COURSE OUTLINE

BIOINFORMATICS

1. GENERAL

SCHOOL	CLASSICS AND HUMANITIES		
DEPARTMENT/UPS	HUMANITIES / DIGITAL APPLICATIONS IN ARTS AND CULTURE		
LEVEL OF STUDIES	UNDERGRADUATE – LEVEL 6		
COURSE CODE	**XXXXX**	**SEMESTER**	6TH
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.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

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

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.

Upon successful completion of the course, participants will be able to:

1. Understand the fundamental concepts of bioinformatics and use basic bioinformatics tools.
2. Work with programming languages such as Python for data analysis and visualization.
3. Perform sequence alignments and analyse phylogenetic relationships between organisms.
4. Use biological databases to retrieve information.
5. Analyse next-generation sequencing (NGS) data.
6. Apply algorithms for genetic data analysis.

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

- Search, analysis and synthesis of data and information, utilizing necessary technologies
- Adaptation to new situations
- Promoting free, creative and inductive reasoning

3. COURSE CONTENT

1	Introduction to Bioinformatics	• Familiarization with the students and presentation of the course objectives, expected learning outcomes, and requirements

		• Historical overview of bioinformatics • Importance of bioinformatics and its interdisciplinary nature
2	Introduction to Linux I	• Familiarization with the Linux environment • Basic commands for file navigation and editing
3	Introduction to Linux II	• Installation and execution of programs for bioinformatics analyses
4	Biological Databases	• Introduction to basic biological databases (NCBI, Ensembl, SWISS-MODEL, ENCODE, etc.) • Data retrieval from the databases • Understanding types of data storage files
5	Introduction to Programming with Python	• Installation and basic elements of Python • Variables, data types, functions
6	Introduction to Programming with Python	• Reading files • Data visualization
7	Probability Theory and Statistics	• Random Variables • Distributions • Hypothesis Testing • Probability Theory
8	Algorithms in Bioinformatics	• Types of Algorithms • Sequence Alignment Algorithms • Sequence Similarity Algorithms • Dimensionality Reduction Algorithms
9	Python for Bioinformatics Analysis	• Biopython Package • Sequence Analysis • Simulations
10	Sequence Alignment	• Basic Theory and Methods for Sequence Alignment • Tools for Aligning DNA, RNA, and Proteins
11	Phylogenetics	• Basic Principles of Phylogenetic Tree Construction • Methods and Tools for Inferring Evolutionary Relationships (e.g., PhyML)
12	Analysis of Next-Generation Sequencing Data	• Introduction to Next-Generation Sequencing (NGS) • Processing and Analysis of Large-Scale Data • Tools for NGS Data Analysis (e.g., FastQC, BWA, GATK)
13	Recap	• Recap and resolving questions • Student feedback

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*	PowerPoint presentations Interactive Platforms for Practical Application Teaching material, announcements and communication through the eClass platform Student study of supplementary material related to course content Communication with students via email
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,*	

Activity	***Workload/semester***
Lectures	26
Laboratory Exercise	13
Essay	30
Weekly projects/tasks	38
Study and analysis of	40

project. Etc. *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	bibliography | Written examination | 3 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*	Formative Final written examination (Multiple choice): 100% Oral examination upon student's request.

5. SUGGESTED BIBLIOGRAPHY

Teaching Aids

Κοσσιδά Σοφία (2008) Βιοπληροφορική, Δυνατότητες και Προοπτικές. Εκδόσεις Νέων Τεχνολογιών ISBN: 978-960-9309-60-8

In addition, scientific articles from high-impact journals from the last decade will be used

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	XXXXXXXX
Contact details:	XXXXXXXX
Supervisors:	YES
Evaluation methods:	Weekly projects/tasks: 40% Essay (mandatory): 30% Final written examination: 30%
Implementation Instructions:	The written assessments and the final examination will be conducted via eClass on a date and time that will be announced along with their duration and content in a reasonable time prior to their occurrence. The assignment will be submitted via eClass by a specified date.