Course Policies	Pre-lab quiz	
2	Aug 28	Lab		Lab Topic: Measurements and Bacterial Growth	
	Sept 1	Lecture		Pre-lab quiz	
3	Sept 4 – Labor day	NO LAB	Bacterial Transformation and Bacterial Culture		

	Sept 8	NO LECTURE			
4	Sept 11	Lab			Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Sept 15	Lecture	Plasmid DNA Extraction and PCR	Pre-lab quiz	
5	Sept 18	Lab			LAB REPORT #1
	Sept 22	Lecture		Pre-lab quiz	
6	Sept 25	Lab	Agarose Gel Electrophoresis		Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Sept 29	Lecture		Pre-lab quiz	
7	Oct 2	Lab	Mammalian Cell Culture		LAB REPORT #1 Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Oct 6	Lecture		Pre-lab quiz	
8	Oct 9	Lab	Transfection		Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Oct 13	Lecture		Pre-lab quiz	
9	Oct 16	Lab	Fluorescence Microscopy	LAB REPORT #2	Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Oct 20	Lecture		Pre-lab quiz	
10	Oct 23	Lab	Cell Lysis, Protein Extraction, and Protein Prep		Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for

					last week (Benchling)	
	Oct 27	Lecture	Protein Quantification	Pre-lab quiz		
11	Oct 30	Lab				LAB REPORT #2 Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)
	Nov 3	Lecture			Pre-lab quiz	
12	Nov 6	Lab	SDS PAGE	LAB REPORT #3	Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)	
	Nov 10	No Lecture	Protein Detection by Western Blot	Pre-lab quiz		
13	Nov 13	Lab			Monday, 11 am: - Pre-lab quiz (Canvas) - Lab notebook entry for last week (Benchling)	
	Nov 17	No lecture				LAB REPORT #3 - Lab notebook entry for last week (Benchling)
14	Nov 20	FALL BREAK				
	Nov 24	FALL BREAK				
15	Nov 27	PRACTICAL EXAM				
	Dec 1	FINAL EXAM (during normal Friday lecture period)				
16	Dec 4	No lab – semester ends				

Disability-Related Accommodations: We are committed to assisting students with disabilities requiring course accommodations that are registered with DRES. To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-4603, e-mail disability@illinois.edu or go to <https://www.disability.illinois.edu>. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting “Request an Academic Screening” at the bottom of the page.

Please discuss these accommodations with us as early in the semester as possible. If you plan on using accommodations for any assignments, please let us know as early as possible.

Diversity and Inclusion: We value all students regardless of background and are committed to fostering a climate of inclusion in the classroom. The diversity of participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your or any other student's contribution is not being valued for any reason, please speak with us directly or submit anonymous feedback.

Grainger College of Engineering Statement on Anti-Racism and Inclusivity: The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community. The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART) (<https://bart.illinois.edu/>). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.

Emergency Response Recommendations: Emergency response recommendations can be found at the following website: <http://police.illinois.edu/emergency-preparedness/>. We encourage you to review this website and the campus building floor plans website within the first 10 days of class. <http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/>.

Sexual Misconduct Reporting Obligation: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity: The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/>.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <https://studentcode.illinois.edu/article1/part4/1-401/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances: Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at <https://odos.illinois.edu/community-of-care/resources/students/religious-observances/> to request appropriate accommodations. This should be done in the first two weeks of classes.

Family Educational Rights and Privacy Act (FERPA): Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.