**SYLLABUS**

1. **Programme Details**

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| **1.1.** | **GRIGORE T. POPA UNIVERSITY OF MEDICINE AND PHARMACY IASI** | | | | | | | |
| **1.2.** | **FACULTY : MEDICINE / DEPARTMENT: MORPHOFUNCTIONAL SCIENCES II** | | | | | | | |
| **1.3.** | **DISCIPLINE: CELLULAR AND MOLECULAR BIOLOGY** | | | | | | | |
| **1.4.** | **FIELD of STUDY:** **HEALTH** | | | | | | | |
| **1.5.** | **STUDY CYCLE: BACHELOR** | | | | | | | |
| **1.6.** | **PROGRAMME of STUDY: Medicine - English** | | | | | | | |
| 1. **Discipline Details** | | | | | | | | |
| **2.1.** | **Name of the Discipline: CELLULAR AND MOLECULAR BIOLOGY** | | | | | | | |
| **2.2.** | **Teaching staff in charge with lectures:** Prof.Univ.Dr. Elena Carmen Cotrutz | | | | | | | |
| **2.3.** | **Teaching staff in charge with seminar activities: Prof.Univ.Dr.Carmen Elena Cotrutz, Asist.dr.Laura Stoica, Asist.Univ.Dr.Ana Emanuela Botez, Asist.Univ.Dr.Pavel Onofrei, Asist.Univ.dr.Vasile Bogdan Grecu** | | | | | | | |
| **2.4. Year** | | **I** | **2.5. Semester** | **I/II** | **2.6. Type of evaluation** | E1/E2 | **2.7. Discipline regimen** | **Compulsory** |

1. **Overall Time Estimates (hours/semester of didactic activity)**

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| * 1. **Number of hours per week** | 4 | **Of which: 3.2. lectures** | | 2 | * 1. **seminar/ laboratory** | 2 |
| * 1. **Total hours in the curriculum** | 52 | **Of which: 3.5. lectures** | | 24 | **3.6. seminar/ laboratory** | 28 |
| **Distribution of time** |  |  | |  |  | Hours |
| **Study time using coursebook materials, bibliography and notes** | | | | | | 30 |
| **Further study time in the libray, online and in the field** | | | | | | 10 |
| **Preparation time for seminars / laboratories, homework, reports, portfolios and essays** | | | | | | 25 |
| **Tutoring** | | | | | | 5 |
| **Examinations** | | | | | | 3 |
| **Other activities** | | | | | | 0 |
| **3.7. Total hours of individual study** | | |  | | | 73 |
| **3.8. Total hours / semester** | | |  | | | 125 |
| **3.9. Number of credits** | | |  | | | 5 |

1. **Prerequisites (where applicable)**

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| **4.1. curriculum** | It’s not necessary |
| **4.2. competences** | It’s not necessary |

1. **Conditions (where applicable)**

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| **5.1. for lecture delivery** | Lecture hall, equipped with whiteboard and laptop, videoprojector and suitable software – Power Point |
| **5.2. for seminar / laboratory delivery** | Seminar room, equipped with whiteboard and laptop, videoprojector and suitable software – Power Point |

1. **Specific Competences Acquired**

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| **Professional Competences (knowledge and skills)** | * Basic cell and molecular techniques for cell study * Microscopy techniques - light and electron microscopy, biologic sample preparation * General aspects regardig cell and its organelles in light and electron microscopy * Performing and staining ice and paraffin thin sections * Blood smear preparation and interpretation |
| **Transversal Competences (roles, personal and professional development)** | * Knowledge morphofunctional aspects of cellular and molecular relevant to medical practice * interpretation of structure and cellular functions in molecular terms * identifying ways and knowledge of the molecular mechanisms modulating intracellular and / or intercellular communication |

1. **Obiectives of the Discipline (related to the acquired competences)**

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| **7.1. General Obiective** | Understanding the cellular and molecular mechanisms with broad medical implications, theoretical and applied |
| **7.2. Specific Obiectives** | 1. understanding cell and subcellular universe regarding human body  2. knowledges regarding the structure and function for cell and substructres  3. basic knowledge regarding pathology involvment for cell structures and their main functions |

1. **Contents**

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| **8.1. Lecture** | **Teaching methods** | **Comments** |
| 1. **Introduction to cell and molecular biology**.   Definitions. Study object. Importance for medicine. Ge-neral organization of the cells: prokaryotes, euka-ryotes. | Video support. Interactive problem based lectures baed on rich content multimedia prsentations | 1h |
| 1. **Cell cover.** Cell membrane classify-cation,   mem-âbrane model; molecular structure of cell mem-brane; molecular asymmetry for cell membranes, glyco-calyx | Video support. Interactive problem based lectures baed on rich content multimedia prsentations | 2h |
| 1. **Cell membrane functions (I).** Molecular biology   of cell membrane transport – general aspects, patholo-gical aspects | Video support. Interactive problem based lectures baed on rich content multimedia prsentations | 1h |
| 1. **Cell membrane functions (II).** vesicular trans-   port (exocytosis, endocytosis, transcytosis) LD internali-zation, pathological aspects | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 1h |
| 1. **Cell membrane functions (III)** intercellular sig-   naling and information interchange (ways of interce-llular signaling, signal molecules, paracrin signaling, endocrine signaling, neurocrin signaling, autocrine signa-ling, cell receptors) | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 1h |
| 1. **Cell membrane functions (IV)**- information   exchange via polypeptide and steroid hormones. | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 2h |
| 1. **Cytoskeleton, the molecular support for cell**   **motility**: classification, general structure, actin and associated molecules: actin-myosin interaction. Mi-crotubules. Intermediate filaments, cytoskeleton func-tions | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 2h |
| 1. **Cell membrane specializations at apical and**   **basal pole**. Morphological , molecular and pathological aspects for microvillia, cilia and stereocilia. | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 1h |
| 1. **Cell adhesion and extracellular matrix.**   Junctional proteins, cell-cell and cell-matrix inter-actions. Cell junctions in pathology. Extracellular matrix and its functions in tissue organization. | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 2h |
| 1. **Nucleus in interphase**. General aspects,   molecular structure. Nuclear membrane molecular structure. Chromatin and nucleolus structure. Interchro-matin space. | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 1h |
| 1. **Cellular synthesis and secretion organelles**:   cellular synthesis and secretion vesicles traffic. Riboso-mes, reticulum and Golgi apparatus and proteogenesis | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 3h |
| 1. **Energy generating organelle:** mitochondria and   molecular biology of respiratory chain. **Apoptosis:** ge-neral presentation; programmed cell death concept. Apoptosis issuing circumstances; Molecular mechanisms of apoptosis. Morphological and molecular characte-ristics of apoptotic cells. | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 2h |
| 1. **Cellular digestion organelles**: lisosomes and   peroxisomes; implica-tions in pathology | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 1h |
| 1. **Cell cycle:** generalities regarding cell cycle, cell   cycle horologe control. Interphase, mitotic cell division. Reductional cell division (mitosis)**.Cell senescence**: ge-neral presentation; cell senescence and general aging of the organisms; morphologic and molecular characte-ristics for senescent cells; theories regarding cellular aging **Molecular biology of the tumor cell** | Video support. Interactive problem based lectures baed on rich content multimedia presentation | 4h |
| **Bibliography**  1. Alberts B., et all - *Molecular Biology of the Cell*, 5th Edition, 2009  2. Cotrutz C., Cotrutz C.E. - *Cell and Molecular Biology, Course*, 1997  3. Steven R. Goodman – *Medical Cell Biology,* Third Edition, 2015  4. Gerald Karp - *Cell and Molecular Biology*, 7th Edition, 2013 | | |
| **8.2. Seminar / Laboratory** | **Teaching methods** | **Comments** |
| 1. **Imaging techniques in cell and**   **molecular biology**: the light microscope, fluorescence microscopy, phase contrast microscopy, polarized light microscopy | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Electron microscopy (I)**: classi-   fication. Transmission electron microscope TEM, SEM and other electron microscopes | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Electron microscopy (II)** methods   for tissue processing regarding examination in TEM | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Special techniques in cell and**   **molecular biology** – cell cultures, cryofrac-ture, ultracentrifugation and cell fractio-ning, chromatography electrophoresis and DNA separation, PCR | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Fine sectioning method**   (prelevation, fixation, embedding mate-rials, sectioning, section spreading, slide mounting) | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Ice sectioning**, **criotome**   (technique, indications). | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Staining and their mechanisms**:   paraffin and ice sections staining; vital stai-ning of cells and organelles | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Smear technique:** blood smear   CBC, WBC count, blood cells morphology and staining | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Citochemistry and IHC:** glycogen   leukocyte, peroxidase, nucleic acids evidentiation | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Cellular and nuclear morphology**   **in light and electronic microscopy**: cell and nucleus shape, size, number | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Cell membrane speciali-sations**   **aspects in light and electron microscopy** | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Cell organelles for synthesis and**   **secretion**, **digestion and energy generation**: aspects in light and electron microscopy | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Methods for cell division study**.   Cell division in light and electron microscopy | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| 1. **Cell and molecular biology**   **methods for identification and quantifi-cation of cell viability.** | Labs are developed in workgroups that compare and evaluate experimental data obtained following guided and supervised labwork | 2h |
| **Bibliography**  1. Alberts B., et all - *Molecular Biology of the Cell*, 5th Edition, 2009  2. Cotrutz C., Cotrutz C.E. - *Cell and Molecular Biology, Course*, 1997  3. Steven R. Goodman – *Medical Cell Biology,* Third Edition, 2015  4. Gerald Karp - *Cell and Molecular Biology*, 7th Edition, 2013 | | |

1. **Correlations between the contents of the discipline and the expectations of the epistemic community, of profesional associations and of employers in the field**

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| The Cellular and Molecular Biology offers an interdisciplinary perspective on cellular and molecular mecanisms based on the latest research important for better medical practice |

1. **Evaluation**

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| **Type of activity** | **10.1. Evaluation criteria:** | **10.2. Methods of evaluation** | **10.3. Percentage of final grade** |
| **10.4. Lecture** | Grade for multiple choice test | standardized multiple choice test | 50% |
| **10.5. Seminar / Laboratory** | Average grade of ongoing examinations | ongoing evaluation | 10% |
| Grade for practical examination | practical exam | 40% |
| **Minimum standard of performance: at least grade 5 to pass the discipline**   * Working with light microscope; knowledge on fluorescence microscopy, phase contrast microscopy and polarized light microscopy. * Performing a permanent microscopic sample: Tissue harvesting, processing, fixing, washing, paraffin embedding, sectioning, staining by haematoxillin-eosin, mounting, identification for cell structures, cell shapes and nucleus shapes. * Ice sectioning and staining by toluidine blue. * Performing a blood smear, staining by May-Grümwald-Giemsa; identification of RBCs and WBCs on the blood smear; normal total cell blood count (CBC). * Transmission electron microscopy – principles and tissue processing for this microscope: Identification of cell organelles and structures on TEM and SEM micrographs | | | |

**Date:**

**11.10.2019 Signiture of Didactic Co-ordinator**

**Prof. Univ. Dr. Carmen Elena Cotrutz**

**Signiture of Department Director Prof. Univ. Dr. Carmen Elena Cotrutz**