**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** | ΒΕΥ605 | **SEMESTER** | | **5** | |
| **COURSE TITLE** | Developmental 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 | | 5 |
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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* | |
| Developmental Biology describes and explains the main processes that take place during the development of an organism from gametogenesis and fertilization to the development of the embryo. A multitude of organisms from insects to humans is examined.  Upon successful completion of the course, the students (1) will possess the basic principles of developmental biology, (2) they will have acquired skills related to the microscopic observation and distinction between different developmental stages in different organisms and(3) will have acquired the ability to design scientific experiments, to answer research questions and to understand the results of scientific research on developmental 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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| Meiosis Cell cycle, 1st and 2nd meiotic cell divisions, haploid-diploid gametes, incorrect chromosome segregation-aneuploidy, spindle assembly complex in meiosis.  Gametogenesis Progenitor germ cells (origin and characteristics), stem cell migration, gonadal development, gonadotropins-steroid hormones, spermatogenesis-spermiogenesis, ovulation-oocyte growth, germ cells, gametes, adult ovary stem cells.  Sex Determination Alfred Jost experiments, meiotic destiny of germ cell, retinoic acid, meiotic destiny inhibitor, SRY transcription factor, gonadal differentiation, other sex determinants.  Recombination Homologous recombination, stages of meiotic prophase, bouquet of chromosomes,Synapsis-Synaptic complex, experimental observation of recombination, mitotic recombination.  Fertilization Preparation for fertilization, sperm capacitation, acrosomal reaction, zona pellucida, fusion of oocyte and spermatozoon, oocyte activation, cortical granulation exocytosis, resumption of the cell cycle, calcium oscillations, embryogenesis protein: PLCζ, egg-specific factors regulating metaphase II arrest and resumption of meiosis.  Early embryonic development Cleavage, blastomeres, maternal effect stage, embryonic genome activation, meroblastic-holoblastic cleavage, cell fate delineators, C. elegans, Drosophila, Xenopus, Zebrafish.  Pre-implantation embryonic development Cleavage, morula, blastocyst, blastocoel, inner cell mass, trophectoderm, totipotent-pluripotent embryonic cells, microenvironment and cell fate, polarity, cell fate determinants, asymmetric early embryonic divisions.  Embryonic Developmental Biology Applications - Stem Cells Embryonic stem cells, embryonic stem cell differentiation, knock-out, knock-in, conditional knock-out, cloning, induced stem cells.  Epigenetics Differentiation of gene expression-transcriptional regulation, methylation and histone acetylation, DNA methylation, genomic imprinting, androgenetic-parthegenetic embryos, IGF2 and IGF2 receptor, X chromosome inactivation, Xist gene.  Gastrulation-Organogenesis Germ layers: ectoderm-mesoderm-endoderm, gastrulation in different vertebrates , epiboly, implantation of mammalian embryo, pathogen, trophoblast, notochord, Hensen’s node, neural crest, somitogenesis and myogenesis, origin and development of the limbs, Intestinal tract.  Segmentation/Metamerism-Hox Genes Embryogenesis in Drosophila, segmentation, morphogens , segment polarity genes, mutagenesis, gap genes, pair rule genes, homeobox, Hox genes in Drosophila and mammals, gene expression regulation.  Laboratory Practicals 1. Mammalian early embryo development Observation of stages of oocyte growth in the mouse. Observation of the stages of early (pre-implantation) embryo development in the mouse.  2. Embryonic development in fish Observation of zebrafish (Danio rerio) embryos. Fixed embryo samples from the cleavage stages to the 5-6 days old larva.  3. Embryonic development in amphibians Observation of embryos of the frog Xenopus laevis. Fixed embryo samples from the early stages of cleavage to the larva stages. Mutated embryos with developmental abnormalities will also be observed.  4. Study of the Segmentation in Drosophila Use of interactive computer educational programs. |

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 | 74 | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | | Course total | ***125*** | |
| **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:*  Slack J.M.W. Essential Developmental Biology, 2nd Edition. |