COURSE OUTLINE "BIOINFORMATICS"

1. GENERAL

SCHOOL	HEALTH SCIENCES		
DEPARTMENT	MOLECULAR BIOLOGY AND GENETICS		
LEVEL OF STUDIES	ISCED LEVEL 6		
COURSE CODE	**MBG304**	**SEMESTER**	5th
COURSE TITLE	BIOINFORMATICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**HOURS/WEEK**	**ECTS CREDITS**
	4	5

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	SCIENTIFIC AREA
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	GREEK ENGLISH FOR ERASMUS STUDENTS
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.duth.gr/courses/ALEX01101/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The thematic units of the course aim at:
(a) Understanding the basic principles of Bioinformatics.
(b) Understanding the basic Bioinformatics algorithms.
(c) The acquisition of the ability to solve biological problems through use tools.

Learning results
Upon successful completion of the course, students will be able to:

- Know the fundamental principles of Bioinformatics,
- Understand and apply basic Bioinformatics algorithms,
- Analyze biological sequence data and interpret results of basic Bioinformatics algorithms,
- Propose solutions to problems / questions of Bioinformatics by formulating assumptions and designing appropriate algorithmic / methodological approaches.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Analysis and synthesis of data and information
- Develop the ability to apply knowledge to solve practical problems
- Development of research skills
- Promotion of autonomous work
- Development of criticism and self-criticism
- Production of new research ideas
- Promoting free, creative and inductive thinking
- Development of ability to evaluate and maintain the quality of work at a high level
- Knowledge related to the working environment and the real working conditions in
- Molecular Biology / Genetics with emphasis on Bioinformatics

3. COURSE CONTENT

1. Computational applications in Biology, definitions - Bioinformatics as a tool and scientific field of research
2. Algorithms, programs, the importance of the internet.
3. Databases: Structure and search of data/knowledge, the most well-known databases.
4. Evolution and Conservation of biological sequences. Scoring tables (PAM, BLOSUM).
5. Global and local alignment of two biological sequences - Optimal matching algorithms
6. Heuristic algorithms - the algorithms used in the BLAST and FASTA programs.
7. Multiple Sequence Alignment - Problems, algorithms, and widely used programs.
8. Phylogenetic trees - Definitions, tree forms, algorithms for creating trees through multiple sequence alignment.
9. Predicting open reading frames, identification and characterisation of gene loci - Peculiarities and problems.
10. Protein patterns and domains - Identification, search, databases, and search tools.
11. Identification and prediction of gene expression regulatory elements- applications, features and problems.
12. Computational methods of gene expression analysis: cDNA microarrays, RNA sequencing - Problems algorithms, programs.
13. Applications of Bioinformatics in Functional Genomics.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Computational Laboratory Education Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	***Activity*** ***Workload/semester*** Lectures 50 Bibliographic research & analysis 40 Laboratory Exercise 40 Tutoring 20 **Course Total** **150**
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Assessment language:** Greek, English **Evaluation methods:** I. Written test (80%) which includes: - Multiple choice questions - Partial development questions II. Written reports and exercises (20%)

5. SUGGESTED BIBLIOGRAPHY

1. Bioinformatics and Functional Genomics (2018). Jonathan Pevsner
2. Bioinformatics (2015), Pantelis Bagos
3. Bioinformatics: Possibilities and Perspectives (2008), Sofia Kossida.
4. Computational Biology (2015), Christoforos Nikolaou.
5. Bibliography recommendation: accessible articles and reviews via Web.
6. Recommendation of educational websites.