NARODOWA AGENCJA WYMIANY AKADEMICKIEJ

UR an international PhD student

COURSE SYLLABUS – DOCTORAL SCHOOL
EDUCATION CYCLE FROM 2022/2023 TO 2025/2026

GENERAL INFORMATION ABOUT THE SUBJECT	
Subject title	***WORKSHOPS WITH AN EXPERT***
Name of the unit offering the subject	Doctoral School at the University of Rzeszów
Type of subject *(compulsory, optional)*	*compulsory*
Year/semester	Year IV, semester VII
Discipline	Biological sciences
Language of instruction	English
Name and surname of the course coordinator	**Raluca Maria Fratila, PhD**
Name and surname of the person(s) teaching the course	**Raluca Maria Fratila, PhD**
Prerequisites	*Research activity related to scientific interests in the field of yeast engineering, systematic publication of research results.*

COURSE SUMMARY

(synthetic description of the content and objectives of the course; 100-200 words)

The course, ***Workshops with an Expert***, enables young scientists from the Doctoral School to establish contact and research cooperation with experienced specialists with significant scientific achievements. The course serves as a platform for the exchange of scientific ideas, consultation on techniques and research tools, and the discussion of results related to doctoral dissertations in the field of biological sciences. The aim is to familiarize students with the use of microorganisms in biosensors.

LEARNING OUTCOMES FOR THE COURSE AND VERIFICATION METHODS

Learning outcome symbol	Expected learning outcomes	Reference to learning outcomes for level 8 PRK qualifications (symbol)	Form of teaching (lectures, practical classes, etc.)	Assessment methods (e.g. test, oral examination, written examination, project, etc.)
Knowledge No.	**knows and understands, has knowledge of:**			
P8S-WG2	Has extensive theoretical and practical knowledge of the direction of scientific research and the latest discoveries in the field of yeast metabolic engineering, including those of global significance.	**P8S-WG**	seminar	credit/report
P8S_WK1	She is aware of the impact of technological development on civilisation and the resulting consequences for humanity.	**P8S-WK**	seminar	credit/report
Skills No.	**is able to:**			
P8S_UW1	Based on extensive theoretical knowledge supported by research experience, is able to identify and solve various scientific problems related to yeast metabolic engineering, is able to define the purpose and subject of scientific research , formulate a research	**P8S_UW**	seminar	credit/report

	hypothesis, develop methods, techniques and research tools, and draw conclusions based on the results of their work.			
P8S_UK6	Being fluent in a specialist foreign language (min. B2 ESKJ), is able to present the results of their research activities and actively participate in discussions on scientific and professional topics in the national and international research community.	**P8S_UK**	seminar	credit/report
P8S_UU1	Is able to independently acquire knowledge from various reliable sources, deepen their analytical skills based on current interdisciplinary knowledge, and inspire others to act and develop.	**P8S_UU**	seminar	credit/report
P8S_UU2	They are able to utilise their extensive interdisciplinary knowledge by inspiring others to engage in creative and research activities, and are able to supervise the learning process of others using modern teaching methods and tools available at.	**P8S_UU**	seminar	credit/report
P8S_UU3	Through continuous learning, is able to update their interdisciplinary knowledge in the field of science and natural sciences in the discipline of biological sciences, improve their own competences, and plan their own and others' development.	**P8S_UU**	seminar	credit/report
Social competences No	**is ready to:**			
P8S_KK1	Is ready to critically evaluate scientific achievements in a field related to their doctoral dissertation, within the chosen scientific discipline of biological sciences.	**P8S_KK**	seminar	credit/report
P8S_KK2	Is ready to critically evaluate their own research contribution to the development of scientific achievements within the scientific discipline of biological sciences in the field of yeast engineering metabolism research.	**P8S_KK**	seminar	credit/report
P8S_KK3	Is ready to solve theoretical and practical problems using their knowledge of yeast engineering metabolism in the discipline of biological sciences and related disciplines.	**P8S_KK**	seminar	credit/report

FORMS OF TEACHING ACTIVITIES, NUMBER OF HOURS AND CREDITS						
Semester (no.)	Lecture	Exercise/Seminar	Lab	Practical	Other	**Number of ECTS points**
IV and VI	**-**	**5**	**-**	**-**	**-**	**1**

TEACHING METHODS
- seminar with multimedia presentation, *- lecture-style seminar,*

CURRICULUM CONTENT
Topic 1: The application of yeast in biosensors Topic 2: Post-doctoral career oppotunities in academia and beyond. Grant applications

COURSE COMPLETION REQUIREMENTS (ASSESSMENT CRITERIA)
After completing the course, the doctoral student prepares a report related to the subject matter of the course. *Preparation of a report on the application of yeast in biosensors (max 2 pages times 12 pt.)* *The applicable grading scale for the course is as follows:* *(zal.) – passed,* *(fail) - fail.*

TOTAL WORKLOAD REQUIRED OF THE DOCTORAL STUDENT TO ACHIEVE THE INTENDED LEARNING OUTCOMES IN TERMS OF HOURS AND ECTS POINTS	
Form of activity	Average number of hours to complete the activity
Hours spent in direct contact resulting from from the study programme	**5 hours**
Other with teacher participation (participation in consultations, examinations)	**1 hour**
Hours completed independently by the doctoral student (preparation for classes, exams, writing papers, etc.)	**24**
TOTAL HOURS	**30 hours**
TOTAL NUMBER OF ECTS POINTS*	**1**

LITERATURE	
Basic literature:	- S. Shi *et al.*, Metabolic Engineering of Yeast. *Annu. Rev. Biophys.* 2025. 54:101–20. https://doi.org/10.1146/annurev-biophys-070924-103134 - Q. Zhao *et al.*, Using nanomaterials to increase the efficiency of chemical production in microbial cell factories: A comprehensive review. *Biotechnology Advances* 59 (2022) 107982. https://doi.org/10.1016/j.biotechadv.2022.107982 - H. G. Le *et al.*, Synthetic biology strategies for sustainable bioplastic production by yeasts. Journal of Microbiology 2025;63(3):e2501022. DOI: https://doi.org/10.71150/jm.2501022 - A. Adeniran *et al.*, Yeast-based biosensors: design and applications, FEMS Yeast Research, Volume 15, Issue 1, February 2015, Pages 1–15, https://doi.org/10.1111/1567-1364.12203
Supplementary literature:	- X. Zhang *et al.* Metabolic Engineering of Lactococcus lactis for the Enhanced Production of Lactate by Manipulating Pyruvate Dehydrogenase Complex E2 and Lactate Dehydrogenase. *J. Agric. Food Chem.* 2025, 73, 40, 25549–25561. https://doi.org/10.1021/acs.jafc.5c09688 - T. Jiang *et al.*, Recent advances in improving metabolic robustness of microbial cell factories. *Current Opinion in Biotechnology* 2020, 66:69–77 https://doi.org/10.1016/j.copbio.2020.06.006

	- C. Maneira *et al.*, Engineering Saccharomyces cerevisiae for medical applications. *Microb. Cell Fact*. 2025 Jan 9;24(1):12. doi: 10.1186/s12934-024-02625-5 - S. Nakashima *et al.*, Capturing CDKs in action: Live-cell biosensors pioneer the new frontiers in cell cycle research. *Cell Struct. Funct*. 2025 Apr 9;50(1):77-90. Doi: 10.1247/csf.25004 - J. Basumatary *et al*. Microbial carbon dots- Mechanisms, properties, and multifunctional applications. *World J Microbiol Biotechnol*. 2025 Oct 28;41(11):412. doi: 10.1007/s11274-025-04619-w - Y. Yu *et al*. Saccharomyces-derived carbon dots for biosensing pH and vitamin B 12. *Talanta*. 2019 Apr 1;195:117-126. doi: 10.1016/j.talanta.2018.11.010

* *(**1 ECTS** POINT CORRESPONDS TO **25–30** HOURS OF TOTAL WORK REQUIRED BY A DOCTORAL STUDENT TO ACHIEVE THE INTENDED LEARNING OUTCOMES, E.G. **2 ECTS** POINTS CORRESPOND TO **50–60** HOURS)*

.....Raluca Maria Fratila, 18.11.2025.....
Date and signature of the course lecturer

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Approval of the Head of the Unit or authorised person