**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | School of Health Sciences | | | | |
| **ACADEMIC UNIT** | Department of Biological Applications and Technology | | | | |
| **LEVEL OF STUDIES** | Undergraduate | | | | |
| **COURSE CODE** | ΒΕΥ306 | **SEMESTER** | | **4th** | |
| **COURSE TITLE** | Cell Biology | | | | |
| **INDEPENDENT TEACHING ACTIVITIES** *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | | | **WEEKLY TEACHING HOURS** | | **CREDITS** |
| Lectures and Practicals | | | 5 | | 6 |
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| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |  | |  |
| **COURSE TYPE**  *general background,  special background, specialised general knowledge, skills development* | Special background (obligatory) | | | | |
| **PREREQUISITE COURSES:** | No | | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek | | | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | No | | | | |
| **COURSE WEBSITE (URL)** |  | | | | |

1. **LEARNING OUTCOMES**

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| **Learning outcomes** | |
| *The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*  *Consult Appendix A*   * *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* * *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* * *Guidelines for writing Learning Outcomes* | |
| Cell Biology describes and explains the structure and function of the cell and basic cellular processes such as the cell cycle, cell communication and cell death, with an emphasis on the animal cell.  Upon successful completion of the course, students (1) will possess the basic principles of cell biology, cellular processes and structures, (2) will have acquired skills related to the observation of cellular structures and the analysis of research experiments, and (3) will have acquired the ability to design scientific experiments, to answer research questions and to understand the results of scientific research on cell biology. | |
| **General Competences** | |
| *Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?* | |
| *Search for, analysis and synthesis of data and information, with the use of the necessary technology*  *Adapting to new situations*  *Decision-making*  *Working independently*  *Team work*  *Working in an international environment*  *Working in an interdisciplinary environment*  *Production of new research ideas* | *Project planning and management*  *Respect for difference and multiculturalism*  *Respect for the natural environment*  *Showing social, professional and ethical responsibility and sensitivity to gender issues*  *Criticism and self-criticism*  *Production of free, creative and inductive thinking*  *……*  *Others…*  *…….* |
| Search for, analysis and synthesis o data and information, with the use of the necessary technology.  Working independently.  Team work.  Working in an international environment.  Criticism and self-criticism.  Production of free, creative and inductive thinking. | |

1. **SYLLABUS**

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| Evolution Abiotic origin of life, from biomolecules to cells, membrane formation, biomolecule reproduction, evolution of the eukaryote, endosymbiosis theory.  Membranes Membrane function, molecular composition, membrane proteins, fluid mosaic model, amphipathic lipids, membrane fluidity, lipid rafts, liposomes.  Microscopy History of microscopy, optical microscope, fluorescence microscopy, immunofluorescence, Green Fluorescent Protein, FRET, FRAP, confocal microscopy, dark field microscopy, phase-contrast microscopy, transmission electron microscopy, Scanning electron microscopy.  Transmembrane Transport Electrochemical gradient, ways of moving substances through membranes: Diffusion-assisted diffusion-active transport, pumps, cystic fibrosis, membrane potential, nerve cell potential, Putch clamping.  Experimental Methods Plasmid cloning, dominant-negative forms, RNA interference (RNAi), differential centrifugation to separate cell components, protein separation by chromatography, protein separation by electrophoresis, Western blotting, Immuno-precipitation.  Protein Targeting and Transfer - Membrane System Ribosomes, protein targeting and transport, membrane system, endoplasmic reticulum, Golgi complex, ER protein binding sequences, major post-translational modifications, lysosomes, endocytosis.  Self-replicating systems Mitochondria, electrochemical proton gradient, electron transfer, oxidative phosphorylation, ATP synthase, chloroplasts, photosynthesis, genetics, protein transfer into mitochondria, peroxisomes.  Nucleus Nuclear envelope, nuclear lamina, nuclear pore complex, pore transport, nuclear membrane breakdown, nucleus assembly, genetic material organization, chromatin, telomeres, centromere - kinetohore, nucleosome, histones, chromatin organization levels, nucleolus.  Cytoskeleton Microtubules, microtubule polymerization, microtubule organizing centers, centrosomes, microtubule motor proteins, flagella movement, actin cytoskeleton, myosin, skeletal muscle actomyosin contraction, cytokinesis, cellular motion, intermediate filaments.  Cell Cycle Cell cycle stages, cell cycle checkpoints, MPF, cyclins, cell cycle mutation studies, cyclin dependent kinases, E3 ligases, role of cell cycle kinases, FACS.  Mitosis Stages of mitosis, Cyclin B-CDK1 activation, centrosome cycle, nuclear envelope breakdown, mitotic spindle, Cohesins and Condensins, chromosome segregation, spindle assembly checkpoint, cytokinesis.  Cellular Communication Signal transduction, forms of cell signaling, hormones, local mediators, neurotransmitters, cell response to a received message, intracellular signaling pathways, extracellular control of cell number and size, mitogens, growth factors, survival factors.  Cell death Necrosis, apoptosis, apoptosis detection techniques, caspases, Bcl-2 family, mitochondrial pathway, death receptor pathway.  Laboratory Practicals 1. Immunofluorescence Immunofluorescence protocol: Fixing-permeabilization-blocking in somatic cell samples, use of primary tubulin antibodies, fluorescent secondary antibodies (AlexaFluor 488) and Hoechst staining for DNA observation.  2. Fluorescence Microscopy Inverted Fluorescence Microscope mode of action (microscope modules, fluorescence process). Observation of the fixed cells from the first practical. Monitoring of the different stages of the cell cycle (interphase and all stages of mitosis) by simultaneous observation of microtubules (tubulin-green fluorescence) and chromosomes (DAPI-blue fluorecence).  3. Observation of live cell fluorescence experiments Computer observation, live cell fluorescence experiments during different cellular functions (division, movement, secretion, etc.) where different organelles and cellular structures have been stained.  4. Analysis of fluorescence experiments Observation of digital cell images with differential fluorescent staining in cytoplasm and nucleus. Fluorescence measurement and analysis with fluorescence imaging software. |

1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **DELIVERY** *Face-to-face, Distance learning, etc.* | Face-to-face in a Lecture Theatre. |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* | Use of ICT in laboratory education.  Educational support through the electronic platform e-course. |
| **TEACHING METHODS**  *The manner and methods of teaching are described in detail.*  *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*  *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS* | |  |  | | --- | --- | | ***Activity*** | ***Semester workload*** | | Lectures | 39 | | Laboratory practicals | 12 | | Study hours | 91 | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | | Course total | ***142*** | |
| **STUDENT PERFORMANCE EVALUATION**  *Description of the evaluation procedure*  *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other*  *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | Student performance is evaluated by a written examination. |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:*  *- Related academic journals:*  Alberts B.,Bray D.,Hopkin K.,Johnson A.,Lewis J.,Raff M.,Roberts K.,Walter P. Essential Cell Biology,2006, Broken Hill Publishers LTD, ISBN: 978-960-489-276-1. |