

“Principles of Instrumental Analysis in Chemistry and Materials Science”

Instructors:

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Prof. Edgard Ferreira, Ph.D.

Prof. Eberlin Nogueira, Ph.D.

Prof. Thiago Canevari, Ph.D.

Prof. Delmarcio Gomes, Ph.D.

Prof. Ricardo Andrade, Ph.D.

Prof. Cecilia de Carvalho Castro, Ph.D.

Prof. Sergio Humberto, Ph.D.

Prof. Camila Maroneze, Ph.D.

Prof. Rosi Simas, Ph.D.

Prof. Manuel Salustiano, Ph.D.

Offering (2023/1S):

From 4th to 8th semester (Chemistry course)

From 4th to 8th semester (Materials Science and Engineering course)

Meeting times:

Friday, 4-6PM

Availability:

Total of 20 positions (10 for each course)

Project Description

This project is proposed to be the first contact of the student with instrumental analysis and characterization techniques that can be applied in Chemistry and Materials Science and Engineering courses. Techniques based on spectroscopy, microscopy, diffraction, thermal analysis, rheology, and chromatography will be explored in their fundamental concepts by different professors. Practical experiments related to inorganic/organic synthesis will be executed in the laboratory, providing different real samples to be investigated and characterized by the students.

Prerequisites

Intermediate level of English (writing, reading, speaking, and listening); All the lectures and discussions will be taken in English.

Principles of Chemistry, Physics 1

Textbook and/or other required material

The recommended textbooks for the Project are:

SKOOG, Douglas A.; HOLLER, F. James; NIEMAN, Timothy A. Principles of instrumental analysis.. 5th ed. Philadelphia, PA: Saunders college, 1998.

CALLISTER, William D. **Materials science and engineering**: an introduction. 7th ed. New York, NY: John Wiley, c2007.

HOUSECROFT, Catherine E.; SHARPE, A. G. **Inorganic chemistry**. 4th. ed. Englewood Cliffs, NJ: Pearson, 2012

BOWER, David I.; MADDAMS, W. F. **The vibrational spectroscopy of polymers**.. Cambridge, England: Cambridge University Press, 2006

LENG, Y. **Materials characterization**: introduction to microscopic and spectroscopic methods. 2nd ed. Weinheim: Wiley-VCH, c2013.

Course content

1. Introduction to characterization and instrumental analysis (Everton)
2. Synthesis of inorganic/organic compounds (Cecilia, Delmarcio, Edgard, Manuel)
3. Infrared spectroscopy analysis (Everton)
4. UV-Vis spectroscopy analysis (Rosy)
5. Mass spectrometry analysis (Eberlin)
6. Chromatography analysis (Edgard)
7. Thermal analysis (TG/DTA) (Thiago)
8. X-ray diffractometry analysis (Sergio)
9. X-ray fluorescence analysis (Camila)
10. Microscopy analysis (SEM) (Cecília)
11. Particle size scattering analysis DLS (Cecília)

Assignment/Grading

Based on Coordination of Extension Activities, as part of the student assiduity, to obtain the number of complimentary activity hours, you must participate at least 75% of the total time, otherwise, no hours will be credited. The project requires a set of technical reports based on the results acquired, discussed, and plotted during the experiments. The grading will be based on the final project (100%).

Date	Activity	Professor
03/03	Introduction, information, and warnings	Everton
10/03	Synthesis	Cecilia / Delmarcio
17/03	Synthesis	Edgard / Manuel
24/03	Infrared spectroscopy / UV-Vis	Everton / Rosy
31/03	Chromatography / Diffractometry	Edgard / Sergio
07/04	Holiday	----
14/04	Mass spectrometry / DLS	Eberlin-Rosy / Cecilia
21/04	Holiday	----
28/04	Hackathon	----
05/05	Thermal analysis / Electron microscopy	Thiago / Camila
12/05	Final report deadline	Everton