

QBRc Lab – EL24B

Jane Kondev, Physics Department, Abelson 301, Office hours: Tue 5:30-6:30PM or by appt.

Course Description. In this course, you will quantitatively explore the living world by doing experiments and theory in research labs at Brandeis. The emphasis is on interdisciplinary science where techniques and ideas from physics, chemistry and biology are used to develop a quantitative understanding of life at the molecular level.

Course Plan: The lab component will consist of two six week-long research projects. One hour-long lecture will take place every week. Additionally, you will spend three to four hours every week in a research lab performing experiments or doing computational work. Lecture and lab reflection will be Mondays 5-6:20PM.

Lectures are all by QBRc faculty and invited speakers from area universities. The goal of the lectures is to inform students about cutting edge research at the interface of the physical and life sciences and to introduce some of the key ideas and techniques employed in the QBRc labs.

Lab reflections will be an instructor moderated discussion of various aspects of lab work. The goal will be discovering common experiences shared by labs doing research in different subject areas, as well as establishing a common language (using concepts from math, physics, chemistry, and biology).

Each lab project will be researched by student pairs alongside a senior graduate student who will serve as the QBRc instructor. The projects are structured in such a way that each student will make, measure and model something in the lab under the tutelage of the QBRc instructor. Every student will present their findings in a poster session and a five-page report to the instructor at the end of each project.

Research lab topics:

| <u>QBRc Instructor</u> | <u>Lab</u> | <u>Project</u> |
|------------------------|------------------|---|
| Bolun Chen | Miller (Neuro) | Exploring Neural Dynamics: from a Single Neuron to Large Populations |
| Chenghao Liu | Katz (Neuro) | Visualizing neurons in the amygdala activated during taste learning in mice |
| Gabe Bronk | Kondev (Physics) | Computational modeling of DNA repair processes |
| Joanna Robaszkowski | Dogic (Physics) | Investigating the physics of membranes using experimental models |
| David Harbage | Kondev (Physics) | Simulating self-assembling filament length control |

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| Vinay Vikas K Jacob | Kadener (Biology) | Determining behavioral and neural functions of circular RNAs (circRNAs) in <i>Drosophila</i> |
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| Joe Rauch | Kondev (Physics) | Modeling the microbial world |
| Linnea Metcalf | Dogic (Physics) | An Introduction to Active Matter Physics |

Lecture Schedule:

| <u>Week</u> | <u>Topic</u> |
|----------------|---|
| 1 1/18 | Project presentations (QBReC instructors) |
| 2 1/22 | Showing off your science (CommLab) |
| 3 1/29 | Guest lecture: Dr. Shashank Shekhar |
| 4 2/5 | Guest lecture: Prof. Michael Hagan |
| 5 2/12 | The art of a good introduction (QBReC instructors) |
| 6 2/26 | Guest lecture: Prof. Avital Rodal |
| 7 3/5 | Poster Session 1 (Report due 3/12) |
| 8 3/12 | Guest lecture: Prof. Bruce Goode |
| 9 3/19 | Lightning talks and reflections (QBReC instructors) |
| 10 3/26 | Guest lecture: Joerg Braun (UMass) |
| 11 4/9 | Class activity |
| 12 4/16 | Guest lecture: Andrew Murray (Harvard) |
| 13 4/23 | Poster Session 2 (Report due 4/30) |

Evaluation: Lab notebook (10%), Posters (40%), Reports (40%), Class/Lab participation (10%).
Success in this 2 credit-hour course is based on the expectation that students will spend a 1-2 hours of study time per week in preparation for class and lab sessions. The total time commitment for this course is 6-7 hours a week.

Disabilities. If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately.