



Vertically Integrated Project (VIP)
Bioengineering Brain and Tissue Repair
Syllabus
Spring 2022

Instructor Information

Instructor/s	Email/Office Phone	Office
Don Sakaguchi	dssakagu@iastate.edu 515-294-3112	5205 ATRB 113 Bessey (BIO GEN)

General Information

Description

Cr. 1-3

Vertically Integrated Project (VIP) for undergraduate teams earn academic credit (or you may volunteer, depending on particular circumstances) for their participation in experiment-based research that assists faculty with research programs in their areas of expertise. The teams of 3-10 students created will work on a multidisciplinary, vertically integrated, and long-term project—each student may participate for up to 3.5 years.

Bioengineering Brain and Tissue Repair: This interdisciplinary, Vertically Integrated Project (VIP) has a goal that seeks to develop novel approaches to facilitate the repair and regeneration of damaged tissues, including brain and bone. Students will work in teams of 3-5 students on a research project and enhance their knowledge in neuroscience, stem cell biology, and bioengineering during this course. In this VIP, small teams of undergraduates – from various majors, years of study, and backgrounds – work with a professor and senior lab members. Undergraduates can earn academic credit (1-3 cr) for their work and have direct involvement with the experimental process, helping to design and conduct experiments. In this VIP, we will use a combination of biomaterials in the form of polymer films and/or scaffolds, adult stem cells seeded on the biomaterials, and use of physical, chemical, biological and/or electrical cues to direct stem cell differentiation using in vitro models. VIP members may have the opportunity to observe, learn, and implement various research techniques: general laboratory procedures, data collection and analysis, mammalian cell culture, immunocytochemical procedures, fluorescence microscopy, image analysis, and tissue engineering strategies. Participating in this course is essentially joining a research team and requires a high level of individual accountability and responsibility and teamwork.

Please note: The Sakaguchi Lab is committed to building an equitable and inclusive scientific community for all persons without regard to ethnicity, race, creed, cultural background, gender identity, national or native origin, physical ability, religious affiliation, or sexual orientation, and recognizes that all these vast diversities exist among, and benefit our lab membership.

Student Learning Outcomes, Expectations, and Goals:

1. Students will gain the ability to effectively manage time by coming prepared to all meetings/experiments and spending adequate time outside of group meetings on individual work/preparation.
2. Students must work well with teammates to solve problems and mitigate any conflict that may arise.
3. Students will gain the ability to apply the process of science. Biology/bioengineering is evidence-based and grounded in the formal practices of observation, experimentation, and hypothesis testing.
4. Students will advance their ability to communicate research findings and scientific concepts to various audiences.
5. Students will improve their quantitative reasoning skills. Biology/bioengineering relies on applications of quantitative analysis and mathematical reasoning.
6. Students will learn about the interdisciplinary nature of science and the importance of collaborative interactions.
7. Students will gain a better understanding of the relationship between science and society.
8. Students will respect the work and opinions of others.

TEAM LEARNING OUTCOMES / COURSE GOALS:

The continuity, technical depth, and disciplinary breadth of these teams are intended to:

- Provide the time and context necessary for students to learn and practice many different professional skills, make substantial technical contributions to the project, and experience different roles on a large, multidisciplinary design/discovery research team.
- Support long-term interaction between the students on the team. The more senior lab members mentor the undergraduates as they work on the research projects embedded in the Labs' research.
- Contribute to the completion of large-scale research projects that significantly benefit faculty members' research programs.

Course Policies

- **General Lab meeting:** Friday's 12-1 pm. All lab members are expected to attend this weekly meeting.
- **Team meetings:** Lab members are organized into **Research project teams**. Teams will generally meet sometime during Th or F (1-5 pm) for about an hour each week. In addition, to the general lab meeting, each team will determine additional meeting times as needed. Students are responsible for participating in team meetings. If you miss any meeting, you are responsible for knowing what occurred in that meeting (typically by discussing it with other team members). An excused absence does not relieve you of that responsibility.
- **Team research/experiment times:** to be determined for each research team.

- **Teams:** Brain-on-Chip
EStim Chip – stem cell differentiation
Nerve regeneration scaffold

Those new to the lab will be assigned to a research team.

Course Grading

The premise of VIP is teams working on projects. Much like a real-world bioengineering team, individual members work on different aspects of the project. Team members range from first-year undergraduates through graduate students, from first-time participants to students who have been involved for four or more semesters. Some students take the course for credits and others, depending on circumstances, as volunteers.

Your grade is based on three areas, along with three requirements. Although each student may work on different areas and contribute differently, you must show achievements in all three areas below. “If it is not recorded in your logbook/lab notebook or documented on your team’s website/wiki/etc., or checked into your teams’ repository, then you did not do it.”

1. Documentation and records (33%)
 - a. VIP Lab Notebook (Lab Archives)
Neatness and legibility are essential.
 - b. VIP documentation
2. Personal accomplishments and contributions to your team’s goals (33%)
 - a. Quizzes, learning modules, essays, reports required by your adviser(s)
 - b. Engagement in project
 - c. Pursuit of knowledge necessary for project
 - d. Contributions to the technical progress of the team
 - e. For more experienced members of the team, contributions to the management of the project may be expected
3. Teamwork and interaction (33%)
 - a. Peer Evaluations
 - b. On-time attendance in meetings/experiments
 - c. Actively contributes to overall team goals
 - d. Coordinates activities with other team members
 - e. Assists other team members
 - f. Team presentation(s)

As part of the assessment of the above, each student is required to:

- a. Maintain a VIP Lab notebook. Scans of well-maintained VIP notebooks are available at: <http://www.vip.gatech.edu/vip-notebooks>. Other details can be found on Canvas and examples provided at our meetings.

b. Complete the **mid-term** peer evaluation and complete the **final** peer evaluation. Failure to complete the peer evaluation will result in a full letter grade deduction. Late submissions are not accepted. The link will be open for a week on Canvas.

Course Details

Documentation in research is critically important, over this course you will document your work as follows

- VIP Lab Notebooks
- Peer and self-evaluations
- Goal setting/action items
- Research paper and/or poster

Semester Overview (Subject to change)

Week #	Events
Week 1 Week of Jan 17	<p>Introductions. Discussion of semester goals. Discuss lab research projects. VIP Lab Notebook. Team member selections finalized. Performing literature searches (PubMed and Endnote). Lab safety orientation for those new to ATRB.</p> <p>Assignment: Complete EH&S online safety training modules (the certificates of completion should already have been submitted) Assignment: Complete and submit "VIP-Lab_Research_Participation_agreement." Assignment: Complete ATRB Safety Procedures Assignment</p>
2 Week of Jan 24	<p>Discussion of Immunocytochemistry (solution preparation, ICC Day 1 and Day 2) Bring VIP Lab notebook to Lab (and all future sessions). Assignment: Read and view videos for "IHC-ICC Reading Assignment" Assignment: The Need for Rigorous Science Begin identifying relevant articles for your research project. Read any assigned paper/s</p>
3 Jan 31/ Feb 1	<p>Immunocytochemistry (solution preparation, ICC Day 1 and Day 2) Assignment: Read and view videos for "Fluorescence microscopy" Read assigned paper/s Assignment: Self-grade VIP notebook with rubric</p>
4 Feb 7	<p>Fluorescence microscopy and image acquisition and analysis Open lab work week and team meeting Assignment: Self-grade VIP notebook with rubric</p>
5 Feb 14	<p>Immunocytochemistry (solution preparation, ICC Day 1 and Day 2) Preparing figure plates Due: Self-graded rubric Open lab work and team meeting</p>
6 Feb 21	<p>Fluorescence microscopy and image acquisition and analysis Open lab work and team meeting Assignment: Submit figure plates</p>
7 Feb 28/ Mar 1 Midterm	<p>Open lab work and team meeting Turn in VIP notebooks by Monday, Feb 28 at 5:00 PM for Peer Evaluation and mid-term grading. Web-based peer-evaluations released for students to complete.</p>
8 Mar 7	<p>Midterm presentations (March 10 & 11) Open lab work and team meeting Discussion of poster preparation and writing a research paper</p>
Spring break	
9 Mar 21	<p>Open lab work and team meeting Discussion of poster preparation and writing a research paper</p>
10 Mar 28	<p>Open lab work and team meeting</p>
11 Apr 4	<p>Open lab work and team meeting</p>
12 Apr 11	<p>Open lab work and team meeting Submit final completed draft of poster (by 5 PM on Apr 8)</p>
13 Apr 18	<p>Open lab work and team meeting Submit final completed poster Honors Poster Symposium and/or Undergraduate research symposium (dates TBD)</p>
14	<p>Open lab work and team meeting</p>

Apr 25	April 28-29: Final Presentations (Team pptx presentations)
15 May 2 "Prep Week"	Assignment: VIP notebooks collected for final grading. Assignment: Conduct VIP Lab TEAM Peer Evaluations. Web-based peer-evaluations released for students to complete.
16 May 9 Finals Week	Finals week – good luck!

ADDITIONAL INFORMATION

COVID-19 Policies:

- **Face masks encouraged:** Because of the continuing COVID-19 pandemic, all students are encouraged to wear face masks, consistent with current recommendations from the Centers for Disease Control and Prevention. Further information on the proper use of face masks is available at: <https://www.cdc.gov/coronavirus/2019-ncov/your-health/effective-masks.html>.
- **Vaccinations encouraged:** All students are encouraged to receive a vaccination against COVID-19. Multiple locations are available on campus for free, convenient vaccination. Further information is available at: <https://web.iastate.edu/safety/updates/covid19/vaccinations>.
- Vaccinations may also be obtained from health care providers and pharmacies.
- **Physical distancing encouraged for unvaccinated individuals:** Classrooms and other campus spaces are operating at normal capacities, and physical distancing by faculty, staff, students, and visitors to campus is not required. However, unvaccinated individuals are encouraged to continue to physically distance themselves from others when possible.
- **Do not attend class** if you are sick or experiencing symptoms of COVID-19.
- **Do not attend class** if you have been told to self-isolate or quarantine by a health official.

Free Expression

Iowa State University supports and upholds the First Amendment protection of [freedom of speech](#) and the principle of [academic freedom](#) in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

Academic Dishonesty

The class will follow Iowa State University's policy on academic dishonesty. Anyone suspected of academic dishonesty will be reported to the [Dean of Students Office](#).

Accessibility Statement

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Students requesting accommodations for a documented disability are required to work directly with staff in Student

Accessibility Services (SAS) to establish eligibility and learn about related processes before accommodations will be identified. After eligibility is established, SAS staff will create and issue a Notification Letter for each course listing approved reasonable accommodations. This document will be made available to the student and instructor either electronically or in hard-copy every semester. Students and instructors are encouraged to review contents of the Notification Letters as early in the semester as possible to identify a specific, timely plan to deliver/receive the indicated accommodations. Reasonable accommodations are not retroactive in nature and are not intended to be an unfair advantage. Additional information or assistance is available online at www.sas.dso.iastate.edu, by contacting SAS staff by email at accessibility@iastate.edu, or by calling 515-294-7220. Student Accessibility Services is a unit in the Dean of Students Office located at 1076 Student Services Building.

Feeling sad? Please consider contacting **Student Counseling Services**, 2505 Union Drive, 515-294-5056. They have many resources available for assisting students.

Discrimination and Harassment

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515-294-7612, Hotline 515-294-1222, email eooffice@iastate.edu

Prep Week

This class follows the Iowa State University Prep Week policy as noted in section 10.6.4 of the [Faculty Handbook](#).

Religious Accommodation

Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request the reasonable accommodation for religious practices. In all cases, you must put your request in writing. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time. You or your instructor may also seek assistance from the [Dean of Students Office](#) at 515-294-1020 or the [Office of Equal Opportunity](#) at 515-294-7612.

Contact Information for Academic Issues

If you are experiencing, or have experienced, a problem with any of the above statements, email academicissues@iastate.edu

Embracing Diversity, Inclusion and Principles of Community:

In our classes, we will practice the ISU Principles of Community. Our goals are to create a classroom environment that fosters learning, embraces diversity, demonstrates respect for others, and is free of discrimination.

ISU Principles of Community (<http://www.diversity.iastate.edu/principles-of-community>)

Respect: We seek to foster an open-minded understanding among individuals, organizations and groups. We support this understanding through outreach, increasing opportunities for collaboration, formal education programs and strategies for resolving disagreement.

Purpose: We are encouraged to be engaged in the university community. Thus, we strive to build a genuine community that promotes the advancement of knowledge, cooperation and leadership.

Cooperation: We recognize that the mission of the university is enhanced when we work together to achieve the goals of the university. Therefore, we value each member of the Iowa State University community for his or her insights and efforts, collective and individual, to enhance the quality of campus life.

Richness of Diversity: We recognize and cherish the richness of diversity in our university experience. Furthermore, we strive to increase the diversity of ideas, cultures and experiences throughout the university community.

Freedom from discrimination: We recognize that we must strive to overcome historical and divisive biases in our society. Therefore, we commit ourselves to create and maintain a community in which all students, staff, faculty and administrators can work together in an atmosphere free from discrimination, and to respond appropriately to all acts of discrimination.

Honest and respectful expression of ideas: We affirm the right to and the importance of a free exchange of ideas at Iowa State University within the bounds of courtesy, sensitivity and respect. We work together to promote awareness of various ideas through education and constructive strategies to consider and engage in honest disagreements.

