A COURSE SYLLABUS – DOCTORAL SCHOOL
REGARDING THE QUALIFICATION CYCLE FROM 2019 TO 2023
AND FROM 2020 TO 2025

GENERAL INFORMATION ABOUT COURSE	
Course title	**"Multiomics – modern strategy for food analysis**
Name of the unit running the course	Doctoral School at University of Rzeszów
Type of course *(obligatory, optional)*	obligatory optional (specialist) of choice
Year and semester of studies	Year II and III winter semester
Discipline	Food technology and nutrition
Language of Course	polish
Name of Course coordinator	Dr hab. Ireneusz Kapusta, prof. UR
Name of Course lecturer	Dr hab. Ireneusz Kapusta, prof. UR
Prerequisites	Chemistry, Biochemistry, Instrumental analysis of food

BRIEF DESCRIPTION OF COURSE
(100-200 words)

The aim of the course is to present the latest strategies and methods in food research covering many branches of science. Multiomics is a broad discipline that integrates all multidisciplinary approaches in modern food science and nutrition (e.g. nutrigenomics, nutrigenetics, microbiomics, toxicogenomics, nutritrancriptomics, nutriproteomics, nutrimetabolomics, etc.). Given the complexity of the metabolome, defined as "the set of all compounds present in any test food sample and / or any biological system that interacts with test food at a given time", the implementation of omics platforms such as transcriptomics, proteomics and metabolomics is essential for convenient to characterize the food metabolome. The aim of the practical part of the subject is to expand the knowledge and skills of doctoral students in the use of analytical methods based on the technique of liquid chromatography combined with mass spectrometry (LC-MS) to conduct metabolomic research, including planning and conducting research, as well as methods of analyzing and presenting the obtained results.

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.)				
K-01	Knows and understands the methodology of in vivo and in vitro research used in food sciences, health sciences and related sciences	P8S-WG/3	Lecture, Lab classes	Colloquium, observation of the doctoral student's work Discussion during classes
K-02	Knows the sources of scientific information and methods of searching for scientific data	P8S-WG/1	Lecture, Lab classes	Colloquium, observation of the doctoral student's work

				Discussion during classes
K-03	Knows and understands the concepts of modern strategies for testing raw materials and food products	P8S-WG/2	Lecture, Lab classes	Colloquium, observation of the doctoral student's work Discussion during classes
Skills (no.)				
S-01	Is able to make conclusions based on the results of scientific research	P8S-UW/1	Lab classes	observation of the doctoral student's work Discussion during classes
S-02	Is able to consciously use modern methods and techniques in the research of raw materials and food products	P8S-UW/1	Lab classes	observation of the doctoral student's work Discussion during classes
S-03	Is able to use statistical methods to develop research results	P8S-UW/2	Lab classes	observation of the doctoral student's work Discussion during classes
S-04	Is able to communicate on specialist topics in the international environment, initiates debate, participates in the scientific discourse	P8S-UK/1 P8S-UK/3 P8S-UK/4 P8S-Uk/5	Lab classes	observation of the doctoral student's work Discussion during classes
Social competence (no.)				
Sc-01	Is ready to fulfill the social obligations of the scientist, including initiating activities for the socio-economic environment	P8S-KO/2	Consultation	Discussion during classes
Sc-02	Is ready to critically evaluate the performance of the discipline	P8S-KK/1	Consultation	Discussion during classes
Sc-03	Is ready to cooperate with the socio-economic environment in order to develop creative thought with full responsibility for the consequences of his own actions	P8S-KK/3	Consultation	Discussion during classes

LEARNING FORMAT – NUMBER OF HOURS

Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
III and IV	5	10	-----------	---------	------	0

METHODS OF INSTRUCTION

MULTIMEDIA PRESENTATION, INDEPENDENT WORK OF THE DOCTORAL STUDENT WITH THE USE OF LABORATORY EQUIPMENT, DISCUSSION WITH THE TEACHER AND OTHER DOCTORAL STUDENTS CONDUCTING EXPERIMENTS)

COURSE CONTENT

1. **Lectures/ Seminars:**
   Multiomics as an example of systemic research, basic definitions. Food and nutrition metabolomic and techniques used for the determination of metabolites in food with an emphasis on chromatography coupled with mass detection. Nutrigenomics and the influence of nutrition on gene expression, methods of determining the activity of biologically active substances in food of plant origin.

2. **Seminars / Lab classes/ others:**
   Application of mass spectrometry in the identification of biologically active compounds present in food. Targeted and non-targeted analyzes: metabolic fingerprint, metabolite profiling, application in the analysis of raw materials and plant products.

COURSE ASSESSMENT CRITERIA

To obtain credit, the doctoral student should obtain at least 60% of the assessed areas of learning. Pass conditions - credit based on knowledge and skills.

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)	----------
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	10
Total number of hours	25
Total number of ECTS credits	

INSTRUCTIONAL MATERIALS

Compulsory literature:	1. Proteomika i metabolomika (Wydawnictwo Uniwersytetu Warszawskiego). Red. Jerzy Silberring, Agnieszka Kraj, Anna Drabik. 2019 ISBN:9788323507659 2. Spektrometria mas Wydawnictwo Naukowe PWN Witold Danikiewicz. 2020 ISBN: 9788301136055
Complementary literature:	1. Metabolomics, Metabonomics and Metabolite Profiling (RSC Publishing) Eds. William J. Griffiths. Cambrige 2008 ISBN: 9780854042999 2. The Handbook of Metabolic Phenotyping (Elsevier) Eds. Jhon C. Lindon, Jeremy K Nicholson and Elaine Holmes. 2019. ISBN: 9780128122938

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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