



BIOE 202: Cell and Tissue Engineering Lab

Credit hours: 2

Semester: Spring 2024

Prerequisite: MCB 150, BIOE 206

Instructor

Megan Griebel, Ph.D.

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Office Hours:

TBD (or by appointment), EL3250

Teaching Assistants (TAs)

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Caleigh Arentsen (lab support)

Class Meeting Time and Location

Lecture (all sections):	Fridays	12:00pm-12:50pm	Everitt Lab 2310
Lab section AB4:	Mondays	11:00am-2:50pm	Everitt Lab 3109
Lab section AB1:	Tuesdays	1:30pm-5:20pm	Everitt Lab 3109
Lab section AB2:	Thursdays	1:30pm-5:20pm	Everitt Lab 3109

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 Websites

- Canvas (<https://canvas.illinois.edu/>) will be used for course announcements, lecture slides, and any other handouts.
- Benchling (<https://www.benchling.com/>) will be used for the lab notebook
- Box (accessed via Canvas) will be used for sharing lab images and data
- Gradescope (integrated with Canvas; <https://gradescope.com/>) will be used to turn in lab reports

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 (not required)

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

Course Grades

Grade distribution:

Laboratory notebook	5%
Pre-lab quizzes	15%
Lab reports	30%
Practical exam	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	A 94 – 96.99	A- 90–93.99
B+ 87–89.99	B 84 – 86.99	B- 80–83.99
C+ 77–79.99	C 74 – 76.99	C- 70–73.99
D+ 67–69.99	D 64 – 66.99	D- 60–63.99
F <60		

- **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. Requests for extra credit may be ignored.

Schedule *(subject to change)*

Week	Week of	LAB	LECTURE
Week 1	15-Jan	DRS Training - ONLINE	Course overview / Measurements and Bacterial Growth
Week 2 - Lab 1	22-Jan	Measurements and Bacterial Growth	Bacterial Transformation and Bacterial Culture
Week 3 - Lab 2	29-Jan	Bacterial Transformation and Bacterial Culture	Plasmid DNA Extraction and PCR
Week 4 - Lab 3	5-Feb	Plasmid DNA Extraction and PCR	Agarose Gel Electrophoresis
Week 5 - Lab 4	12-Feb	Agarose Gel Electrophoresis	Mammalian Cell Culture
Week 6 - Lab 5	19-Feb	Mammalian Cell Culture	Transfection
Week 7 - Lab 6	26-Feb	Transfection	Fluorescence Microscopy
Week 8 - Lab 7	4-Mar	Fluorescence Microscopy	Cell Lysis, Protein Extraction, and Protein Prep
Week 9	11-Mar	NO LAB - Spring Break	NO LECTURE - Spring Break
Week 10 - Lab 8	18-Mar	Cell Lysis, Protein Extraction, and Protein Prep	Protein Quantification
Week 11 - Lab 9	25-Mar	Protein Quantification	SDS PAGE
Week 12 - Lab 10	1-Apr	SDS PAGE	Protein Detection by Western Blot
Week 13 - Lab 11	8-Apr	Protein Detection by Western Blot	HOLD
Week 14	15-Apr	Cell Culture Practice	Final Review
Week 15	22-Apr	PRACTICAL EXAM	FINAL EXAM
Week 16	29-Apr	NO LAB - half wek	

University Policies and Resources

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.

Community of Care: As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (217-333-0050 or <http://odos.illinois.edu/community-of-care/referral/>). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, as a Community of Care, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the Student Assistance Center (SAC) in the Office of the Dean of Students for support and referrals to campus and/or community resources.

Disability-Related Accommodations: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible and provide the instructor with a Letter of Academic Accommodations from Disability Resources and Educational Services (DRES). To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should apply for services with DRES and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-1970, e-mail disability@illinois.edu or visit the DRES website at <http://www.disability.illinois.edu/>. Here is the direct link to apply for services at DRES, <https://www.disability.illinois.edu/applying-services>.

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.

Disruptive Behavior: Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students’ ability to learn and an instructor’s ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office for Student Conflict Resolution (<https://conflictresolution.illinois.edu>; conflictresolution@illinois.edu; 333-3680) for disciplinary action.

Diversity and Inclusion: We value all students regardless of background and am 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.

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

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.

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.

Mental Health: Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center (217) 333-3704
- McKinley Health Center (217) 333-2700
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)

If you are in immediate danger, call 911.

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.**

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: <https://wecare.illinois.edu/resources/students/#confidential>. Other information about resources and reporting is available here: <https://wecare.illinois.edu/>