Course name:

ANALYSIS OF BIOACTIVE COMPONENTS IN CEREAL GRAIN

ECTS	**3**
Course status	**complementary**
Course final assessement/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)	**SI/SM (bachelor/master)**
Semester of studies	**winter**
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	Student knows bioactive compounds in cereal grain and is able to characterize them. 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.	TŻ1_W01 TŻ2_W01 TŻ2_W02 TŻ2_W03 TŻ2_W04	R
ABC_W2	He is able to characterize 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. He knows the division of proteins and the role of different fractions of proteins in cereal products. He is able to char-acterize the methods of protein isolation, examination of their structure and technological properties.	TŻ1_W01 TŻ1_W02 TŻ2_W01 TŻ2_W02 TŻ2_W03 TŻ2_W04	R
ABC_W3	Student knows phenolics of cereal grain. He is able to present the mechanism of antioxidative action of polyphenols. Student is able to present the mechanism of oxidative crosslinking 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.	TŻ1_W01 TŻ1_W02 TŻ2_W02 TŻ2_W03 TŻ2_W04	R

ABC_W4	Student is able to characterize substances responsible for taste, smell and texture of cereal food products. Student is able to present examples of practical usage of the knowledge concerning bioactive compounds in food industry, pharmacy, cosmetology and medical sciences.	TŻ1_W01 TŻ2_W01 TŻ2_W02 TŻ2_W03 TŻ2_W04 TŻ2_W10	R
	SKILLS – student is able to:		
ABC_U1	Student knows how to identify and determine of sugar content in cereal grain and its derivatives using TLC and HPLC chromatography. He knows how to operate a HPLC chromatograph. He knows the chromatographic software. He is able to calculate obtained by HPLC results.	TŻ1_U01 TŻ2_U01 TŻ2_U03 TŻ2_U05 TŻ2_U07 TŻ2_U08	R
ABC_U2	Student knows how to determine molecular mass of starch, inulin, arabinoxylan beta-glucan using SEC chromatog-raphy. He is able to prepare the sample for SEC chromatographic analysis. He knows how to operate a HPSEC/RI chro-matograph. He knows the chromatographic software. He is able to calculate obtained by SEC results.	TŻ1_U01 TŻ2_U03 TŻ2_U05 TŻ2_U04 TŻ2_U07 TŻ2_U08	R
ABC_U3	Student knows how to isolate proteins from rye and wheat grain.	TŻ1_U01 TŻ2_U01 TŻ2_U03 TŻ2_U05 TŻ2_U07 TŻ2_U08	R
ABC_U4	Student knows how to 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 knows how to operate a HPLC/RI/UV chromatograph. He knows the chromatographic software. He is able to calculate obtained results.	TŻ1_U01 TŻ2_U05 TŻ2_U06 TŻ2_U07	R
	SOCIAL COMPETENCE- student is ready to:		
ABC_K1	Student is able to express objective evaluation of his work and work of his team. He is able to cooperate and work in team.	TŻ1_K01 TŻ2_K01 TŻ2_K05 TŻ2_K06	R
ABC_K2	Student creatively solves analytical problems and organizes workshop.	TŻ2_K03	R

Teaching contents:

Lectures		**15**	**hours**
Topics of the lectures	What are bioactive components in cereals? 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 proteins and examination of their structure and properties.		
	Phenolic compounds as antioxidants having anti-cancer and anti-aging activity. The role of ferulic acid in determination of texture of cereal products.		

	Substances affecting 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	TŻ2_W01, TŻ2_W02, TŻ2_W03, TŻ2_W04, TŻ2_W05, TŻ2_W06, TŻ2_W09, TŻ2_W10, TŻ2_K01 TŻ2_K02, TŻ2_K03, TŻ2_K04
Verification methods, rules and criteria of outcome assessment	Written examination (test). Share in final grade 70%.

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, water soluble arabinoxylans and beta-glucans.
	Determination of selected phenolic acids in cereal and cereal products.
Accomplished learning outcomes	TŻ2_U01, TŻ2_U02, TŻ2_U03, TŻ2_U05, TŻ2_U07, TŻ2_U08, TŻ2_U09, TŻ2_U10, TŻ2_U11, TŻ2_K01 TŻ2_K02, TŻ2_K03, TŻ2_K04
Verification methods, rules and criteria of outcome assessment	Attendance at at least 2 classes. Share in final grade 30%.

Seminars	**…**	**hours**
Topics of the seminars		
Accomplished learning outcomes	*symbol of learning outcomesof the seminars*	
Verification methods, rules and criteria of outcome assessment	*together with participation in the final asessement (in %)*	

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. Official methods of analysis. 18th edn. Gaithersburg Association of Official Analytical Chemists International (2006).2. Chaplin M.F. Kennedy J.F. (1994). Carbohydrate Analysis. Oxford University Press. 3. Buksa K., Ziobro R., Nowotna A., Praznik W., Gambuś H. 2012. Isolation, modification and characterization of soluble arabinoxylan fractions from rye grain. European Food Research and Technology. 235 (3) , 385-395.*

Structure of learning outcomes:

Discipline: R – Agricultural science - discipline nutrition and food technology	*3*	ECTS**
Discipline: # (*provide appripriate symbol - if the course relates to more than one academic discipline*)	…	ECTS**

Structure of student activities:

Contact hours	37	hours	1,5	ECTS**
including: lectures	15	hours		
classes and seminars	15	hours		
consultations	5	hours		
participation in research	0	hours		
mandatory trainerships	0	hours		
participation in examinations	2	hours		

e-learning	…	hours	…	ECTS**
student own work	35	hours	1,5	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.