Biology Second Year Laboratory

Laboratory Sections: CRN 55840-1 and 55841-2
Wednesday 1:00 pm – 3:50 pm

Instructors:

Dr. Ming-Mei Chang, *Genetics and Molecular Genetics Instructor*; Lab: ISC 304
Office ISC 352, E-mail: chang@geneseo.edu, Phone: 245-5416

Virtual Office Hours:

M: 1- 2 :30 pm
Join Zoom Meeting with the following links:
https://geneseo.zoom.us/j/99968735373?pwd=ZDhEbWl0S0VGYVRmM1pJbW84U1dXUT09
Meeting ID: 999 6873 5373
Passcode: 992807

R: 10- 11:30 am
Join Zoom Meeting with the following link:
https://geneseo.zoom.us/j/93898474356?pwd=b1JkWjZIYXJ6WVkzNDNGRUlhSElWUT09
Meeting ID: 938 9847 4356
Passcode: 361880
E-mail for virtual appointments at other times.

Regina Clinton, *Ecology Instructor*; Lab: ISC 107
Office ISC 139A, E-mail : clinton@geneseo.edu, Phone: 245-6051

Virtual Office Hours:

M, W: 10:00-11:00 am
Join Zoom Meeting with the following links:
https://geneseo.zoom.us/j/94063870754?pwd=TUlQWDVqNnVtV0hhVE5MZHo4TzF5Zz09
Meeting ID: 940 6387 0754
Passcode: 219809

T 12:30-1:30pm
Join Zoom Meeting
https://geneseo.zoom.us/j/97400925369?pwd=SFRZUE9KNmdpVzhuYzk2UnR6L1ZaZz09
Meeting ID: 974 0092 5369
Passcode: 004235
E-mail for virtual appointments at other times.

Tentative Schedule

Week	Date	Day	Topic
1	Feb 3	W	*Common Activity: Introduction, Pre-lab for each section*
9	March 31	W	Start of the next lab module.
15	May 11	T	*Final: lab practical*

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:

Genetics Section	50%
Ecology 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. Please contact the Office of Accessibility Services for questions related to access and accommodations.

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 lab 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. It is however, your responsibility to contact your instructors and lab group members to see what you have missed.

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. We 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 our 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

Please familiarize yourself with any special seating arrangements in the classroom and be sure to practice 6-foot physical distancing at all times. This includes entering and exiting the classroom.

Genetics and Molecular Genetics Module. Room 304
Instructor: Dr. Ming-Mei Chang

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* XL1-Blue strain with the plasmid pBluescript II KS+, a process called bacterial transformation. XL1-Blue 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 pBluescript II KS+, we will perform a plasmid DNA isolation. You will also learn to measure the amount and purity of the DNA that you have isolated. However, how can we convince ourselves that the **transformed bacteria** contain the predicted plasmid and is not simply a random mutant to ampicillin resistance and/or turning blue? One way to determine if the isolated plasmid is truly pBluescript II KS+ is to digest it with restriction enzymes for restriction mapping. Another way is to confirm the presence of the ampicillin resistance gene in the isolated plasmid by polymerase chain reaction (PCR). The resulting PCR-amplified DNA and restriction digested fragments are then analyzed by agarose gel electrophoresis. In addition to practicing various techniques mentioned above, you will also learn the principles behind.

Schedule

Date	**Topic**
2/3[1], **2/3[2]**	Introduction
2/10, **3/31**	Bacterial Transformation
2/17, **4/7**	Plasmid Isolation and DNA Measurement
2/24, **4/14**	Restricting Mapping I- Restriction Digest
3/3, **4/21**	Polymerase Chain Reaction (PCR)
3/10, **4/28**	PCR product Analysis and Restriction Mapping II- Agarose Gel Electrophoresis
3/17, **5/5**	Data Analysis and Discussion on the Lab write-up
5/11, **5/11**	Lab Practical

[1]section 1; **[2]section 2 (bold)**

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;
- Perform microbial culturing techniques, bacterial transformation, plasmid DNA isolation, restriction digest, polymerase chain reaction (PCR), and agarose gel electrophoresis;
- Understand the principle behind each technique used;
- Describe how DNA yield and DNA purity are determined;
- Differentiate genetic transformation from gene mutation.

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 (snow, sleet, rain or shine) with the appropriate gear (dressed in layers, winter coat, long underwear, ski pants, scarf, 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 (soil sampling, quadrats, transects)
- develop and give an oral presentation of your results to a group in a standard scientific form (Introduction, Methods, Results, and Discussion)
- describe/defend your work to your peers.

Ecology Module Schedule

Week #	Date	Notes†	Activity	Individual Assignments Due	Group Assignments Due	Ecology Points
	Feb 3	Comp	Introduce the lab	Pre-lab homework - Watch sampling video and Read lab handout, take *online* Quiz #1 (10 pts) due Wed, Feb 10		10
1	Feb10	FW	Field sampling techniques and study site selection	Pre-lab homework - Tree species assignment (10 pts) due Wed, Feb 17		10
2	Feb 17	FW	Data collection on tree species, soil and invertebrate sampling	In-lab Quiz (10 pts) on Tree Id and sampling on Wed, Feb 24	Group Lab report Plan due Wed, Feb 24; Enter field data into shared Google doc	10
3	Feb 24	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 Wed, March 3	Enter field data into shared Google doc	5
4	March 3	Comp	Data collection on tree species, soil and invertebrate sampling	Density, Relative Density, Frequency and Relative Frequency homework (5 pts) due Wed, March 10	Enter field data into shared Google doc	5
5	March 10	Comp	Biodiversity and Soil Analysis		Enter Soils analysis data into shared Google doc, Group Presentation due March 17 (10 pts)	10
6	March 17	Comp	Data Analysis Finish up Data Analysis, In-lab Quiz and Presentations	In lab Quiz (10 pts) on Wed, March 17	Group Lab report due **Tues, March 23** at 11:00 pm (15 pts)	25
	March 24	Rejuvenation Day		No Lab		
	May 11		Lab Practical			10
					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.