**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | Health Sciences | | | | |
| **ACADEMIC UNIT** | Biological Applications and Technology | | | | |
| **LEVEL OF STUDIES** | Undergraduate | | | | |
| **COURSE CODE** | **ΒΕΕ905** | **SEMESTER** | | **9th** | |
| **COURSE TITLE** | High-Throughput Biomolecular Data Analysis | | | | |
| **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** |
|  | | | 3 | | 3 |
|  | | |  | |  |
| *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* | Specialised general knowledge | | | | |
| **PREREQUISITE COURSES:** | BEE832 (former BEY804) - Bioinformatics | | | | |
| **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* | |
| Advance students in current concepts and tools of Bioinformatics and expand their knowledge regarding the structure and analysis of high-throughput datasets obtained from microarrays and NGS experiments. Additionally, introduce students to the R language and particularly in Bioconductor, which is an essential tool for software development in the field. | |
| **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 of data and information, with the use of the necessary technology  Working independently  Working in an interdisciplinary environment  Production of new research ideas  Production of free, creative and inductive thinking | |

1. **SYLLABUS**

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| Course Theory: Variables, operators and data. Data types and frames. Dataset factors and manipulation. Graphical procedures. Machine learning. Processing of genomic data. Biological data annotation and visualization. Statistical analysis of omics data. Graphs and networks. Other case studies of high-throughput datasets.  Laboratory Exercises: Data I/O in R. Biological data retrieval and processing. Bioconductor. Clustering and classification. Biological networks. Analysis of differential gene expression. Gene set enrichment analysis. Tuxedo suite. |

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

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| **DELIVERY** *Face-to-face, Distance learning, etc.* | Computers laboratory |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* | **Yes** |
| **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 | 13 | | Laboratory practice | 24 | | Project | 16 | | Study hours (theory) | 13 | | Study hours (laboratory) | 24 | |  |  | | Course total | ***90*** | |
| **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.* | Short-answer questions  Problem solving  Written work  Laboratory work |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:*  *- Related academic journals:*  C. Nikolaou, Data analysis with R, Disigma publications, 2019  R. Gentleman, V.J. Carey, W. Huber, R.A. Irizarry, S. Dudoit, Bioinformatics and Computational Biology Solutions Using R and Bioconductor, Springer New York, 2005  F. Hahne, W. Huber, R. Gentleman, S. Falcon, Bioconductor Case Studies, Springer New York, 2008 |