

DISCIPLINE SHEET**ACADEMIC YEAR****2022 - 2023****1. DATA ABOUT THE STUDY PROGRAM**

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| 1.1 Institution of higher education | UNIVERSITY OF MEDICINE AND PHARMACY OF CRAIOVA |
| 1.2 Faculty | MEDICINE |
| 1.3 Department | I |
| 1.4 Study Domain | HEALTH |
| 1.5 Study cycle | LICENCE |
| 1.6 Study program/ Qualification | Medicine |

2. DATA ABOUT THE DISCIPLINE

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| 2.1 DISCIPLINE NAME | MOLECULAR AND CELLULAR BIOLOGY | | |
| 2.2. Discipline code | MED1105 | | |
| 2.3 The holder of course activities | Mihai Ioana / Ioana Streață | | |
| 2.4 The holder of seminar activities | Mihai Ioana / Ioana Streață / Anca Costache / Răzvan Pleșea | | |
| 2.5. Academic degree | Professor / Lecturer /Assistant Prof. | | |
| 2.6. Employment (base norm/associate) | Base Norm / Associate | | |
| 2.7. Year of study | I | 2.8. Semester | II |
| | | 2.9. Course type (content) | |
| | | 2.10. Regime of discipline (compulsoriness) | CFD |

3. TOTAL ESTIMATED TIME (teaching hours per semester)

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|---|------------|-------------------------|-----------|-------------------------|-----------|
| 3.1 Number of hours per week | 5 | 3.2 From which - course | 2 | 3.3 seminary/laboratory | 3 |
| 3.4 Total hours in curriculum | 70 | 3.5 From which - course | 28 | 3.6 seminary/laboratory | 42 |
| Time found distribution (hours) | | | | | |
| Study by manual, course support, bibliography, and notes | | | | | 10 |
| Additional documentation in the library, specialized electronic platforms and, on the field | | | | | 23 |
| Training seminars / labs, homework, reports, portfolios, and essays | | | | | 10 |
| Tutoring | | | | | 12 |
| Examinations | | | | | 10 |
| Other activities, counselling, student circles | | | | | 15 |
| 3.7 Total hours of individual study | 80 | | | | |
| 3.9 Total hours per semester | 150 | | | | |
| 3.10 Number of credits ¹ | 6 | | | | |

4. PREREQUISITES (where appropriate)

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| 4.1 curriculum | The students must have good knowledge of anatomy, physiology, biochemistry and biophysics |
| 4.2 competency | - |

5. CONDITIONS (where appropriate)

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| 5.1. of course deployment | Lecture Hall with projector / online |
| 5.2. of seminary/ lab deployment | Physiology Lab / online. |

6. SPECIFIC COMPETENCES ACCRUED

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| PROFESSIONAL COMPETENCES | C1. Recognize the molecular mechanisms involved in pathological processes. |
| | C4. To address health problems / illness from the perspective of community features, directly related to the social, economic and / or that their cultural community. |
| | C5. To initiate and conduct a scientific research and / or format field of competence |

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| TRANSVERSAL COMPETENCES | <p>CT1. Autonomy and responsibility:</p> <ul style="list-style-type: none"> • acquisition of moral guidelines, training of professional and civic attitudes that enable students to be fair, honest, non-confrontational, cooperative and understanding in the face of suffering, available to help people interested in the developer community; • to know, respect and contribute to the development of moral values and professional ethics; • learn to recognize when a problem arises and provide responsible solutions to solve them. <p>CT2. Social interaction:</p> <ul style="list-style-type: none"> • recognize and have respect for diversity and multiculturalism; • have or learn to develop teamwork skills; • communicate orally and in writing requirements, working methods, results, consult with the team; • get involved in volunteering, to know the essential problems of the community. <p>CT3. Professional and personal development:</p> <ul style="list-style-type: none"> • appreciate the need for individual study as the basis of personal autonomy and professional development; • to exploit their potential to the optimum and creative collective activities; • know how to use information and communication technology. |
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7. DISCIPLINE OBJECTIVES (based on the grid of specific competences acquired)

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| 7.1 The general objective of the discipline | The objective of Cellular and Molecular Biology Course is to provide students in the 1 st year, informational and logistical support necessary to acquire knowledge on general concepts about cells, the molecular basis of cellular organization (structure and ultrastructure of eukaryotic cells) and cellular mechanisms of physiological and pathological. |
| 7.2 The specific objectives of the discipline | <p>On completion of training in this discipline the student will be familiar with the concepts and techniques of modern molecular and cellular biology: light and electron microscopy, cell culture, cell fractionation methods, spectrophotometry, RNA-DNA technology (PCR, Sequencing, Real-Time PCR), and can integrate knowledge of Cell Biology and Molecular notions gained from other disciplines.</p> <p>Thus, by following the discipline program, the student will be able to acquire:</p> <p>COGNITIVE SKILLS that will allow them:</p> <ul style="list-style-type: none"> • to integrate theoretical and practical knowledge gained from molecular and cellular biology discipline with those obtained from other disciplines fundamentals and use them as a platform for clinical training; • communicate clearly, rigorous knowledge gained and the results obtained; • to issue hypotheses and verify them by experimenting. <p>PRACTICAL SKILLS:</p> <ul style="list-style-type: none"> • organize the application of practical work: to form a team, share tasks, collaborate, communicate requirements, prepare materials, pursue a given protocol, record the results, communicating results, discuss them as a team; • use teaching materials and equipment specified in Cellular and Molecular Biology Laboratory; • using optical microscopy; • recognize electronic microscopy images; • isolate and evaluate nucleic acids to interpret PCR results, Real-Time PCR, ASO, RFLP, sequencing; • to interpret agarose gel electrophoresis and polyacrylamide gel for DNA samples. <p>ATTITUDE:</p> <ul style="list-style-type: none"> • to know, respect and contribute to the development of moral values and professional ethics; • recognize and have respect for diversity and multiculturalism; • have or learn to develop teamwork skills; • communicate orally and in writing requirements, working methods, results, consult with the team; • get involved in volunteering, to know the essential problems of the community. • to exploit their potential to the optimum and creative collective activities; • know how to use information and communication technology; • have initiative to engage in educational activities and scientific discipline. |

8. CONTENTS

| 8.1 Course (content units) | hours |
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| CB01. Introduction to the Cell. Cells and Genomes. The Universal Features of Cells on Earth. The Chemical Components of a Cell. The Diversity of Genomes and the Tree of Life. Genetic Information in Eucaryotes. The Shape and Structure of Proteins Protein Function. | 2 |
| CB02. Internal Organization of the Cell. Membrane Structure. The Lipid Bilayer. Membrane Proteins. | 2 |

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| CB03. DNA and Chromosomes. The Structure and Function of DNA. Chromosomal DNA and Its Packaging in the Chromatin Fiber. The Global Structure of Chromosomes | 2 |
| CB04. DNA Replication, Repair, and Recombination. The Maintenance of DNA Sequences | 2 |
| CB05. How Cells Read the Genome: From DNA to Protein. From DNA to RNA. From RNA to Protein. The RNA World and the Origins of Life | 2 |
| CB06. Control of Gene Expression. An Overview of Gene Control. DNA-Binding Motifs in Gene Regulatory Proteins. Posttranscriptional Controls | 2 |
| CB07. Membrane Transport of Small Molecules. Principles of Membrane Transport. Carrier Proteins and Active Membrane Transport. Ion Channels and the Electrical Properties of Membranes | 2 |
| CB08. Cell Junctions, Cell Adhesion, and the Extracellular Matrix. | 2 |
| CB09. The Cytoskeleton. The Self-Assembly and Dynamic Structure of Cytoskeletal Filaments. How Cells Regulate Their Cytoskeletal Filaments. Molecular Motors. The Cytoskeleton and Cell Behavior | 2 |
| CB10. Intracellular Compartments and Protein Sorting. The Compartmentalization of Cells. The Transport of Molecules between the Nucleus and the Cytosol. The Transport of Proteins into Mitochondria and Chloroplasts. Peroxisomes. The Endoplasmic Reticulum | 2 |
| CB11. Intracellular Vesicular Traffic. The Molecular Mechanisms of Membrane Transport and the Maintenance of Compartmental Diversity. Transport from the ER through the Golgi Apparatus. Transport from the Trans Golgi Network to Lysosome. Endocytosis. Exocytosis | 2 |
| CB12. Cell Communication. General Principles of Cell Communication. Signaling through G-Protein-Linked Cell-Surface Receptors. Signaling through Enzyme-Linked Cell-Surface Receptors. Signaling Pathways That Depend on Regulated Proteolysis | 2 |
| CB13. Energy Conversion: Mitochondria. The Mitochondrion. Electron-Transport Chains and Their Proton Pumps | 2 |
| CB14. The Cell-Division Cycle. The General Strategy of the Cell Cycle. An overview of M Phase. Mitosis. Cytokinesis | 2 |
| BIBLIOGRAPHY | |
| 1. Molecular Biology of the Cell Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter. Garland Science; 2015. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mboc4.TOC&depth=2 | |
| 2. Lectures | |
| 3. Link: Lectures – Cell and Molecular Biology: http://suportcursonline.umfcv.ro/CursuriOnline/Medicina/AN%201/BIOLOGIE%20CELULARA%20SI%20MOLECULARA/ | |
| 4. Harvey Lodish, Arnold Berk, et al. <i>Molecular Cell Biology, 8th edition</i> . New York: W. H. Freeman; 2016; http://www.ncbi.nlm.nih.gov/books/NBK21475/ | |
| 8.2 Practical work (topics / themes) | hours |
| LB01. Basic and advanced cellular and molecular biology techniques. Design and implementation of experiments. | 3 |
| LB02. Visualizing Cells. Looking at the Structure of Cells in the Microscope. Light and Electron Microscopy. Types of Microscopes and their uses. Visualizing Molecules in Living Cells. | 3 |
| LB03. Subcellular Fractionation. Methods used to disrupt the plasma membrane under conditions that do not destroy the internal components of the cell: sonication, grinding in a mechanical homogenizer, or treatment with a high-speed blender. Fractioning methods: differential centrifugation; ultracentrifugation; density-gradient centrifugation; velocity centrifugation. | 3 |
| LB04. Isolating Cells and Growing Them in Culture. Basic cell culture techniques. Culturing of cell lines. Cell lines and their growth, storage, and subculture. | 3 |
| LB05. Overview of DNA&RNA isolation procedures and applications. Quantity and quality assessment . Spectrophotometric analysis of nucleic acids. | 3 |
| LB06. Polymerase chain reaction I. Types of PCR methods, applications and optimization. RNA. | 3 |
| LB07. Polymerase chain reaction II. Types of PCR methods, applications and optimization. RNA. | 3 |
| LB08. Gel Electrophoresis. Principles. Types of gel most commonly used. Applications. | 3 |
| LB09. Molecular genetics methods for detecting mutations in human genes (Part I). Allele specific Oligonucleotides (ASO). Southern Blot. Real-Time PCR. Protein Truncation Test (PTT). PCR-RFLP (restriction fragment length polymorphism). Single Strand Conformational Polymorphism (SSCP). | 3 |
| LB10. Molecular genetics methods for detecting mutations in human genes (Part II). Nucleotide sequencing. Denaturing Gradient Gel Electrophoresis (DGGE). Heteroduplex analysis. DNA microarray technology. Denaturing high-performance liquid chromatography (DHPLC). | 3 |
| LB11. Methods to find deletions and duplications. CGH Array (Comparative Genomic Hybridization Array). MLPA (Multiple Ligation-dependent Probe Amplification). Quantitative Fluorescent Polymerase Chain Reaction (QF-PCR). SCAIP (Single Condition Amplification/ Internal Primer). | 3 |

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| LB12. Detection methods used for gene expression assays. Sample collection, transportation and storage. Procedures for Quality Control of RNA Samples. Reverse Transcription (RT) and cDNA Synthesis. Screening of gene expression signatures (microarray-based methods). Quantitative Real-Time PCR. | 3 |
| LB13. Paternity Testing and Human Identification by DNA typing. Detection of the infectious agents, assessment of patient response to treatment. Detection of genetically modified organisms (GMOs). | 3 |
| LB14. Labs Overview | 3 |
| BIBLIOGRAPHY | |
| <ol style="list-style-type: none"> Discipline protocols Molecular Biology of the Cell Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter. Garland Science; 2015. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mboc4.TOC&depth=2 <i>Link: Lectures – Cell and Molecular Biology:</i> http://supportcursonline.umfcv.ro/CursuriOnline/Medicina/AN%201/BIOLOGIE%20CELULARA%20SI%20MOLECULARA/ <i>Harvey Lodish, Arnold Berk, et al. Molecular Cell Biology, 8th edition. New York: W. H. Freeman; 2016;</i> http://www.ncbi.nlm.nih.gov/books/NBK21475/ | |

9. CORROBORATING THE DISCIPLINE CONTENT WITH THE EXPECTATIONS OF EPISTEMIC COMMUNITY REPRESENTATIVES, PROFESSIONAL ASSOCIATIONS AND EMPLOYEE REPRESENTATIVES RELATING TO THIS PROGRAM

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| <ul style="list-style-type: none"> Cell and Molecular Biology is a fundamental discipline, mandatory for a student in his preparation for becoming a doctor. The knowledges, practical skills and the attitudes learned on this discipline are offering the basics of the pathological processes that will be studied in other disciplines and it is the basis for comprehension and understanding and learning of every medical attitude regarding the prevention, diagnosis, curative and the recovery processes. |
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10. METHODOLOGICAL LANDMARKS

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| Types of activity | Techniques of teaching / learning, materials, resources: lecture, interactive group work, learning based problems / projects audio-video recordings, etc. |
| Course | In case of special situations (alert states, emergency states, other types of situations that limit the physical presence of people) the activity can be carried out online using computer platforms approved by the faculty / university. The online education process will be adapted accordingly to ensure the fulfilment of all the objectives set out in the discipline sheet. |
| Practical work | The following combined methods are used: lecture, debate, problematization. |
| Individual study | For the online version: lecture, debate, problematization based on materials provided in advance. |

11. RECOVERY PROGRAM

| | No. absences that can recover | Place of deployment | Period | In charge | Scheduling of topics |
|--|-------------------------------|---|----------------------------|-------------------------|---|
| Absences recoveries | 3 | Molecular and cellular biology laboratory | Final week of the semester | Teaching Assistant | According to the internal schedule |
| Schedule consultations / Students' Scientific Circle | 2 hours / week / teacher | Molecular and cellular biology laboratory | Every week | All teaching assistants | The theme of the week. |
| Program for students poorly trained | 2 hours / week | Molecular and cellular biology laboratory | Every week | All teaching assistants | According to the situation of each student Theme from that specific week |

12. ASSESMENT

| Activity | Types of assessment | Methods of evaluation | Percentage from final grade |
|-----------------------|---|--|-----------------------------|
| Lecture | Formative assessment through essays, projects and surveys during the semester Summative assessment during the exam | Multiple Choice Questions Answering System (MCQ)/MCQ with the help of the IT platform in the online version. | 60% |
| Practical work | Formative assessment through Multiple Choice Questions Answering System (MCQ) or/and descriptive, projects, | Multiple Choice Questions Answering System (MCQ) simultaneously with the one | 20% |

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|---|--|--|--------------------------------------|
| | survey during the semester. Periodic assessment during the semester Summative assessment during the exam | from the course / with the help of the video platform in the online version. | |
| Periodic assessment | | | 10% |
| Assessment of individual activity | | | 10% |
| Minimum performance standard | At least 50% for each component of the evaluation | | |
| 13. GUIDANCE AND COUNSELLING PROGRAMS | | | |
| Professional guidance and counselling programs (2 hours/monthly) | | | |
| Scheduling the hours | Place of deployment | | In charge |
| Last Thursday of each month, 12-14 | Molecular and cellular biology laboratory | | All the members of the teaching team |

Endorsement date in the department: 01.09.2022

**Department Director,
Prof. Ion MÎNDRILĂ**

**Coordinator of study program,
Prof. Marius Eugen CIUREA**

**Discipline holder,
Prof. Ioana MIHAI**