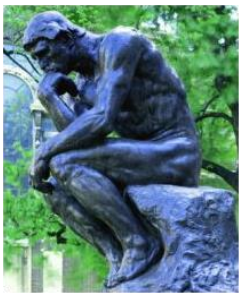
Fluorescence Techniques in Chemistry and Biochemistry

Topics in Biochemistry (CHEM 701)

Spring 2019

4:00 pm – 5:15 pm, MW (room TBA)
January 22 - May 9



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This course will explore advanced fluorescence spectroscopy techniques as they apply to modern studies in chemistry, biochemistry and related research areas. Hands-on activities (i.e. laboratory practices/demonstrations) are included and will be performed in CHM 210.

Credits: 3

Required readings: Articles from the primary research literature and *Principles of Fluorescence Spectroscopy, 3rd edition.* Joseph R. Lakowicz; Springer, 2006 (ISBN: 978-0-387-31278-10).

Supplementary books: *Principles of Molecular Photochemistry. An Introduction.* N.J. Turro, V. Ramamurthy, J.C. Scaiano.; University Science Books, 2009 (ISBN: 978-1-891389-57-3). *Essentials of Molecular Photochemistry.* A. Gilbert, J. Baggott. Blackwell Scientific Publications, 1991 (ISBN: 978-0-632024-29-2). *Modern Molecular Photochemistry of Organic Molecules.* N.J. Turro, J.C. Scaiano, V. Ramamurthy. University Science Books, 2010 (ISBN: 978-1-891389-25-2).

Prerequisites: graduate student; grade of C or better in Chem 501 (P) or Chem 601 (P), *or consent of instructor*.

Grading:

Mid-term exam I: 35%. Exam I will be made available to the students by February 11, and will be due only on March 13. Students are expected to work on the respective problems as the course progresses. Experimental data, to be acquired at the spectroscopic lab located in room 210, will be used to answer some of the exam questions.

Mid-term exam II: 35%. Exam II will be made available to the students by March 25, and will be due only on April 29. Students are expected to work on the respective problems as the course progresses. Experimental data, to be acquired at the spectroscopic lab located in room 210, will be used to answer some of the exam questions.

Final PowerPoint presentation (25-30 minutes): 30%. Individual projects for the final PowerPoint presentations will be identified by the end of the fourth week of classes, and will focus primarily on subjects of immediate interest to the students on basis of their respective PhD/MS research projects or graduate school areas of interest.

Tentative Course Plan

Weeks 1-3

UV-Visible absorption spectroscopy
Principles of Photochemistry
Transient uv-vis spectroscopy - Laser-flash photolysis

Weeks 4-6

Introduction to fluorescence spectroscopy
Instrumentation
Fluorophores
Solvent and environmental effects
Kinetics of photophysical processes
Measurements of corrected fluorescence spectra and quantum yields

Weeks 7

Fluorescence lifetime measurements

Week 8

Fluorescence quenching

Week 9

Spring recess

Week 10

Fluorescence Anisotropy

Weeks 11-13

Energy transfer
Forster Resonance Energy Transfer
Dexter Collisional Mechanisms

Weeks 14-15

Single and multi-photon fluorescence microscopy
Fluorescence-lifetime imaging microscopy

Week 15-16

PowerPoint presentations.