

Universidade Federal de Juiz de Fora
Instituto de Ciências Biológicas

Programa de Pós Graduação em Ecologia

Course Plan

Course name: Optical spectroscopy methods in Biology

Course Length: 45 h

Date: 15/08/2017 to 31/08/2017

Lecturer: Erix A. Milán Garcés (UFJF),

Coordinator: Prof. Dr. Rossana C. N. Melo (UFJF)

Aim of the course:

The course will present the theoretical principles and applications of the main optical spectroscopic methods used in the study of biomolecules. We will introduce optical electronic spectroscopy (absorption and fluorescence) and vibrational spectroscopy (IR and Raman). The course covers applications to specific biological problems (i. e. protein folding). However, these methods are more general and can be apply to other problems in biology, chemistry, physics, medicine, etc. The theoretical and mathematical formalism will be kept as minimum as possible.

Course Schedule:

	Theoretical Introduction
15/08	<ul style="list-style-type: none">• Molecular interactions in macromolecular structures.• Structure of some biological macromolecules: Protein and nucleic acid structures.
17/08	<ul style="list-style-type: none">• Introduction to quantum mechanics and spectroscopy.• Molecular Orbitals and Covalent Bonds.• Electronic and vibrational states of a molecule.
19/08	<ul style="list-style-type: none">• Interaction between electromagnetic radiation and a molecular system.• Jablonski diagram.• Electronic transitions in biological molecules.
	Optical Spectroscopy Techniques and Applications
22/08	<ul style="list-style-type: none">• UV-visible absorption spectroscopy. Spectrophotometry in the study of proteins and nucleic acids.
24/08	<ul style="list-style-type: none">• Paper presentations by groups of students.
26/08	<ul style="list-style-type: none">• Fluorescence spectroscopy. Energy transfer. FRET. Applications.
29/08	<ul style="list-style-type: none">• Principles of vibrational spectroscopy. Applications I.
30/08	<ul style="list-style-type: none">• Principles of vibrational spectroscopy. Applications II
31/08	<ul style="list-style-type: none">• Paper presentations by groups of students.

Course evaluation and grades are based on the following points:

- Presence and participation in lectures and other course activities.
- Paper presentations and discussions. (These presentations are mandatory for the completion of the course).

Bibliography:

- Principles of physical biochemistry. Kensal E. van Holde, W. Curtis Johnson, P. Shing.
- Physical Chemistry. P. Atkins and J. de Paula.