**Al-Farabi Kazakh National University**

**Facultyof biology and biotechnology**

**Departmentof Molecular biology and genetics**

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|  | APPROVED by **Dean of Faculty**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ B.K Zayadan**  **"09" July 2021** |

### EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

**MMK 6307- Molecular mechanisms of carcinogenesis**

Educational program 7M05109- Biotechnology

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| Course | 2 |
| Semester | 3 |
| Number of credits | 5 |
| Lecture | 15 hour |
| Семинар | 30 hour |
| IWSP | 7 |

**Almaty 2021**

Educational-methodical complex of the discipline is made by Dr., professor Saparbaev M.K.

Based on the working curriculum on the educational program "7M05109 – Biotechnology"

Considered and recommended at the meeting of the department of Molecular Biology and Genetics

from «15» June 2021, protocol № 37

Head of department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A.B. Lovinskaya

(Signature)

### Recommended by methodical Council of the faculty of Biology and Biotechnology

«19» Junet 2021, protocol № 18

Chairman of the Methodical Council of the faculty \_\_\_\_\_\_\_\_\_\_S.T. Nazarbekova (Signature)

**PREFACE**

**Short description:** DNA repair pathways, highlighting the cellular responses to ionizing radiation will be covered, including: base excision repair, mismatch repair, nucleotide excision repair, and DNA single strand and double strand break repair. The relationship of replication stress to genomic instability in a cancer context will also be covered, as well has human diseases of genomic instability and cancer predisposition. We will cover here the main DNA repair pathways including base excision repair, mismatch repair, nucleotide excision repair, and DNA single-strand and double-strand break repair. We will stress the mechanisms of non-homologous end-joining and homologous recombination repair. The topics of ATM and ATR dependent signaling, H2AX foci and roles of protein phosphorylation and protein ubiquitination, the Fanconi Anemia pathway, and the relationship of replication stress to the DNA damage response will be covered, as well has human diseases of genomic instability and cancer predisposition.

**Aim of course:** The learning objective here is for master students to gain an understanding of the major DNA repair pathways in eukaryotic cells, highlighting proteins involved in the cellular responses to ionizing radiation or anti-cancer chemotherapy.

As a result of studying the discipline Master students will be able to:

-To provide a solid understanding of the concepts and scientific methods of modern genetics as it applies to humans.

-To develop a better appreciation of the power and the limitations of a genetics-centric view of human biology and disease.

-To develop conceptual skills to address questions in genetics research and clinical practice

-To develop critical thinking with regard to news reports of advances in genetics and their social implications.

**Prerequisites:** "Biochemistry-1В22", "Genetics-Gen3419", "Molecular biology-1В118", "Special Practical for human cytogenetics-SPCytGch3505". "General and molecular genetics-1B210", "Basics of Development genetics -OGR 3506 ", "Genetic engineering-GI 3418".

**Post requisites:** Doctoral students can use this knowledge in solving specific scientific problems defense of the thesis