Course Unit Descriptor

Study Programme: Food Engineering

Course Unit Title: Sampling and Sample Preparation for Analysis

Course Unit Code: KKO303

Name of Lecturer(s): Prof. Jaroslava Švarc-Gajić, PhD

Type and Level of Studies: Undergraduate Academic Studies

Course Status (compulsory/elective): Compulsory

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: None

Course Aims:

Correct sampling and sample preparation are of utmost importance for reliable analysis and minimization of measurement uncertainty. At the course students will be trained for correct sample collection of food, pharmaceutical and environmental samples. They will get knowledge on different sample preparation techniques for direct and indirect analysis by chemical, physical, biochemical and instrumental analytical methods.

Learning Outcomes:

Graduate students will be skilled to correctly collect food, pharmaceutical, environmental and other samples respecting basic sampling principles, and selecting appropriate sampling strategy. They will be capable of selecting and applying appropriate sample preparation technique, depending on the sample type, target analytes and analytical method. The students will gain knowledge and skills for correct extraction of different compounds in closed and open systems, solid phase extraction, extraction with sub- and supercritical fluids, microwave and ultrasound extraction. In addition, they will learn how correctly to perform sample digestion in closed and open systems.

Syllabus:

Theory

Significance of correct sampling. General and statistical principles of sampling. Probabilistic and non-probabilistic sampling strategies. Statistical aspects of sampling and measurement uncertainty. Sampling techniques of gaseous, liquid and solid samples. Sample documentation. Basic principles of the extraction. Liquid/liquid, membrane and solid/liquid extraction. Microwave-assisted, ultrasound and accelerated extraction. Solid phase extraction (SPE, SPME, SBSE): sorbent types, configurations, strategies, steps, error sources, recovery and optimization. Sample digestion. Digestion in open and close systems. Dry ashing. Microwave-assisted digestion. Verification of the sample preparation protocol: recovery test.

Practice

Application of different sampling strategies. Comparison of different extraction techniques: conventional S/L extraction, intense agitation extraction, microwave-assisted and ultrasound extraction. Soxhlet, Twisselman and Soxtec extraction. Purification of obtained extracts. Digestion of liquid and solid samples in closed and open systems: Kjeldahl, microwave-assisted digestion. Dry ashing. Subcritical water extraction and hydrothermal conversion.

Required Reading:

1. J. Švarc-Gajić: Sampling and Sample Preparation in Analytical Chemistry, New York, Novapublishers, 2011.

2. J. Pawliszyn: Sampling and sample preparation for field and laboratory, Elsevier, 2002.

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	10	oral exam	30
Preliminary exam(s)	55		
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.