Biology Second Year Laboratory

Monday 1:30 pm – 4:30 pm

Instructors: **Joshua Baecker**, *Genetics Instructor*; Lab: ISC 306
Office ISC 351
Virtual Office Hours: T 1-2pm, and W 11-12:30
E-mail for virtual appointments at any other times.
E-mail: baecker@geneseo.edu
Phone: 245-6385

Regina Clinton, *Ecology Instructor*; Lab: ISC 107
Office ISC 139A
Virtual Office hours:
M & T 8:30-9:30 am
In person (ISC 107) and virtual office hours:
R 1:30-2:30 pm
Other times by appointment
Click on zoom link below for all office hours
https://geneseo.zoom.us/j/95214207943?pwd=clprZy81b1J0RjlUdHlFVmJJV3BHUT09
E-mail : clinton@geneseo.edu
Phone: 245-6051

Tentative Schedule

Date	Day	Topic
August 30	M	*Common Activity:* Introduce the lab, Pre-lab for each section
November 1	M	Start of the next lab module.

Overall Goals for this Course.

1. To give you the intellectual, physical and technical skills that will enable you to succeed in more advanced Biology labs, independent research with Biology faculty, summer research experiences and in technical occupations.

2. To introduce you to selected technical and intellectual approaches used by biologists in Ecology and Genetics.

General structure of Course:

This course is designed to introduce second year students to the two core areas of the Biology curriculum. It will be structured in two 6-week modules, with one module each representing

ecology and genetics/molecular biology. Each module will be taught in a different room by faculty member with interests in the field being covered. After six weeks in one laboratory, students will rotate to the next module of the course.

The modules are not meant to cover all of their respective fields, but rather to introduce you to one or two in-depth examples of modern approaches to answering contemporary questions in each. This lab does not replace the 1-credit laboratories that are offered in Ecology and Genetics, all of which will be available for students who wish to obtain more laboratory exposure to those areas. In contrast to our first year laboratory (which emphasizes process skills), the second year laboratory will introduce student to techniques used in the respective fields. We hope this lab will give you increased intellectual and technical skills that allow you to excel in upper level lab laboratories, in summer research experiences and in the workplace.

Grading:

Ecology Section	50%
Genetics Section	50%

Laboratory Modules

Genetics and Molecular Genetics Module: Bacterial Transformation
Ecology Module: Population Size, Spatial Dispersion Patterns, and Biodiversity

Accommodations

SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility (Erwin Hall 22, (585) 245-5112, **access@geneseo.edu**) will coordinate reasonable accommodations for persons with physical, emotional, or cognitive disabilities to ensure equal access to academic programs, activities, and services at Geneseo. Students with letters of accommodation should submit a letter to each faculty member and discuss their needs at the beginning of each semester. Additional information on the Office of Accessibility is available at https://www.geneseo.edu/accessibility-office.

Attendance

In the context of the COVID-19 pandemic, it is vital that we all do what we can to protect the health and safety of each other. If you are feeling unwell on a day that class meets in-person, do not attend. Remember that it is better to stay home if you are not feeling well than to attend class and risk spreading illness to others. Throughout the semester, please be proactive in communicating about absences and contact the Dean of Students if you expect to be out for an extended period of time. Rest assured that there will be no penalty for missing class and that I've designed our course so that there's a path for you to make up any learning that takes place in a class meeting you miss.

The college has developed an online COVID-19 screening report for students. Be sure to familiarize yourself with this process and complete the brief screening report before leaving for class. If you are experiencing common symptoms of COVID-19, stay home and contact Health

and Counseling Services as soon as possible. I strongly encourage you to set a daily reminder to fill out the screening report.

Face-Masks

Face masks are required in all instructional spaces (including classrooms, lecture halls, and laboratories) and all common areas including residence halls and academic buildings. If you forget your mask, please be sure to pick up a disposable one before entering the classroom. Masks must be worn for the duration of class. If you do not have a mask or are unwilling to wear one, you will be asked to leave the classroom. We cannot safely hold class if students are not wearing face masks.

If you would feel more comfortable or if my teaching could be more accessible if we wear a clear face mask, please let me know as soon as possible. Students who have concerns about wearing a face mask due to a documented disability need to contact the Office of Accessibility Services (access@geneseo.edu) to request reasonable accommodations

Ecology Module Room 107

Instructor: Regina Clinton

Population Size, Spatial Dispersion Patterns, and Biodiversity.

Ecology is the study of the interactions of organisms with their physical and biotic environments. In this lab we will learn how to estimate how many organisms there are in a population, quantifying how organisms are spread out in their environment and, ultimately, quantify the diversity of organisms in a community. Our analyses will use samples to estimate population parameters and, therefore, will require statistics. To accomplish these analyses you will become familiar with descriptive and inferential statistics.

Come prepared to go in the field in all kinds of weather (rain or shine) with the appropriate gear (dressed in layers, rain coat, hat, gloves and boots).

Week	Topic
1	Field sampling techniques and study site selection
2	Data collection on tree species, soil and invertebrate sampling
3	Data collection on tree species, soil and invertebrate sampling
4	Biodiversity and Soil Analysis
5	Invertebrate and Data Analysis
6	Data Analysis and Presentations

Expected Learning Outcomes

After successfully completing this six-week module you should be able to:

- estimate the size and spatial dispersion pattern of a population;
- quantify the biodiversity of a community by fitting a species-area curve to data and calculating the Shannon diversity index;
- use *descriptive* and *inferential* statistical tests to interpret data collected in the field
- demonstrate use of some the basic laboratory tools and field research skills pertinent to the field of ecology (e.g. DBH tapes, dichotomous keys, sampling methods (Berlese funnels and sweep nets)
- develop and give an oral presentation of your results to a group in a standard scientific form (Introduction, Methods, Results, and Discussion);
- describe what you did and found to someone who is not a scientist.

Tentative Ecology Module Schedule for Section 2

Week #	Date	Notes†	Activity	Individual Assignments Due	Group Assignments Due	Ecology Points
	Aug 30	Comp	Introduce the lab	Pre-lab homework - Watch sampling video and Read lab handout, take *online* Quiz #1 (10 pts) due Sept 6		10
	Sept 6		No Lab	Pre-lab homework - Tree species assignment (10 pts) due Mon, Sept 13		10
1	Sept 13	FW	Field sampling techniques and study site selection	In-lab Quiz (10 pts) on Tree Id and sampling on Sept 20		10
2	Sept 20	FW	Data collection on tree species, soil and invertebrate sampling	Shannon Weiner index (H') and Species evenness (J') homework (5 pts) due Mon, Sept 27	Group Lab report Plan due Mon, Sept 27 Enter field data into shared Google doc	5
3	Sept 27	FW	Data collection on tree species, soil and invertebrate sampling- In lab tree Id & sampling quiz	Density, Relative Density, Frequency and Relative Frequency homework (5 pts) due Mon, Oct 4	Enter field data into shared Google doc	5
4	Oct 4	Comp	Soil Analysis		Enter Soils analysis data into shared Google doc and answer questions in lab handout	
	Oct 11		No Lab			
5	Oct 18	Comp	Biodiversity and Data Analysis	In lab Quiz (10 pts) on **Mon, Oct 25**	Enter Soils analysis data into shared Google doc, Group Presentation due Mon, Oct 25 (10 pts)	
6	Oct 25	Comp	Finish up Data Analysis, In-lab Quiz (10 pts) and Presentations (10 pts)		Group Lab report due **Mon, Nov 1** (25 pts)	20
1	Nov 1	Comp	**Start of Genetics Module: ISC 306**		Group Lab report due	25
					Participation & Peer evals	15
					Total Points Earned in Ecology module	100

† FW = field work: Wear appropriate clothing & footwear for working outside – check weather; Comp = bring your laptop computer to lab.

Tentative Ecology Module Schedule for Section 1

Week #	Date	Notes†	Activity	Individual Assignments Due	Group Assignments Due	Ecology Points
	Aug 30	Comp	Introduce the lab	Pre-lab homework - Watch sampling video and Read lab handout, take *online* Quiz #1 (10 pts) due Nov 1		10
1	Nov 1	FW	Field sampling techniques and study site selection	Pre-lab homework - Tree species assignment (10 pts) due Mon, Nov 8	Group Lab report Plan due Mon, Sept 27 Enter field data into shared Google doc	10
2	Nov 8	FW	Data collection on tree species, soil and invertebrate sampling	In-lab Quiz (10 pts) on Tree Id and sampling on Nov 15	Enter field data into shared Google doc	10
3	Nov 15	FW	Data collection on tree species, soil and invertebrate sampling- In lab tree Id & sampling quiz	Shannon Weiner index (H') and Species evenness (J') homework (5 pts) due Mon, Nov 22	Enter field data into shared Google doc	5
4	Nov 22	Com	Soil Analysis	Density, Relative Density, Frequency and Relative Frequency homework (5 pts) due Mon, Nov 29	Enter Soils analysis data into shared Google doc and answer questions in lab handout	5
5	Nov 29	Com	Biodiversity and Data Analysis	In lab Quiz (10 pts) on **Mon, Dec 6**	Group Presentation due Mon, Dec 6 (10 pts)	
6	Dec 6	Comp	Finish up Data Analysis, In-lab Quiz (10 pts) and Presentations (10 pts)		Group Lab report due **Mon, Dec 13** (25 pts)	20
	Dec 13				Group Lab report due	25

Participation & Peer evals	15
Total Points Earned in Ecology module	100

† FW = field work: Wear appropriate clothing & footwear for working outside – check weather; Comp = bring your laptop computer to lab.

Genetics and Molecular Genetics Module. Room 306

Instructor: Mr. Joshua Baecker

Bacterial Transformation

Introducing DNA molecules into organisms is at the core of both molecular genetics and genetic engineering, and is one of the most common "techniques" used by biologists. There are numerous reasons why an investigator will introduce a DNA molecule into a microorganism such as generating multiple copies of the DNA molecule for applications such as cloning or sequencing and engineering a microorganism to produce a specific protein for biochemical studies. In this section, you will transform *E. coli* JM109 strain with the plasmid pUC19. JM109 is sensitive to ampicillin (and most other antibiotics) but the plasmid contains the gene for ampicillin resistance. After obtaining bacterial strains that we tentatively believe to have taken up the plasmid, we will do a plasmid DNA isolation. You will learn to measure the amount and purity of the DNA that you have isolated. However, how can we convince ourselves that the transformants contain the predicted plasmid and is not simply a random mutant to ampicillin resistance? One way is to determine if the plasmid is truly pUC19 via a restriction mapping experiment. Another way is to analyze the isolated plasmid for the presence of the ampicillin resistance gene using PCR. Once we know the plasmid is pUC19, we will restrict the plasmid, then ligate plasmids back together to double their size. We'll do this to show how a sequential series of steps: restriction, isolation, addition of new strands of DNA and ligation of new DNA to the existing plasmid allows us to add any gene we want to any plasmid we like, giving us fine control over exactly how we carry out genetic experiments.

Week	Topic
1	Bacterial Transformation
2	Plasmid Isolation and DNA Measurement
3	Restricting Mapping I- Restriction Digest and PCR
4	Restriction Mapping II- Agarose Gel Electrophoresis
5	Plasmid Ligation
6	Agarose Gel Electrophoresis II

Expected Learning Outcomes

After successfully completing this six-week module, you should be able to:

- Explain the parameters relevant for the design of a transformation experiment including strain genotype and selection/screening strategies;
- Describe how DNA yield and DNA purity are determined following plasmid DNA isolation;
- Differentiate genetic transformation from gene mutation;
- Develop experience in microbial culturing techniques, plasmid isolation and transformation;
- Understand the principles behind the restriction digest, polymerase chain reaction (PCR), and agarose gel electrophoresis and DNA Ligation.