

PHYS4010.353/PHYS5110.351

Infrared Biophysics I

Instructor: Professor Aihua Xie

Classes: Wednesday 3:30-4:30pm, 112 PSI

Credit hours: *1 credit hour** (**2-3 credit hours* may be allowed by consent of the instructor)

Office Hours: by appointment

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Webpage: [TBA](#)

Description: “*Virtually every property that characterizes a living organism is affected by proteins.*” (TE Creighton). How to understand the nature’s design and engineering of proteins? How to understand the structure, dynamics and functional mechanism of proteins? In this class we will introduce “infrared structural biology”, a powerful emerging tool for studies of proteins. In addition, we will engage students to explore, research, and collaborate with a class research project. Newly installed unique and powerful advanced FTIR system at OSU (NSF MRI) will be used in this class. We aim to publish the research results from the class project in a peer review journal with all class participants as coauthors (perhaps one as the first author)[#].

Two more courses in infrared biophysics (one credit hour each) will be offered in the near future:

- **Infrared Biophysics II:** Protein Dynamics
- **Infrared Biophysics III:** FT-IR Imaging

The following topics will be covered:

- Introduction to the physics of proteins
- Introduction to FTIR spectroscopy
- Introduction to infrared structural biology
- Presentation of potential class projects
- Selection of the class project
- *Research design and explore!*
- Presentations of research results
- *Preparation of the manuscript[#]!*

[#]From the 2012 Molecular Biophysics class, One manuscript was prepared, submitted and published: “*Structure and Stability of an Azoreductase with an FAD Cofactor from the Strict Anaerobe Clostridium perfringens*”, Morrison, Jessica, Dai, Shuo, Ren, Jie, Taylor, Amanda, Wilkerson, Mitchell, John, Gilbert, Xie, Aihua. 2014. *Protein and Peptide Lett.* 21: 523-534.

Pre-requisite: General Physics I & II or by consent of instructor.

Excellent books:

- (1) *Fourier Transform Infrared Spectroscopy*, 2nd edition, Peter R Griffiths & James A de Haseth Wiley (2007)
- (2) *Physical Biology of the Cell*, Phillips, Kondev, Theriot, Garland Science (2012)
- (3) *The Physics of Proteins*, Hans Frauenfelder, Springer (e-book is available from OSU Library)
- (4) *PROTEINS-Structures and Molecular Properties*, 2nd edition, Thomas E. Creighton, W.H. Freeman and Company (1993)

Grade: will be based on participation, effort and progress in classes and class projects. Graduate and undergraduate students will have different grading standards.