



Chromatographic analysis of volatiles in food, agricultural and pharmacy
Educational subject description sheet

Basic information

Field of study Food Technology		Education cycle 2021/22	
Speciality -		Subject code WBiNoZNTŻ-AMS.MI2BO.3286.21	
Organizational unit The Faculty of Biotechnology and Food Science		Lecture languages english	
Study level Second-cycle (engineer) programme		Mandatory optional	
Study form Full-time		Block major subjects (conducted) in foreign languages	
Education profile General academic		Disciplines Food technology and nutrition	
		Subject related to scientific research Yes	
		Subject shaping practical skills Nie	
Teacher responsible for the subject	Antoni Szumny		
Other teachers conducting classes	Antoni Szumny, Jacek Łyczko		
Period Semester 2	Examination exam	Number of ECTS points 3.0	
	Activities and hours lecture: 20 laboratory classes: 10		

Goals

C1	To acquaint students with the methods of isolation of volatile compounds from the material.
C2	To make the audience aware of the problems associated with the identification and quantification of isolated volatile compounds.
C3	Providing students with knowledge on methods and parameters of chromatographic separation of volatile compounds.
C4	To make the audience aware of sensory quality issues depending on the volatile compound profile.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge - Student knows and understands:			
W1	the methods of isolation of volatile compounds from raw materials.	NT_P7S_WG01, NT_P7S_WG02	written exam, oral exam
W2	how to interpret the chromatograms and mass spectra obtained from the analyses.	NT_P7S_WG04	written exam, oral exam
W3	the theoretical basis of gas chromatography and mass spectrometry techniques.	NT_P7S_WG01	written exam, oral exam
Skills - Student can:			
U1	to search in scientific sources for information necessary to confirm the results of the analysis of the results.	NT_P7S_UW01	observation of student's work, report
U2	plan an experiment involving the isolation of volatile compounds from raw materials and conduct GC-MS analysis.	NT_P7S_UO06	observation of student's work, report
U3	prepare a comprehensive report presenting the results of GC-MS analysis of volatile compounds and translate the results into information on the quality of the raw material.	NT_P7S_UW02	observation of student's work, report
U4	can solve difficulties and optimize the process of chromatographic analysis.	NT_P7S_UW01	observation of student's work, report
U5	use correct analytical nomenclature, related to gas chromatography and mass spectrometry	NT_P7S_UK07	observation of student's work, report
Social competences - Student is ready to:			
K1	present his results to the group, including the explanation of individual elements of the project.	NT_P7S_KK01	observation of student's work
K2	take responsibility for the reliability of the analyses performed and the interpretation of the prepared results.	NT_P7S_KO02	observation of student's work
K3	take initiative in designing analyses and experiments so that the technological problems posed can be solved.	NT_P7S_KOR3	observation of student's work

Balance of ECTS points

Activity form	Activity hours*	
lecture	20	
laboratory classes	10	
report preparation	20	
literature study	5	
collecting and studying literature	10	
conducting research	10	
project preparation	5	
Student workload	Hours 80	ECTS 3.0
Workload involving teacher	Hours 30	ECTS 1.0
Practical workload	Hours 40	ECTS 1.5

* hour means 45 minutes

Study content

No.	Course content	Activities
1.	1. Essential oils and volatile organic compounds: properties, technology and production. 2. Volatile compounds isolation: methods, procedures and optimization 3. Gas chromatography and mass spectrometry 4. GC-MS analytical method development 5. GC-MS analysis results interpretation	lecture
2.	1. Isolation of volatile compounds: SPME, hydrodistillation, solvent extraction 2. GC-MS method development and samples analysis 3. Chromatograms interpretation and results reporting.	laboratory classes

Course advanced

Teaching methods:

case analysis, text analysis, brainstorming, problem-solving method, project-based learning (PBL), teamwork, computer lab/laboratory, discussion, lecture

Activities	Examination methods	Percentage in subject assessment
lecture	written exam, oral exam	60%
laboratory classes	observation of student's work, report	40%

Literature

Obligatory

1. Adams, R.P. Identification Of Essential Oil Components By Gas Chromatography/ Mass Spectrometry; 4.1.; Allured publishing: Carol Stream, 2017; Vol. 24; ISBN 9781932633214.
2. Handbook of Essential Oils. Science, Technology, and Applications; Başer, K.H.C., Gerhard Buchbauer, Eds.; 2nd ed.; CRC Press: Boca Raton, 2016; ISBN 9781466590472.
3. Handbook of Advanced Chromatography/Mass Spectrometry Techniques; Holcapek, M., Byrdwell, C., Eds.; Academic Press and AOCS Press: London, 2017; ISBN 9781626239777.
4. Rubiolo, P.; Sgorbini, B.; Liberto, E.; Cordero, C.; Bicchi, C. Essential oils and volatiles: Sample preparation and analysis. A review. *Flavour Fragr. J.* 2010, 25, 282-290, doi:10.1002/ffj.1984.
5. Mass Spectrometry: An Applied Approach; Smoluch, M., Grasso, G., Suder, P., Silberring, J., Eds.; 2nd ed.; John Wiley & Sons, Inc.: Hoboken, 2019; ISBN 978-1-119-37736-8.

Optional

1. Cserháti, T. Chromatography of Aroma Compounds and Fragrances; Springer-Verlag: Berlin, 2010; ISBN 9783642016554.
2. Mondello, L.; Tranchida, P.Q.; Dugo, P.; Dugo, G. Comprehensive two-dimensional gas chromatography-mass spectrometry: A review. *Mass Spectrom. Rev.* 2008, 27, 101-124, doi:10.1002/mas.20158.
3. Essential Oils in Food Preservation, Flavor and Safety; Preedy, V.R., Ed.; Academic Press: London, 2016; ISBN 9780124166417.

Kierunkowe efekty uczenia się

Kod	Treść
NT_P7S_KK01	The graduate is ready to critical and self-critical capacity to assess, contrast, and decide upon scientific advances in agro-food technology and quality.
NT_P7S_KO02	The graduate is ready to apply knowledge acquired and form judgments that include reflection on social and ethical responsibilities in the agro-food field.
NT_P7S_KOR3	The graduate is ready to capacity for innovation and creativity in the agro-food field.
NT_P7S_UK07	The graduate can communicate abilities with professionals also in foreign language at B2 + level of the European Training Description System and to a higher degree use a specific terminology
NT_P7S_UO06	The graduate can plan research projects related to food quality and safety in agro-food technology.
NT_P7S_UW01	The graduate can use tools to search for relevant and reliable information to resolve problems, develop strategies, and advise agro-food industries.
NT_P7S_UW02	The graduate can develop and produce reports and procedures to manage food quality and safety based on continuous improvement.
NT_P7S_WG01	The graduate knows and understands integrate knowledge in food production and technology to provide scientific and technical advice to producers and consumers.
NT_P7S_WG02	The graduate contrast and interpret advances in agro-food biotechnology and their practical applications.
NT_P7S_WG04	The graduate knows and understands scientific progress in the production and preparation of food, ensuring the improvement of quality in production.