THE UNIVERSITY OF CHICAGO | Summer Session

Sample Syllabi – Subject to Change
Research in the Biological Sciences
A Laboratory Course in Molecular and Cellular Biology

Course Instructors:
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Course description:
RIBS is a laboratory immersion course. Expect to spend all day, every day in lab for four weeks. During RIBS, you will be exposed to a broad range of molecular, genetic and cellular biological techniques currently used in research laboratories. The main goals of RIBS are to teach you some basic lab skills and to give you the confidence to work in a research laboratory. For the first two weeks, you will be trained in different techniques. We emphasize hands-on training and learning how these techniques are used to answer questions. During the second two weeks, the course work shifts to designing and performing a research project.
Students will use skills acquired during the first two weeks but the emphasis is on the research process. Some projects will be extensions of experiments performed during the first two weeks; other projects may be completely new to the students. Many projects use reagents and materials on hand but for a few projects, students will order or design reagents needed for that particular project. On a space- available basis, we will invite back students the following summer to carry out a research project in one of the faculty labs on campus.

Course objectives:
- Develop skills and confidence important for succeeding in a laboratory.
- Learn some basic lab operations and techniques.
- Learn how to design and carry out a research project.
- Learn how to present results clearly and concisely
- Develop skills important for productive collaborations - working in groups

Schedule: The class will run from 9:30 AM to 5:30 PM with an hour break for lunch. Most of the time will be spent in lab. Background lectures will supplement the labs.

Lab notebooks: Students will receive a lab manual with detailed instructions for each of the labs. Students are required to keep a lab notebook; spiral bound notebooks will be available for purchase.

Evaluation:

Lab journals (notebooks)	30%
Misc. Presentations	10%
Final Project paper	15%
Final Project poster presentation	15%
Class Participation	30%

Science does not stand still and neither does RIBS. Experiments listed in the syllabus below may change as we add new techniques and try out new projects.

WEEK 1

- **Lab Safety** - training run by the university's Office of Research Safety.
- **Lab Basics** – how to use micropipetters, how to prepare solutions, how to keep a "good" lab notebook, analysis of results, etc.
- **Molecular Biology** - students will learn and perform traditional techniques used in cloning genes - e.g. restriction digestion, purification of DNA fragments, transformation of *E. coli*, DNA minipreps, gel electrophoresis. Students will clone a *C. elegans* gene involved in the osmotic stress response.
- ***C. elegans* Project** – students will begin studies of the physiological response of the nematode *C. elegans* to osmotic stress (high salt levels). They will follow up the preliminary observations with an RNA interference experiment, where, using the gene cloned in the Molecular Biology module, the students will disrupt the ability of *C. elegans* to respond normally to osmotic stress.
- **CRISPR -** students will edit a genome using CRISPR, generating (or correcting) mutations in yeast, and learning about this important new technique.
- **Microbiology Basics** – students will learn basic techniques in working with bacteria.

WEEK 2

- **Human Taste Receptor Variation** – DNA with a dash of bitters! We take a classic and common genetic test for the ability to taste the bitter compound PTC and add a molecular twist to it. Students will PCR amplify the PTC receptor gene from their own DNA and analyze their own DNA sequence (sequenced on campus) to see how particular variations of the receptor correlate with the ability to taste PTC. Since we look at the sequence of the entire PTC receptor gene, we often uncover other interesting variations in this gene. If time permits, we may discuss the evolution of the PTC receptor locus.
- **Microscopy Basics** – students will learn how to use microscopes – includes dissecting and compound scopes and phase contrast optics.
- **Fluorescence Microscopy** – students learn about and use another type of microscope – the fluorescence microscope – to reveal brilliantly stained organelles and cytoskeletal structures within the cell. Then we mess up the cells with drugs, allowing students to probe some of the functions of these structures and organelles.
- ***C. elegans* Project** – Using the technique of RNA interference (RNAi), we will reduce ("knock-down") expression of genes involved in the osmotic stress response in the worm. Can the worms still handle high salt? Using fluorescence reporters, students will monitor intracellular events that result from osmotic shock.
- **Cell Culture** – students will learn the basic steps in passaging and culturing cell lines. They will culture a mouse immune system B cell line and look at the effects of various drugs on the ability of the cells to proliferate.
- **Group Projects** – Students will discuss and plan projects.

WEEKS 3 and 4

- **Short (5-10 min) presentations** – project proposal and initial background readings.
- **Group Projects** - students work on projects.

- **Poster presentations** (last day of class) and **farewell lunch**.