

Synthetic Biology/iGEM Experimental Design

MW 8:30 – 11:00 am, Classroom South 443 (GSU Students)

M-F 8:30 – 11:00 am, Classroom South 443 (International Students)

CRN 54613

Instructor: Dr. Jonathan B. Sylvester

Office: 284 PSC

Office Hours: I am available throughout the week and will respond to you through Groupme messages and via email. If needed, we can also meet via video chat by appointment.

E-mail: jsylvester@gsu.edu Please use your “student.gsu” e-mail account when writing me. E-mail from other accounts tends to be treated as junk mail and I may never see it.

Groupme: All students are expected to use the Groupme app and join our group to communicate with me and with the other group members.

Purpose: This course is designed to prepare undergraduates for participation in the International Genetically Engineered Machine (iGEM) competition www.igem.org. Not only will this course help you prepare for participation in the iGEM competition, but it will also help you develop skills that will be applicable for any career that requires group work, laboratory research, record keeping, and individual or group presentations.

In this course:

Students will learn how to work with others in a group, sharing information and coordinating workflows to develop a common project

Students will learn how to frame a research idea to develop a project

Students will find and evaluate information from a variety of sources, including primary research papers

Students will incorporate information from primary research into their own project ideas

Students will present summaries of their background research to peers

Students will develop and present (in written, oral, and multimedia form) a detailed plan for their research project

Students will keep and share records of their work so that progress can be clearly monitored

Students will apply techniques in molecular biology necessary to complete a research project

Students will learn and practice appropriate safety techniques for lab research in synthetic biology

Student Learning Outcomes:

To determine your success in meeting the course goals, you will be assessed for your progress toward the following outcomes:

Active group participation will require regular meetings in Classroom South 443 to discuss group plans and progress. Each student will be expected to attend these meetings and give a summary of their progress.

Students will submit posts to the class Discussion Boards in iCollege and respond to the posts of their peers.

Students will find research papers and websites related to the project, create summaries of the information they find, and present their summaries in both discussion board posts and in class presentations.

Students will create a record of their activities in a physical notebook and in an online shared document in Google Drive.

Students will complete Right To Know safety training and core facilities training (if it becomes available).

Students will demonstrate an understanding of the purposes and limitations of several core techniques in molecular biology, including design of protein expression plasmids, DNA transformation of cells, PCR, DNA restriction digest and ligation, DNA plasmid prep isolation

Each student will be expected to give a final presentation summarizing the project and their contributions.

iCollege: iCollege is used for all announcements and class notes. Familiarize yourself with the system and make sure that this class appears on your homepage. E-mail me with your iCollege ID if you do not see this course listed. Some graded assignments will be completed through iCollege.

Attendance: We will meet twice a week, on Mondays and Wednesdays at 8:30 AM. During our meetings, we will go over laboratory techniques, experimental design, read journal articles, and split into groups. Each group will construct their own project idea, consisting of a question, hypothesis, and prediction. These projects will be considered for the main project the Synthetic Biology club (iGEM) works on for their competition in the fall.

Synthetic Biology Club Meetings: This course is designed to introduce students to the Synthetic Biology Club (iGEM). iGEM exists to provide undergraduate students the opportunity to collaborate on ideas, research, and laboratory techniques related to the field of synthetic biology. Involved students will have the opportunity to participate in journal readings and discussions, and to make connections with other like-minded scientists. You are strongly encouraged to join and attend all scheduled meetings.

Presentations: Journal club presentations will consist of a 10-15 minute oral presentation on a paper related to synthetic biology. These oral presentations will take the form of PowerPoint or similar presentation. Topics will be chosen by the students and must be confirmed by the instructor a week before presenting. As part of the presentation each student will explain a scientific paper related to the topic. Prior to the presentation, each student will submit an outline and brief discussion of their paper for a Journal Club grade. A rubric for these journal club presentations will be posted on iCollege.

The final presentation will consist of researching an iGEM project (from a non-GSU team) from a previous year's conference and presenting the project design, results, and the essentials of that team's Wiki page. You will need to compare this project to your own idea and use it to improve your group's project. A rubric for this final presentation will be posted on iCollege.

Safety: All students will observe appropriate safety procedures while working in the iGEM lab as outlined in the Lab Safety document available on the lab D2L page. All students will be required to take online Right to Know safety training (also available via a link in the lab's D2L page). You will also require core facilities training in order to use the available core facilities equipment if those resources become available.

International students: This course has a dual format; GSU students will take the course over the full seven week summer semester but international students will take the course over an accelerated 4 week July semester. International students will catch up and work with the GSU students in the latter half of their summer semester.

Grades: Because this is a lab course, the focus is on your activities in and associated with your work in the lab. To assess your active participation, each student will be given a series of lab tasks to complete, using the techniques necessary for completion of an iGEM competition project. Your final grade is determined in part by the completion of all tasks on the list. The list will be provided in lab, when training in laboratory techniques.

Grade Breakdown

| Assignments | Grade (%) |
|--------------------------------------------------------------------|-------------|
| Attendance/Participation (Lab meetings and Discussion board posts) | 30% |
| Lab task checklist | 20% |
| Journal Club Presentation | 20% |
| Final Presentation | 30% |
| Total | 100% |

Final grades will be assigned according to the scale below:

| | |
|----|---------------|
| A+ | 96.5-100% |
| A | 90.5-96.49% |
| A- | 89.0-90.49% |
| B+ | 86.5-88.99% |
| B | 80.5-86.49% |
| B- | 79.0 – 80.49% |
| C+ | 76.5 – 78.99% |
| C | 70.5-76.49% |
| C- | 69.0 – 70.49% |
| D | 60-68.99% |
| F | below 60% |

Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

Syllabus: The course syllabus provides a general plan for the course; deviations may be necessary. This is a laboratory research course; deviations WILL happen as we proceed with our experiments. The course schedule is designed to be flexible, especially in the back half of the semester. Please keep that in mind.

| Week | Description: |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Complete Online Safety Training, Review 2022 iGEM project Begin Module 1: Primary Literature Search and Evaluation |
| 2 | Continue Module 1: Primary Literature Search and Evaluation Planning a Synbio Project First group led JC presentation |
| 3 | Module 2: Genetic Engineering and Molecular Techniques Second group led JC presentation |
| 4 | Module 3: Intro to Expression systems and DNA Part Design Third group led JC presentation International students arrive |
| 5 | Module 4: Math Workshop and Data Analysis Fourth group led JC presentation |
| 6 | Module 5: Experimental Design and Proposal Preparing for final presentations |
| 7 | Module 6: Presenting Your Work Final Presentations |

Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation.