**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**
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| **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
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| **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
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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 body2. knowledges regarding the structure and function for cell and substructres3. 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, 20092. Cotrutz C., Cotrutz C.E. - *Cell and Molecular Biology, Course*, 19973. 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, 20092. Cotrutz C., Cotrutz C.E. - *Cell and Molecular Biology, Course*, 19973. 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
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**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**