Syllabus QB 826, fall 2014

QB 826, Introduction to Quantitative Biology Techniques

A 1-credit, intensive lab workshop before the start of fall 2014
Monday to Friday, August 11–15, 9:00 AM to 5:00 PM

The goal of this workshop is to combine professional development with various dimensions of interdisciplinary research, such as teamwork, cultural and vocabulary differences, as well as diversity in the learning and thinking process. Students from biological and chemical/physical and mathematical/computational fields will work in different interdisciplinary teams everyday.

Instructors: Claire Vieille 6172 BPS 884-5392 vieille@msu.edu
Guest instructors

Grading: Pass/Fail course

Enrollment: 12 maximum

Days will be divided in morning sessions, usually spent in the biology lab; afternoon sessions, spent in the computer lab; and one evening discussion session. Students will work in pairs that will change every day to maximize the exposure of every student to students trained in other disciplines.

The biology lab section is designed for bio-trained students to train non-bio students to do simple tasks around the lab: preparing buffers and media (1 day), bacterial growth curve (1 day), enzyme assays (1 day), genomic DNA mini prep, PCR, and agarose gel (1 day), and protein unfolding (1 day). In these sessions, non-bio students will learn some biology vocabulary and basic wet lab techniques. They will acquire a sense of what it takes to accumulate experimental data, and the sizes of errors associated with typical biological data.

In the computer lab section, students will learn basic commands in UNIX, analyze their enzyme assay data from the bio lab section, do curve fitting, calculate inhibitor constants, model a protein 3D structure, bind a ligand in a catalytic site, and practice with bioinformatics and microarray analysis tools.

On Wednesday evening, students will practice describing their research to students in the class in a 10-min chalkboard presentation. On Thursday evening, students will participate in a discussion that integrates aspects of interdisciplinary research.

The main focus of this course is not so much to learn numerous techniques, but for students coming from different backgrounds (mathematics, physics, biology, computer science, statistics, chemistry, etc.) to learn to work together, learn how people with different educational backgrounds think, and to prepare to work in interdisciplinary environments.
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Schedule QB 826 August 11 – 15, 2014

Mo, We, and Fr: 9:00–12:00 and 2:00–5:00
Tu, Th: 9:00–12:00, 2:00–5:00, and 6:00–8:00

Biology lab sessions: Biochemistry room 117
Computer lab sessions: Th, Fr: BPS room 2245
                      Mo, Tu, We: Biochemistry room 202
Evening discussion:  We: Biochemistry 208

Monday

Intro to the course at 9:00 AM in Biochemistry room 208

AM:  *Bio lab*: Buffers, media preparation, pipetting, sterilization (Vieille)
PM:   *Computer lab*: Unix basics, PyMol molecular visualization tool (Pappan)

Tuesday

AM:  *Bio lab*: growth curve, standard curve, spectrophotometer linearity
      (Vieille)
PM:   *Computer lab*: Homology modeling of protein structure (Pappan)
Evening: *Communication*: 10-min presentations of every student's research project
         (Vieille)

Wednesday

AM:   *Bio lab*: Genomic DNA purification, PCR, agarose gel electrophoresis
      (Vieille)
PM:   *Computer lab*: Protein ligand docking (Kuhn)

Thursday

AM:   *Bio lab*: Protein purification (Vieille)
PM:   *Computer lab*: Microarray data analysis (Cui)
Evening: *Discussion*: benefits and difficulties associated with doing interdisciplinary
         research (Vieille)

Friday

AM:   *Bio lab*: Enzyme kinetic assays (Vieille)
PM:   *Computer lab*: Curve fitting, calculating $K_m$ for substrate and $K_i$ for
       inhibitor. (Using results from morning experiments) (Vieille)