A COURSE SYLLABUS – DOCTORAL SCHOOL
regarding the qualification cycle from 2022/2023 to 2025/2026
and
regarding the qualification cycle from 2024/2025 to 2027/2028

GENERAL INFORMATION ABOUT COURSE	
Course title	***OPTIONAL SPECIALIZED SUBJECT:*** ***Bioavailability of nutrients***
Name of the unit running the course	Doctoral School at University of Rzeszów
Type of course *(obligatory, optional)*	obligatory - optional specialist subject
Year and semester of studies	year I: semester II and year III: semester VI
Discipline	food and nutrition technology
Language of Course	Polish language
Name of Course coordinator	**dr hab. Agata Znamirowska - Piotrowska, prof. UR**
Name of Course lecturer	**dr hab. Agata Znamirowska - Piotrowska, prof. UR**
Prerequisites	The scope of knowledge, skills and social competences resulting from the completion of higher education (level 7 PRK), in fields ascribed to the scientific discipline: food and nutrition technology, knowledge of a modern foreign language (English) to the extent enabling the use of foreign language sources of scientific information.

BRIEF DESCRIPTION OF COURSE
(100-200 words)

The aim of the course is to familiarise students with the issues related to the physiology of the digestive system and the practical determination of nutrient bioavailability and/or bacterial survival in a simulated digestive system. Models for determining bioavailability and factors shaping nutrient bioavailability and bacterial survival will be analysed.

COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES

Learning outcome	The description of the learning outcome defined for the course	Relation to the degree programme outcomes (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge (no.)	knows and understands, has knowledge			
P8S_WG/1	Possesses a broad theoretical knowledge to the extent that it is possible to re-analyse existing scientific results on the topic related to bioavailability of active substances in specific foodstuffs that enter the general circulation of the human body from a given dose and on issues related to determining the rate of absorption of these substances.	**P8S_WG**	Conversation, laboratory	Written examination,
P8S_WG/2	Has advanced knowledge of the latest discoveries and development trends in nutrient bioavailability and survival of probiotic bacteria.	**P8S_WG**	Conversation, laboratory	Written examination,
P8S_WG/3	Is familiar with the specialised terminology used in the national and international environment in the field of food and nutrition technology,	**P8S_WG**	Conversation, laboratory	Written examination,

	especially in the topic of complex mechanisms occurring in specific food products, affecting their bioavailability.			
P8S_WK/1	Understands the necessity of proper management of food production taking into account various biological and chemical risks resulting from technological and technical developments.	**P8S_WK**	Conversation, laboratory	Written examination,
Skills (no.)	can			
P8S_UW/1	Based on interdisciplinary knowledge, is able to identify and solve research problems related to the determination of nutrient bioavailability and/or bacterial survival under simulated digestion conditions, as well as apply various solutions to increase bioavailability/survival.	**P8S_UW**	Conversation, laboratory	Written examination, discussion
P8S_UW/2	Use available theoretical knowledge to diagnose and solve complex research problems related to food production.	**P8S_UW**	laboratory	discussion
P8S_UW/3	Apply interdisciplinary knowledge to analyse and evaluate available research results, expert papers and other studies on topics related to nutrient bioavailability and bacterial survival in selected foods.	**P8S_UW**	Conversation, laboratory	Written examination, discussion
P8S_UK/6	Initiates and actively participates in discussions on scientific topics related to the bioavailability of nutrients in selected foods, including the presentation of research results obtained in national and international settings.	**P8S_UK**	Conversation,	discussion
Social competence (no.)	is ready to			
P8S_KK/3	Use knowledge and skills in solving theoretical and practical problems.	**P8S_KK**	Conversation, laboratory	Written examination,

LEARNING FORMAT – NUMBER OF HOURS

Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
II and VI	-	-	10	-	5	**2**

METHODS OF INSTRUCTION

- CONVERSION/LABORATORIES IN TRADITIONAL FORM;
- PERFORMING AND PLANNING EXPERIMENTS;
-WORKING IN THE LABORATORY USING LABORATORY EQUIPMENT;
- DISCUSSION.

COURSE CONTENT

1. Physiology of the digestive system.
2. Models for determining bioavailability.
3. Factors shaping nutrient bioavailability and survival of probiotic bacteria.
4. Evaluation of bioavailability of micronutrients or macronutrients or other bioactive compounds or

survival of probiotic bacteria by simulated digestion (in vitro).

COURSE ASSESSMENT CRITERIA

The subject ends with a written examination.

Possible semester grades are: 2.0, 3.0, 3.5, 4.0, 4.5, 5.0.

Course completion - exam: up to 59% - failing grade; 60% sufficient grade; 61-70% sufficient plus; 71-80% good; 81-90% good plus; 91-100% very good.

Active attendance in class may increase the grade by half a grade.

TOTAL PhD STUDENT WORKLOAD REQUIRED TO ACHIEVE THE INTENDED LEARNING OUTCOMES– NUMBER OF HOURS AND ECTS CREDITS

Activity	Number of hours
Scheduled course contact hours	**15**
Other contact hours involving the teacher (consultation hours, examinations)	**1**
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	**39**
Total number of hours	**55**
Total number of ECTS credits*	**2**

INSTRUCTIONAL MATERIALS

Compulsory literature:	1.Górski J. (red). Fizjologia człowieka. Wydawnictwo lekarskie PZWL, 2010, Warszawa Gronowska- Senger A. Podstawy biooceny żywności. Wydawnictwo SGGW, 2004, Warszawa
Complementary literature:	1.Kowalczyk, M.; Znamirowska-Piotrowska, A.; Buniowska-Olejnik, M.; Pawlos, M. Sheep milk symbiotic ice cream: Effect of inulin and apple fiber on the survival of five probiotic bacterial strains during simulated *in vitro* digestion conditions. *Nutrients* 2022, *14*, 4454. 2.Szopa, K.; Szajnar K.; Pawlos, M.; Znamirowska-Piotrowska, A. Probiotic fermented goat's and sheep's milk: Effect of type and dose of collagen on survival of four strains of probiotic bacteria during simulated in vitro digestion conditions. *Nutrients* 2023, *15*(14), 3241. 3.Kowalczyk, M.; Znamirowska-Piotrowska, A.; Buniowska-Olejnik, M.; Zaguła G., Pawlos, M. Bioavailability of macroelements from synbiotic sheep's milk ice cream. *Nutrients* 2023, *15*(14) 3230 4.Pawlos Małgorzata, Szajnar Katarzyna, Znamirowska-Piotrowska Agata. Probiotic milk and oat beverages with increased protein content: survival of probiotic bacteria under simulated in vitro digestion conditions. Nutrients, 2024, *16(*21), 3673

*(1 ECTS CREDIT CORRESPONDS TO 25 - 30 HOURS OF THE TOTAL WORKLOAD OF A DOCTORAL STUDENT, NEEDED TO ACHIEVE THE ESTABLISHED EFFECTS).

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Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person