

The Department of Bacteriology will offer a summer course that is open to any student who has an Intermediate or Advanced Microbiology Laboratory or equivalent Biology Laboratory prerequisite. The course will be Micro525-Advanced Biological Laboratory Practices-A Research Experience. The overall goals of the course are as follows:

- To ensure students get a strong foundation in the theory of those techniques typically used in microbiological and related biological disciplines research
- To ensure students get a strong foundation in the practice of those techniques typically used in microbiological and related biological disciplines research
- To ensure students hone skills of data interpretation and analysis
- Have practice writing a research paper and reading primary literature
- Have practice presenting their work to their peers
- To ensure students get experience in independent research with significant self-direction that includes keeping accurate lab notebooks.
- To ensure students are exposed to research ethics

Syllabus

Week-Class	Experiment/Activity	Pre-assessment	Lectures/Discussions	Proficiency Tests	Post Lab Assessments
1-1	Basic Lab Skills		Introductions Lab Safety Laboratory Notebooks		
1-2			Research Ethics	Aseptic Technique, Pipetting, media and reagent making, and Dilution Plating Techniques	Quantitative Biology Problem Set
1-3	Protein Purification and enzyme assays	Prelab Quiz	Enzymes and Protein Purification and spectrophotometry		
2-1	SDS-PAGE Gels and enzyme kinetics		Research Ethics	Pipetting and Enzyme Assays	Enzyme Kinetics Graph
2-2	Gene cloning using PCR amplified DNA	Prelab Quiz	Cloning and Molecular Biological Techniques		
2-3			Research Ethics	Spectro-photometry	
3-1					
3-2	Mutagenesis Exp.	Prelab Quiz	Genetic Techniques		
3-3			Research Ethics		
4-1	Transposon Mutagenesis of <i>Serratia marcescens</i>		Writing a Research Proposal		Mutagenesis Analysis

4-2	Tissue	Prelab Quiz			
4-3	Culture and antibodies Macrophage Activation experiment and detection of cytokines with ELISA.		Immunology and Immunodiagnostics		Interpreting Practical Immunology Date Worksheet
5-1	Independent Research Project on the Microbiome of an environment Summer 2017 will be studying the 13-line Ground Squirrel Microbiome as it relates to hibernation biology		Next Generation Sequencing and Illumina Technology		
5-2					
5-3					
6-1					Proposal Draft
6-2					
6-3			Beyond the sequences		
7-1			Proteomics		
7-2					
7-3			Metabolomics		Final Proposal
8-1					
8-2		Systems Biology			
8-3					Final Poster on Experimental Results

Assignments and Grading

Assignment	Points
Prelab quizzes and Proficiency Tests	100
Quantitative Biology Worksheet	20
Enzyme Kinetics Graph	20
Cloning Plasmid Map	20
Mutagenesis Analysis	20
Macrophage Experiment-ELISA results	20
Proposal Draft	20
Proposal Final	100
Poster Draft	10
Poster Final	50
Total Points	380 points

Grading Scale

Percentage of Possible Points	Letter Grade	Percentage of Possible Points	Letter Grade
91-100	A	72-78.9	C
89-90.9	AB	60-71.9	D
82-88.9	B	<59.9	F
79-81.9	BC		

Explanations:

Text/Lab Manual

Instructors in the course will create a lab manual, similar to manuals used in other laboratory courses in the Department of Bacteriology. Students will be required to buy the manual but will be charged a nominal fee to cover the cost of photocopying, typically around \$15.

Didactic Activities

Prior to the beginning of each experiment, students will be introduced to the background material on the techniques and the systems they will use to address a related hypothesis.

At the conclusion of each experiment, we will analyze the data and present the results in the most appropriate format, a graph, a written discussion, etc.

Time will also be set aside to have discussion on Research ethics and writing research proposals and presenting results.

Laboratory Time (described above)

Laboratory Time

Week 1: Basic lab skills, refreshers and important lab skills

Weeks 2-4: Specific experiments will be performed using basic lab skills and techniques common to many biological sciences research.

Weeks 5-8: Students will spend time, in small groups, investigating the microbiome of an environment using Illumina sequencing technology.

Assignments

In addition to proficiency tests to ensure students have competencies in basic lab skills, there will be a variety of small and larger writing assignments. The small assignments will require students to analyze results from experiments. We will also work on writing a research proposal based on the format of National Science Foundation's Graduate Student Fellowships. Students will submit rough drafts so instructors can provide feedback on the intellectual merit of their presentation of the project as well as writing skills. The summer will culminate with a special poster session.