

Tárgytematika / Course Description

Food analytics 2

MENB_ÉTTA003

Tárgyfelelős neve /

Teacher's name: dr. Ajtony Zsolt

Félév / Semester: 2022/23/1

Beszámolási forma /

Assesment: Vizsga

Tárgy heti óraszám /

Teaching hours(week): 2/2/0

Tárgy féléves óraszám /

Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The course will focus on providing students with a detailed knowledge of modern techniques used in research and development as well as inspection of food products in the industry, analytical laboratory, and government. The course is composed of oral lectures and hands-on laboratories.

TANTÁRGY TARTALMA / DESCRIPTION

ORAL PRESENTATIONS

Teacher's name

Ass. Prof. Zsolt Ajtony, Ph.D, Dept. of Food Science

Topics

1) Moisture and total solids analysis.

Moisture /water content. Oven drying methods, distillation procedures, chemical method, physical methods.

Water activity measurement. Chilled mirror dew point, electric hygrometer.

2) Ash analysis. Sample preparation. Dry ashing. Wet aching. Microwave ashing.

3) Methods of elemental analysis.

Analysis of the main and trace elements. Inductively coupled plasma source atomic emission spectrometry (ICP-AES). Flame and electrothermal atomization atomic absorption spectrometry (FL-AAS, ETA-AAS). Hydride generation and cold vapor technique.

4) Carbohydrate analysis.

Total carbohydrate. Phenol-sulfuric acid method

Mono- and oligosaccharides. Total reducing sugars. High performance liquid chromatographic (HPLC) methods. Capillary electrophoresis. Enzymic methods.

5) Carbohydrate analysis

Polysaccharides. Starch and non-starch polysaccharides.

Physical methods. Refractometry, polarimetry, mass spectrometry (MS), Fourier transform infrared spectroscopy (FTIR), near-infrared spectroscopy (NIR)

6) Lipid analysis I.

Total lipid content. Solvent extraction methods. Nonsolvent wet extraction methods. Instrumental methods.

7) Lipid analysis II.

Fat characterization. Method for bulk oils and fats. Lipid oxidation: measuring present status, evaluating oxidative stability. Methods of lipid components.

8) Protein analysis I.

Total protein determination. Nitrogen-based methods: Kjeldahl method, Dumas method. Infrared spectroscopy. Colorimetric methods. Ultraviolet absorption methods

9) Protein analysis II.

Protein separation and characterization procedures. Separation by liquid chromatography, separation by electrophoresis. Amino acid analysis.

10) Vitamin analysis.

High performance liquid chromatographic methods. Normal phase chromatography (NP-HPLC), ion paired reverse phase chromatography (IP-RP-HPLC), hydrophilic interaction liquid chromatography (HILIC)

Other chemical methods. Titrimetric, fluorometric

11) Determination of phenolics and antioxidants.

Analysis of phenolics. Sample preparation. Colorimetric assay (total phenolics). Chromatographic methods: (GC, HPLC).

Antioxidant capacity assays. Hydrogen atom transfer (HAT) assays: ORAC, crocin bleaching assay. Single electron transfer (SET) assays: TEAC, DPPH, FRAC, CUPRAC

12) Analysis of food contaminants, residues, and chemical constituents of concern I.

Sample preparation. Solid phase microextraction (SPME), the QuEChERS, microwave-assisted solvent extraction, accelerated-solvent extraction.

13) Analysis of food contaminants, residues, and chemical constituents of concern II.

Pesticide residue analysis. GC-ECD, GC-MS, HPLC-PDA, HPLC-FL, HPLC-MS

Mycotoxin analysis. HPLC-PDA, HPLC-FL, HPLC-MS, GC-MS, capillary electrophoresis

Antibiotic residue analysis

14) Tutorial

LABORATORY EXERCISES:

Teacher's name

Asst. Prof. Ágnes Nagy/(Varga) PhD, Dept. of Food Science

Requirements

- 1) Students should have a closed work jacket, flawless rubber gloves, alcohol felt-tip pen, calculator, and wipes during the internship.
- 2) Only students who have received accident and fire prevention education may participate in the exercises. Students who have not attended the mandatory accident and fire prevention training due to the absence of the first laboratory internship and have not certified the relevant protocol with their signatures may perform further internships only if their deficiencies are remedied and reported orally.
- 3) An additional condition for participation in the internship is that the students have the basic knowledge necessary for the successful implementation of the internship, the tasks to be performed, and the theory belonging to them.
- 4) A written report is required during laboratory exercises.
- 5) At the end of the internship, the protocol must be signed by the internship supervisor for certification.
- 6) The requirement is for signing at the end of the semester to complete eighty percent of the internships. The internship is considered completed if the student has submitted the written report on time and it has been approved by the instructor.

Topics

- 1) Accident and fire prevention education. Introduction to laboratory work.
- 2) Measurement of the total phenolic content of an aromatic plant. Spectrophotometric method.
- 3) Determination of fructose-to-glucose mass ratio in a honey sample. Ion exchange liquid chromatography.
- 4) Electrothermal atomization atomic absorption spectrometric determination of lead in a wine sample by

direct sampling method.

- 5) Determination of caffeine content of an instant coffee. RP-HPLC-UV method.
- 6) Identification and determination of casein fractions in a milk powder sample. RP-HPLC-UV method.
- 7) Replacement practice.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Exam: The written examination is will be scheduled in the exam period and will be closed-notes and closed-book.

Requirements: Completion of at least 80% of the laboratory exercises. More than 50% performance on the final exam.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Textbook

- 1) S. Suzanne Nielsen (Eds). Food Analysis. 5th Edition, Springer, 2017, Part 4th, 5th, and 7th