

BIPH 4010 Principles of Quantitative Instrumentation

Course Outline - Spring 2019/20

Instructors

Prof. ZHU, Guang (LIFS)

Prof. PARK, Hyo Keun (LIFS & PHYS)

Prof. Shangyu Dang (LIFS)

Prof. DU, Shengwang (PHYS & CBE)

Prof. TONG, Penger (PHYS)

Prof. WANG, Ning (PHYS)

Schedule

Rm 2463; Mon, Wed: 12:00-1:20pm

Course description

This course aims to provide a general understanding of modern instruments used in biological research with special emphasis on bright-field and fluorescence light microscopes, electron microscopy, X-ray crystallography, local probes and manipulation, nuclear magnetic resonance, and mass spectrometer. The approach is a practical one geared to students who are or will be using these instruments in research. The course consists of ten-week long lectures and four-week long demonstration. During the lectures, students learn basic principles of biological instrumentation and the performance of the instruments. In the demonstration, students apply the understanding gained during the lectures and learn how the instrumentation is used to address biological questions.

Grading

Midterm Exam: 30%

Final Exam: 40%

Final project: 30%

Course Intended Learning Outcomes

On successful completion of this course, students are expected to be able to:

1. Understand the basic concepts of quantitative instrumentation.
2. Recognize how quantitative instrumentation can be built and contribute to modern complex equipment.
3. Evaluate and analyze the system of quantitative instrumentation related to biotechnology.
4. Communicate and explain issues and importance of quantitative instrumentation to general public.

5. Obtain a global perspective to analyze issues related to quantitative instrumentation and biotechnology.

BIPH 4010 (Spring 2020)

Mon & Wed: 12:00 - 1:20 pm

Venue: Room 2463 (L25-26)

	Monday			Wednesday		
Week 1				19-Feb	Course Outline and General Principles	G. Zhu
Week 2	24-Feb	BIO-AMF	P. Tong	26-Feb	Structure-function of Biomolecules	S. Dang
Week 3	2-Mar	Basic Principle of NMR (I)	G. Zhu	4-Mar	Basic Principle of NMR (II)	G. Zhu
Week 4	9-Mar	Application of Biomolecular NMR (I)	G. Zhu	11-Mar	Application of Biomolecular NMR (II)	G. Zhu
Week 5	16-Mar	MS, ITC, DSC and SPR (I)	G. Zhu	18-Mar	MS, ITC, DSC and SPR (II)	G. Zhu
Week 6	23-Mar	Lab visit	G. Zhu	25-Mar	Mid-term Exam	
Week 7	30-Mar	Electron Microscopy, x-ray crystallography	N. Wang	1-Apr	Electron Microscopy, x-ray crystallography	N. Wang
Week 8	6-Apr	EM-Lab visit	N.Wang	8-Apr	Structure determination of biomolecules by x-ray crystallography	S.Dang
Week 9	13-Apr	Easter Monday		15-Apr	Introduction to single particle cryo-EM	S. Dang
Week 10	20-Apr	Cryo-EM lab visit	S. Dang	22-Apr	Optical basics-Fluorescence microscopy	H. Park
Week 11	27-Apr	Laboratory-Fluorescence microscopy	H.Park	29-Apr	Advanced optical microscopy I: Super-resolution microscopy (SRM)	S.Du
Week 12	4-May	Advanced optical microscopy II: Light-Sheet microscopy (LSM)	S.Du	6-May	Lab visit	S.Du
Week 13	11-May	Laboratory-Fluorescence microscopy	H. Park	13-May	Optical and magnetic tweezers	H.Park
Week 14	18-May	Laboratory-optical and magnetic tweezers	H. Park			