Course Unit Descriptor

Study Programme: Food Engineering

Course Unit Title: Selected Chapters of Optical Methods

Course Unit Code: DKKI 02

Name of Lecturer(s): Prof. Jaroslava Švarc-Gajić, PhD; Assoc. Prof. Jaroslav Katona, PhD; Asocc. Prof. Snežana Kravić, PhD

Type and Level of Studies: Undergraduate Academic Studies

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 7

Prerequisites:

Course Aims:

Optical methods have important place in physico-chemical analysis and quality control of different samples. The course aim is to upgrade the knowledge and improve the skills related to spectroscopic and spectrometric analysis and quality control of food, pharmaceutical, biological and environmental samples.

Learning Outcomes:

The students will upgrade their knowledge on the principles and instrumentation for spectrophotometric and photometric analysis. They will also expand their knowledge in atomic absorption/emission spectroscopy, and the techniques with background correction. The course will focus also on infrared, two-dimensional, ATR and FTIR spectroscopy. As an outcome familiarization with nuclear magnetic resonance spectroscopy, X-ray crystallography and their application is projected. The students shall be proficient in mass spectroscopy, ionization techniques used in mass spectroscopy and the types of mass analyzers. Hyphenated techniques, spectroscopy coupled with chromatographic analysis, will be also covered by the course.

Syllabus:

Theory

The principles and instrumentation for spectrophotometric and photometric analysis. Error types and error minimization. Atomic absorption/emission and fluorescent spectroscopy. Continuous source atomic absorption spectroscopy. Techniques with background correction: Zeeman Effect, pulsed-lamp background correction, background correction in high-resolution continuum source atomic absorption spectrometry. The techniques of infrared spectroscopy: two-dimensional, ATR and FTIR. X-ray diffraction techniques; X-ray sources: rotating anode, synchrotron radiation, free electron laser. Mass spectrometry: ionization techniques, mass analyzers, tandem mass spectroscopy. Nuclear magnetic resonance spectroscopy: types and acquisition of spectra. Coupling of spectroscopy with chromatography and other analytical methods.

Practice

Spectroscopic determination of beta-carotene, phenols and flavonoids in plant samples after extraction. Determination of antioxidant and antiradical activity of plant extracts by spectrophotometric techniques. *In vitro* analysis of the influence of

plant extracts on the activity of lipase, glucosidase, amylase and tyrosinase: bioactivity assessment. Quantification by absolute and relative methods in spectrophotometry and atomic absorption spectroscopy. Derivatization in spectroscopic techniques.

Required Reading:

1. R.S. Sirohi: Optical Methods of Measurement: Wholefield Techniques, CRP Press, 2017.
2. J. Švarc-Gajić: Sampling and Sample Preparation in Analytical Chemistry, New York, Novapublishers, 2011.

Weekly Contact Hours:	**Lectures:** 3	**Practical work:** 3

Teaching Methods:

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	
Practical work	25	oral exam	30
Preliminary exam(s)	40		
Seminar(s)			

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.