

QB 826, Introduction to Quantitative Biology Techniques

QB 826, *Introduction to Quantitative Biology Techniques*, is an intensive one-week workshop (1-credit) conducted before the start of fall semester when students join the QB program. Interdisciplinary teams combining students from biological and chemical/physical and mathematical/computational fields participate in morning sessions in the biology lab, afternoon sessions in the computer lab, and evening discussions that integrate these aspects of interdisciplinary research. Teams are changed everyday to maximize interdisciplinary interactions. In each half-day module, students are provided with enough preliminary information to get them started, with cross-training among the participants required for completing the objectives of the module. After participating in this workshop, students are able to

- (i) Conduct basic wet lab techniques (e.g., bacterial growth curves, enzyme assays, and transformation) and acquire a sense of the sizes of errors associated with typical biological data.
- (ii) Demonstrate competence with a few computational tools commonly used to process experimental data. Students gain experience with free (e.g., R and PyMol) and commercial software (e.g., Matlab, Origin) and provide experience with curve fitting, data mining, molecular modeling, and statistical analysis of microarray data.
- (iii) Describe and experience various dimensions of interdisciplinary research, such as teamwork, cultural and vocabulary differences, learning and thinking processes, and professional development.
- (iv) Demonstrate individual accountability and group responsibility in small teams that combine students from biological and chemical/physical and mathematical/computational fields.

This intensive workshop is planned to be the first QB course students take when they join the program, to help build an interdisciplinary graduate community.

Syllabus of the QB 826 course taught August 13-17, 2007, from 9:00 AM to 8:00 PM.

Monday	Morning	30-min introduction to the course <i>Bio lab:</i> Buffers, media preparation, pipetting, sterilization
	Afternoon	<i>Computer lab:</i> Unix commands, PyMol molecular visualization tool
	Evening	Presentation of interdisciplinary research By Dr. M. Huebner, MSU dept of Statistics, followed by discussion on interdisciplinary research
Tuesday	Morning	<i>Bio lab:</i> growth curve, standard curve, spectrophotometer linearity
	Afternoon	<i>Computer lab:</i> Avida-ED: studying evolution with digital organisms
Wednesday	Morning	<i>Computer lab:</i> Microarray data analysis using R
	Afternoon	<i>Computer lab:</i> Homology modeling of protein structures using MODELLER
Thursday	Morning	<i>Bio lab:</i> Genomic DNA purification, PCR, agarose gel electrophoresis
	Afternoon	<i>Computer lab:</i> Bioinformatics, genome annotation
	Evening	Student presentations based on a paper presenting a quantitative technique and what type of biology problem it can help answer
Friday	Morning	<i>Bio lab:</i> thrombin/inhibitor assays
	Afternoon	<i>Computer lab:</i> Using Origin, curve fitting, calculating K_m for substrate and K_i for inhibitor. Protein-ligand docking and scoring using SLIDE
	Evening	Student presentations