COURSE CARD

Course title	Polish	**Mechanizmy uszkodzeń i naprawy DNA**
	English	**DNA damage and repair mechanisms**

1. POSITION OF THE COURSE IN THE EDUCATIONAL SYSTEM

1.1. Section	Natural Sciences
1.2 Discipline	Biological Sciences
1.3 Mode of study	Full-time
1.4 Educational level	Doctoral School
1.5 Course coordinator	Prof. Michał Arabski
1.6 Contact	arabski@ujk.edu.pl

2. GENERAL COURSE CHARACTERISTICS

2.1 Course type	Specialized course
2.2 Language of instruction	English

3. DETAILED COURSE CHARACTERISTICS

3.1. Teaching forms		Lectures, practical classes
3.2. Number of hours		Practical classes (22.5 h), lectures (22.5 h)
3.3. Place of delivery		Teaching facilities of Jan Kochanowski University (UJK)
3.4. Assessment method		Graded credit (practical classes), final examination (lectures)
3.5. Teaching methods		Presentation, discussion
3.6. Literature	Basic literature	Francesca Storici, DNA Repair: On the Pathways to Fixing DNA Damage and Errors, BoD – Books on Demand, 2011
	Supplementary literature	Scientific publications made available to students in full-text versions.

4. LEARNING OBJECTIVES, CONTENTS, AND LEARNING OUTCOMES

4.1. Course Objectives

C01 – Familiarization with the types of DNA damage and the repair systems dedicated to them (lecture)

C02 – Techniques used in DNA damage and repair studies (lecture)

C03 – Principles of designing studies in cytotoxicity, DNA damage, and DNA repair research (practical classes)

4.2. Course Contents

The course covers the types and mechanisms of DNA damage, including loss of nitrogenous bases through depurination and depyrimidination, DNA intercalation, and modifications of nitrogenous bases such as alkylation, methylation, hydrolytic deamination, and oxidation. It also addresses single-strand and double-strand DNA breaks, as well as the formation of DNA-DNA and DNA-protein crosslinks.

Students will become familiar with the major DNA repair pathways, including Base Excision Repair (BER), Nucleotide Excision Repair (NER), Mismatch Repair (MMR), Non-Homologous End Joining (NHEJ), Homologous Recombination (HR), and direct repair mechanisms. Particular attention is given to the relationships between DNA damage, DNA repair processes, and the induction of apoptosis. The course also presents contemporary methods used to investigate DNA damage and repair. These include the comet assay in its alkaline, neutral, and FISH-comet variants, pulsed-field gel

electrophoresis, chromosomal aberration analysis, the micronucleus test, clonogenic assays, γ-H2AX assays, and the analysis of plasmid conformational transitions. In addition, students will learn molecular techniques employed in DNA damage research, such as RFLP-PCR, real-time PCR (TaqMan), and HRM-PCR. Immunological and cell biology methods, including ELISA, confocal microscopy, and flow cytometry, are also discussed as important tools for assessing cellular responses to DNA damage and repair processes.

5. SUBJECT LEARNING OUTCOMES

Course Learning Outcomes	Upon successful completion of the course,	Reference to the Learning Outcomes of the Doctoral School (in accordance with the Doctoral School curriculum)
KNOWLEDGE:		
W01	The doctoral student has sufficient knowledge and understanding to re-examine existing paradigms, including theoretical foundations, general issues and selected specific topics relevant to the scientific discipline in which they are preparing their doctoral dissertation.	SD_W01
W02	The doctoral student knows and understands the main development trends in the scientific disciplines taught and related to the research topics covered	SD_W02
W03	The doctoral student knows and understands the fundamental dilemmas of modern civilisation and can identify significant current and unresolved issues in the scientific discipline in which they are preparing their doctoral dissertation.	SD_W07
SKILLS:		
U01	The doctoral student is able to define the aims and scope of scientific research, formulate research hypotheses and critically analyse and evaluate research results and their contribution to the advancement of knowledge.	SD_U01
U02	The doctoral student is able to use a foreign language at B2 level of the Common European Framework of Reference for Languages to the extent necessary to participate in an international professional, academic milieu	SD_U07
U03	The doctoral student is able to apply knowledge from various scientific fields to creatively identify, formulate and solve complex problems and carry out research tasks.	SD_U03
SOCIAL COMPETENCES:		
K01	The doctoral student is ready to think and act in an entrepreneurial way.	SD_K04

6. METHODS OF ASSESSING THE ACHIEVEMENT OF COURSE LEARNING OUTCOMES

Course Learning Outcomes	**Method (+/-)**						
	Oral/Written Examination	**Test**	**Project**	**Class Participation**	**Independent Study**	**Group Work**	**Other**

	Course Format			***Course Format***			***Course Format***			***Course Format***			***Course Format***			***Course Format***			***Course Format***		
	L	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*	*L*	*C*	*S*
W01	+																				
W02	+																				
W03	+																				
U01														+							
U02														+							
U03														+							
K01														+							

7. ASSESSMENT CRITERIA FOR LEARNING OUTCOMES ACHIEVEMENT

Course Format	Grade	Assessment Criteria The final grade for the practical component of the course will be based on the evaluation of a multimedia presentation. The final grade for the lecture component will be based on the result of the final examination.
Lectures (L)	3,0	Achievement of 65–72% in the final examination.
	3,5	Achievement of 73–78% in the final examination.
	4,0	Achievement of 79–84% in the final examination.
	4,5	Achievement of 85–90% in the final examination.
	5,0	Achievement of 91% and more in the final examination.
Classes (C) [1]	3,0	Achievement of 65–72% in the independent assignment.
	3,5	Achievement of 73–78% in the independent assignment.
	4,0	Achievement of 79–84% in the independent assignment.
	4,5	Achievement of 85–90% in the independent assignment.
	5,0	Achievement of 91% and more in the independent assignment.

Accepted for implementation

.....
.....