- Nome da disciplina

Photonic Materials and Structures
Ministrada em 2021-2

Número de créditos: 4 Carga horária: 48 Obrigatória/Eletiva: Eletiva

Ementa:

Materials and structures (micro and nanometric) capable of manipulating and/or altering the properties of light are presented. Program content:
Motivation and review of electromagnetic waves
Optical properties of metals and metallic structures
Optical properties of dielectrics and dielectric structures
Optical Properties of Semiconductors
Materials with optical gain and lasers
Nonlinear materials
Metamaterials

Bibliografia:

SIMMONS, J. H., POTTER, K. S. Optical Materials. Academic Press. 2000.
VERDEYEN, J. T. Laser Electronics. 3rd Ed. Prentice Hall. 1995.
AGRAWAL, G. P. Nonlinear Fiber Optics. 5th Ed. Academic Press. 2012.
JOANNOPOULOS, J. D., JOHNSON, S. G., WINN, J. N., MEADE, R. D. Photonic Crystals: Molding the Fl of Light. 2nd Ed. Princeton University Press. 2009.

Nome da disciplina

Advanced Spectroscopic Methods
Ministrada em 2021-2

Número de créditos: 4 Carga horária: 48 Obrigatória/Eletiva: Eletiva

Ementa:

The discipline deals with the study of the theoretical foundations and applications of spectroscopic and spectrometric techniques. The techniques covered are the following: infrared spectroscopy, Raman spectroscopy, X-ray excited photoelectron spectroscopy, UV-Vis spectroscopy and mass spectrometry. Program content:
1 - Infrared Spectroscopy:
Principles of the technique. Fourier transform. Sample preparation procedures. Spectrainterpretation. Practical applications.
2 - Raman Spectroscopy:
Principles of the method. Sample preparation procedures. Spectra interpretation. Practical applications.
3 - X-ray excited photoelectron spectroscopy:
Determination of binding energies in solids and liquids, study of surfaces, identification of elements, instrumentation, sample handling, spectra interpretation, areas of application.
4 - UV-Vis Spectroscopy:
Fundamentals of technique; relationship between absorption and concentration: Lambert-Beer law; absorption spectra; spectrophotometric instrumentation; deviations from the Lambert-Beer Law. Practical applications.
5- Mass spectrometry:
Fundaments of the technique: nominal and exact masses (molecular formula), rules (nitrogen, Stevenson), resolution, isotopic patterns, molecular ions and main fragmentation routes, and ion

detection.
Principles and applications of the main ionization techniques: EI, ESI, MALDI, APCI, APPI and ambient ionization techniques: DESI, DART, EASI.
Principles and applications of the main mass analyzers: quadrupoles, ion traps, TOFs and orbitraps.
Uses of the technique in applied chemistry as in omic sciences, forensics, new materials, natural products, fuels, and food chemistry.

Bibliografia:

Basic Bibliography
DOMIN, M.; CODY, R. Ambient Ionization Mass Spectrometry (New Developments in Mass Spectrometry). 1st Edition, Royal Society of Chemistry, 2015.
McHALE, J.L.. Molecular Spectroscopy. CRC Press; 2017.
LAMBERT, J.B.; MAZZOLA, E.B.; RIDGE,C.D. Nuclear Magnetic Resonance Spectroscopy: An Introduction to Principles, Applications, and Experimental Methods. UK, Wiley, 2019
SKOOG, D. A.; HOLLER, F. J., NIEMAN, T. A., Princípios de Análise Instrumental, 6ª edição, Bookman: São Paulo, 2009.
Bibliografia Complementar
WATSON, J. THROCK; SPARKMAN, O. DAVID. Introduction to Mass Spectrometry: Instrumentation, Applications, and Strategies for Data Interpretation, UK, Wiley 2007.
Artigos científicos recentes.
SALA, O. Fundamentos da Espectroscopia Raman e no Infravermelho - 2ª Edição, Editora UNESP, 2008.
HOFFMANN, EDMOND; STROOBANT, VINCENT. Mass Spectrometry: Principles and Applications, 3rd EditioN, UK, Wiley 2007.
WATTS, JOHN F.; WOLSTENHOLME, JOHN. An introduction to surface analysis by XPS and AES. UK, Wiley 2009.