

Course name:**OPTIONAL SPECIALIZATION COURSE II: ANALYSIS OF BIOACTIVE COMPOUNDS IN CEREAL GRAIN**

ECTS	4
Course status	complementary
Course final assesement/evaluation of outcomes	completion with grade
Prerequisites	no prerequisites

Main field of study:**field of study name (capital letters)**

Profile of study	General-academic
The code of studies (education level)	SM (master)
Semester of studies	summer
Language of instruction	English

Course offered by:

Name of faculty offering the course	Faculty of Food Technology
Name of department offering the course	Department of Carbohydrate Technology
Course coordinator	Krzysztof Buksa PhD. DSc. Eng., associate professor

Learning outcomes of the course:

Symbol of outcome	Description of learning outcome	Reference to	
		main field of study outcomes	discipline#

KNOWLEDGE – student knows and/or understands:

ABC_W1	bioactive compounds in cereal grain and is able to characterize them. He knows potential of cereals as a superfood. Student gains the knowledge about the influence of water soluble and insoluble dietary fiber on human health. He has the basis knowledge of chemical composition of dietary fiber and methods of analysis its compounds. He knows the influence of dietary fiber on technological properties in food production.	TŻ2_W01 TŻ2_W02 TŻ2_W03 TŻ2_W04 TŻ2_W05 TŻ2_W06 TŻ2_W09	R
ABC_W2	characteristics of polysaccharides in cereal grain taking into account their molecular dimensions. He knows the methods of molecular mass determination and practical application of the knowledge of cereal polysaccharides structure in food industry, pharmacy, cosmetics, medical sciences and more.	TŻ2_W01 TŻ2_W02 TŻ2_W03 TŻ2_W04 TŻ2_W05	R
ABC_W3	the division of proteins and the role of different fractions of proteins in cereal products. He characterizes the methods of protein isolation, examination of their structure and technological properties.	TŻ2_W01 TŻ2_W02 TŻ2_W04 TŻ2_W05	R
ABC_W4	phenolics of cereal grain; is able to present the mechanism of antioxidative action of polyphenols. Student knows the mechanism of oxidative cross-linking of polysaccharides through ferulic acid bridges formation and the influence of this process on properties of cereal products. He knows the mechanism of anti-cancer and anti-aging action of polyphenols.	TŻ2_W01 TŻ2_W02 TŻ2_W04 TŻ2_W05 TŻ2_W09	R

ABC_W5	substances responsible for taste, smell and texture of cereal food products.	TŽ2_W01 TŽ2_W02 TŽ2_W03 TŽ2_W04	R
ABC_W6	examples of practical usage of the knowledge concerning bioactive compounds in food industry, pharmacy, cosmetology and medical sciences.	TŽ2_W01 TŽ2_W02 TŽ2_W03 TŽ2_W04 TŽ2_W09	R

SKILLS – student is able to:

ABC_U1	identify and determine of sugar content in cereal grain and other plant material (e.g. chia seeds) and its derivatives using TLC and HPLC chromatography. Is able to operate a HPLC chromatograph and chromatographic software. He is able to calculate obtained by HPLC results.	TŽ2_U02 TŽ2_U03 TŽ2_U05 TŽ2_U07 TŽ2_U08	R
ABC_U2	determine molecular mass of starch, inulin, fructooligosaccharides (FOS), arabinoxylan, β -glucan using SEC chromatography. He is able to prepare the sample for SEC chromatographic analysis. He can operate a HPSEC/RI chromatograph and the chromatographic software. He is able to calculate obtained by SEC results.	TŽ2_U02 TŽ2_U03 TŽ2_U05 TŽ2_U07 TŽ2_U08	R
ABC_U3	isolate bioactive proteins from cereal grain (e.g. rye, wheat, corn) and from other plant material (seeds of chia, flax, etc.).	TŽ2_U03 TŽ2_U05	R
ABC_U4	carry out a determination of phenolic acids content in cereals and the products derived from cereals. He is able to prepare the samples for chromatographic analysis. He can operate a HPLC/RI/UV chromatograph and the chromatographic software. He is able to calculate obtained results.	TŽ2_U03 TŽ2_U05 TŽ2_U07 TŽ2_U08	R

SOCIAL COMPETENCE- student is ready to:

ABC_K1	express objective evaluation of his work and work of his team. He is able to cooperate and work in team	TŽ2_K05 TŽ2_K08	R
ABC_K2	creatively solve analytical problems and organizes workshop.	TŽ2_K01 TŽ2_K03	R

Teaching contents:

Lectures	15 hours
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Topics of the lectures	Bioactive components in cereals. Potential of cereals as a superfood.
	Soluble and insoluble dietary fiber - is it healthy or not? Analysis of the composition of dietary fiber. An impact of dietary fiber on technological properties in food production.
	What size are cereals polysaccharides? Methods of determination of molecular mass of cereal polysaccharides and practical application of the knowledge of polysaccharide molecular structure in food and non-food industry.
	Cereal proteins – what is their role in cereal products? Methods of isolation of bioactive proteins and examination of their structure and properties.
	Phenolic compounds as antioxidants having anti-cancer and anti-aging activity. The influence of ferulic acid on texture of cereal products.
	Substances affecting flavor (smell, taste and appearance) of food products.
	Future prospects for the analysis of bioactive components in plant material. Application of the knowledge concerning bioactive compounds in food industry, pharmacy, cosmetics, medical sciences and more.

Accomplished learning outcomes	TŽ2_W01, TŽ2_W02, TŽ2_W03, TŽ2_W04, TŽ2_W05, TŽ2_W06, TŽ2_W09, TŽ2_W10, TŽ2_K01, TŽ2_K02, TŽ2_K03, TŽ2_K04
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Verification methods, rules and criteria of outcome assessment	Written test – share in final grade of the module 50%, positive assessment for 60% points.
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Classes **15 hours**

Topics of the classes	TLC and HPLC chromatography – modern, accurate, simple and fast methods for determination of sugar composition in cereal grains.
	SEC chromatography as a tool for determination of molecular mass of starch, inulin, fructooligosaccharides, water soluble arabinoxylans and β -glucans.
	Isolation of bioactive proteins from rye and wheat grain.
	Non cereals but often treated as cereals – determination of unique properties of plant seeds of Chia, Flax and others. Determination of selected phenolic acids in cereal and cereal products.

Accomplished learning outcomes	TŽ2_U01, TŽ2_U02, TŽ2_U03, TŽ2_U05, TŽ2_U07, TŽ2_U08, TŽ2_U09, TŽ2_U10, TŽ2_U11, TŽ2_K01 TŽ2_K02, TŽ2_K03, TŽ2_K04
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Verification methods, rules and criteria of outcome assessment	Report concerning laboratory work (one for whole group) – share in final grade of the module 50%.
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Seminars **... hours**

Topics of the seminars	
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Accomplished learning outcomes	<i>symbol of learning outcomes of the seminars</i>
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Verification methods, rules and criteria of outcome assessment	<i>together with participation in the final assesement (in %)</i>
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References:

Basic	1. Eliasson A.C. (2006). Carbohydrates in food, 2nd edition. Taylor & Francis, New York. 2. Ito R., Matsuo Y. (2010). Handbook of carbohydrate polymers: development, properties and applications. Nova Science Pub Inc. 3. Kamerling J.P. (2007). Comprehensive Glycoscience. From Chemistry to Systems Biology. Elsevier Ltd.
Supplementary	1. AOAC. <i>Official methods of analysis</i> . 18th edn. Gaithersburg Association of Official Analytical Chemists International (2006). 2. Chaplin M.F. Kennedy J.F. (1994). <i>Carbohydrate Analysis</i> . Oxford University Press. 3. Buksa K., Ziobro R., Nowotna A., Praznik W., Gambuś H. 2012. <i>Isolation, modification and characterization of soluble arabinoxylan fractions from rye grain</i> . <i>European Food Research and Technology</i> . 235 (3) , 385-395.

Structure of learning outcomes:

Discipline: R – Agricultural science - discipline nutrition and food technology	4	ECTS**
Discipline: # (provide appropriate symbol - if the course relates to more than one academic discipline)	...	ECTS**

Structure of student activities:

Contact hours	32	hours	1,3	ECTS**
including:				
lectures	15	hours		
classes and seminars	15	hours		
consultations	1	hours		
participation in research	0	hours		
mandatory traineeships	0	hours		
participation in examinations	1	hours		
e-learning	...	hours	...	ECTS**
student own work	68	hours	2,7	ECTS**

Syllabus valid from the academic year 2021/2022

*** where 10 hours of classes = 1 ECTC (in case of 15 h → 2 ECTS)**

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes

academic discipline code: RZ - animal science and fishery, PB - biological sciences, etc.