NE 431: Neural Cell and Tissue Engineering Lab

Meeting times:
Wednesdays, 2:00 – 4:50 PM
Fridays, 12:00 – 2:50 PM
Location: 3109 Everitt Lab

Credit hours: 4
Prerequisites: Concurrent in NE 430 enrollment required

COURSE STAFF

Instructor: Prof. Caroline Cvetkovic, Ph.D. (ccvetko@illinois.edu) – 3138 Everitt Lab
Teaching Assistant: Junxi Yi (junxiyi2@illinois.edu)
Undergraduate Course Assistant: Matthew Surburg (surburg2@illinois.edu)

COURSE INFORMATION

Description: This laboratory course, which serves as a companion to Neural Cell and Tissue Engineering, will provide students with a hands-on understanding of many of the concepts and techniques central to this field. Students will take part in an immersive laboratory experience centered on the biomaterial-guided directed differentiation of neural stem cells from pluripotent stem cells and their transplantation into the nervous system of a rodent model for the goal creating a functional neural graft. Cell culture, nucleic acid extraction, qPCR and immunofluorescent imaging are among the laboratory techniques that students will become proficient in. Data quantitation, methods for statistical analysis, and scientific writing are emphasized.

Learning Objectives: Upon completion of this course, students should be able to:

- Perform molecular and cell biology techniques central to neural cell and tissue engineering.
- Perform power analysis to inform experimental design.
- Apply inferential statistics to test a hypothesis.
- Manage a detailed laboratory notebook.
- Write scientific reports with quantitative descriptions of the results.

Topics: The instructor has the right to change the schedule as needed. Changes will be communicated to the students in a timely manner and posted on Canvas. Topics include:

- Laboratory safety and fundamentals
- Bacterial culture techniques and transformation
- Plasmid preparation and gel electrophoresis
- Aseptic technique and stem cell culture
- Transfection of human pluripotent stem cells
- Quantitative immunofluorescence microscopy
- Analysis of directed neural differentiation
- Engineering of 3D neuronal spheroids
- Protein extraction, quantification, and detection
- Quantitative data analysis and assessment of outcomes

COURSE RESOURCES

Course Website: The Canvas site (https://canvas.illinois.edu/courses/61941) will be used for all course announcements and materials. Gradescope may be used to turn in assignments.

Office Hours: No set times; if necessary, email for appointment with course instructor or TA.

Textbook and Reading Materials: No textbook is required. Reading materials relevant to the content will be assigned via Canvas and may come from a combination of review articles, research papers, and book chapters.

ASSIGNMENTS AND GRADING

Final Grade Breakdown:

Participation	5%	Individual
Quizzes	10%	Individual
Worksheets	20%	In teams
Cell Culture Practical	10%	Individual
Journal Club Presentation	10%	In teams
Lab Reports • *Report 1: 10%* • *Report 2: 15%* • *Report 3: 20%*	45%	In teams

Grading Scale:

≥97.0	A+	≥77.0	C+
≥93.0	A	≥73.0	C
≥90.0	A-	≥70.0	C-
≥87.0	B+	≥67.0	D+
≥83.0	B	≥63.0	D
≥80.0	B-	≥60.0	D-

Final grades may be rounded at the instructor's discretion. Requests for grade inflation or extra points will not be accepted.

Assignments: For each experiment, students will work in teams of two to complete at least one relevant assignment with equal effort. The nature of the assignment and time allotment vary by the type of experiment performed. Assignments will be submitted via Canvas or Gradescope.

- Participation (5% total): As teamwork is central to the success of any experiment, students will receive a participation grade based on their effort as well as feedback from their partner, TA, and instructor. Students are expected to complete assignments as a group, with equal effort. Students will be required to provide Author Contribution Statements on some assignments. Attendance is critical to success in this course.
- Quizzes (10% total): Quizzes will be given approximately once per week. Their objective is to assess preparedness to perform that week's lab, including basics of the procedure and background information as well as other topics announced by the instructor. Quizzes will be given in class, and students are expected to complete them individually, without notes or online resources. The lowest quiz score will be dropped without penalty. As such, makeup quizzes will not be given. Any missed quizzes beyond the first will count as zeros without an excused university absence.
- Worksheets (20% total): For some experiments, teams will complete a worksheet that tests concepts of the procedure, analysis of acquired data, or application of the material. The nature of the worksheets, frequency, and time allotment vary by the type of lab.
- Cell Culture Practical (10% total): Students will be assessed individually on basic cell culture practices and aseptic techniques.

- Journal Club Presentation (10% total): Teams will present a scientific manuscript in the field of neural engineering to the class.
- Lab Reports (45% total): Teams will write reports that include an introduction, materials and methods, results, discussion, and figures. Detailed instructions will be provided. The weight of each subsequent lab report will increase throughout the semester.

COURSE POLICIES

Course-Related Communication: Email communication is preferred between students and the instructor/TAs. Please include "[NE 431 FA25]" in the subject line. The Canvas discussion board may also be used and will be occasionally monitored by the instructor or TAs. There is no guarantee that communication sent after 5:00 pm will be answered that same day.

Attendance: This is a lab-based course in which attendance is imperative for success, and your team's grade depends on your active involvement. Assignments are based on laboratory exercises and participation is thus necessary to pass the course. Attendance in class is required, and students are responsible for all materials and announcements given during the class time, including quizzes. For planned schedule changes for university-excused absences, religious observances, interviews, or university-sponsored athletic events, please contact the instructor as soon as possible, and at least two weeks before the lab date. In this case, students should coordinate with the instructors to complete a makeup lab. For last-minute schedule changes or illness, please alert the instructor, TAs, and lab group via email as soon as you are able.

Due to safety training requirements, students who arrive late and miss the safety overview might not be allowed to participate. Makeup labs might be scheduled at the instructor's discretion.

Illness Policy: Students who feel ill must not come to class. In this case, students should let the instructor/TA know as soon as possible and coordinate with their lab partner to complete the lab work. An appropriate plan for making up missed lab experiments (in-person or virtually) and assignments will be initiated by the instructor as appropriate for the assignment, and agreed upon by the instructor, TA, and student. Repeated absences will require an absence letter from the Dean of Students addressed to the instructor.

Late Policy: The course late policy is as follows:

- An assignment submitted <24 hours after the deadline will lose 10% of the total points.
- An assignment submitted 24-48 hours after the deadline will lose 20% of the total points.
- No credit will be received >48 hours after the assignment deadline.

Electronic Devices: Mobile devices should be silent and out of sight during class. Laptops and devices may be used for course-related tasks only (e.g., to take notes, complete quizzes, or work on assignments) and not for other coursework or email. Great care should be taken that use of electronic devices does not lead to contamination in the lab.

Safety: The procedures of this course are designed to be safe for students and instructors. However, risk is inherent to any experiment, especially with chemicals or biological materials. Thus, students are required to abide by all rules and safety guidelines and will sign their name to a safety agreement during the first week of the semester. Those who do not sign will not be allowed to participate in the course. Additionally, students must complete assigned DRS safety training before participating in the lab. Any student who knowingly endangers themselves, fellow students, or instructors will be asked to leave the lab immediately and will fail the course.

Use of Generative AI Technology: Generative AI, such as ChatGPT, Google Gemini, and Microsoft Copilot, can answer questions and generate text, images, and other media. The appropriate use of generative AI varies from course to course. In NE 431, there are times when generative AI may be useful in the course. If you choose to use generative AI as permitted below, you must document and attribute all AI contributions to your coursework and take full responsibility for the contributions including the accuracy of the information and reliability of sources. When using generative AI, keep a journal documenting prompts, AI responses, and your usage. Your instructor may ask you to provide this documentation.

You may use generative AI in NE 431 for the following:

- Creating study aids (e.g., flashcards)
- Testing and practicing your knowledge of course topics

You MAY NOT use generative AI in NE 431 for the following:

- Generating data or altering images for experiments conducted in the course
- Assistance during quizzes or homework
- Writing sentences, paragraphs, or full papers to complete assignments or lab reports

If you have a question about the use of Generative AI, please reach out to your instructor. Failure to abide by these guidelines is a violation of academic integrity. We will investigate suspected uses of generative AI that do not follow these guidelines and apply sanctions as outlined in the Illinois Student Code. Visit Digital Risk Management: Generative AI for guidance and policies.

Academic Integrity: Students will sign their name to an academic honesty agreement during the first week of the semester in order to be allowed to participate in the course. Academic dishonesty may result in a failing grade. All students are expected to:

- Read and abide by the University of Illinois at Urbana-Champaign Student Code, including Article 1, Part 4: Academic Integrity.
- Perform all of the lab procedures themselves.
- Use only the data obtained by their lab group to write reports, unless stated otherwise by the TA or instructor. Use of previous semesters' material is prohibited.
- Write lab reports in assigned groups only. Although some discussions about data and analysis strategies may occur between groups, each lab report should reflect the work of that lab group only.
- Complete quizzes without the aid of class materials, peer input, or the internet.
- Uphold the highest ethical standards, be honest, and practice academic integrity. This includes doing original work and citing sources used. TurnItIn will be used to check for plagiarism in assignments uploaded to Canvas.
- Ask the instructor if in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity. Ignorance is not an excuse for any academic dishonesty.

UNIVERSITY POLICIES AND RESOURCES

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 (SAC; 217-333-0050). 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 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 an accommodation, please speak to me as soon as possible. DRES provides students with academic accommodations, access, and support services. To contact DRES, visit 1207 S. Oak St., Champaign, call 217-333-1970, e-mail disability@illinois.edu, or visit the DRES website. The link to apply for services is 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 (conflictresolution@illinois.edu) for disciplinary action.

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 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 also encouraged to review the building emergency action plans 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: Diminished mental health, including significant stress, mood changes, excessive worry, substance/alcohol abuse, or problems with eating and/or sleeping can interfere with optimal 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 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, 610 East John Street, Champaign, IL 61820
- McKinley Health Center: 217-333-2700, 1109 South Lincoln Avenue, Urbana, IL 61801
- University of Illinois Wellness website: https://wellness.illinois.edu/
- 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 regarding admissions, class attendance, and the scheduling of examinations and work requirements. Students should view the policy here: https://odos.illinois.edu/resources/students/religious-observances. 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 to request appropriate accommodation in the first 2 weeks of class.

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/