COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF HEALTH SCIENCES		
DEPARTMENT	MBG / APPLIED BIOINFORMATICS - BIOLOGICAL DATA ANALYSIS		
LEVEL OF STUDIES	ISCED 7 - Masters degree or equivalent tertiary education level		
COURSE CODE	**AB104**	**SEMESTER**	**2ND**
COURSE TITLE	Applications of Bioinformatics and Data Analysis		

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**
	5	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, Skill Development
PREREQUISITES:	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE URL:	https://eclass.duth.gr/courses/ALEX01341/

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.

After successfully completing the course, participants will be able to:

- know the most modern computational tools required for the analysis of biological data,
- design appropriate bioinformatic analyses and utilize data processing tools in computational problems and applications related to the three-dimensional structure of biological macromolecules (e.g., proteins and nucleoprotein complexes), annotation of unknown genomes, organization of the immune system, single-cell RNA-seq analysis, barcoding and metabarcoding in environmental samples, use of NGS results in clinical diagnostics, and federated machine learning for handling sensitive data.
- work in interdisciplinary teams to address computational problems in biology and
- tackle practical issues that arise during bioinformatic analyses

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

- Searching, analyzing and synthesizing data and information, using the necessary technologies
- Generating new research ideas

- Designing and managing projects
- Respecting the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Promoting free, creative and inductive thinking
- Teamwork
- Independent work
- Exercising criticism and self-criticism
- Working in an interdisciplinary environment
- Adapting to new situations

3. COURSE CONTENT

The course includes a series of hands-on exercises that provide practical training in fundamental techniques for biological data analysis. These include methodologies for determining and analyzing the three-dimensional structure of biological macromolecules, analysis of unknown genomes, immunoinformatics, single-cell RNA-seq analysis, metabarcoding analysis for microbiome studies in environmental samples, NGS applications in clinical diagnostics, machine learning applications in "Omics," and the implementation of Federated Machine Learning models for protected data in the healthcare sector.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD
Face to face, Distance learning, etc.

Face to face, project work, distance learning

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students

Use of ICT in Teaching, in Communication with students

- Digital slides
- Computer room
- VR room
- Video
- MsTeams/ e-class, webmail

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	56
Exercises	30
Final project	30
Bibliographic research & analysis	30
Exams	4
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

Student evaluation languages : Greek

Method : Formative

Student evaluation methods :

- Homework (problem solving, written assignment, Essay/report, presentation in audience) : 35%
- Laboratory Report, presentation in audience, oral exam: 65%

5. SUGGESTED BIBLIOGRAPHY

- ΑΝΑΛΥΣΗ ΔΕΔΟΜΕΝΩΝ ΜΕ ΤΗΝ R. Έκδοση: 2/2023. Συγγραφείς: ΝΙΚΟΛΑΟΥ ΧΡΙΣΤΟΦΟΡΟΣ. ISBN: 978-618-202-154-5. Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ ΔΙΣΙΓΜΑ ΙΚΕ
- Βιοπληροφορική και Λειτουργική Γονιδιωματική (2018). Jonathan Pevsner
- Principles of Protein X-Ray Crystallography [electronic resource], Jan Drenth
- Μία μη μαθηματική εισαγωγή στην κρυσταλλογραφία πρωτεϊνών, ΝΙΚΟΛΑΟΣ ΓΛΥΚΟΣ
- Βιοπληροφορική (2015), Παντελής Μπάγκος
- Ανασυνδυασμένο DNA, Watson D.A. κα ISBN: 978-960-88412-5-3

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Vasiliki Fadouloglou, Aristotelis Papageorgiou, Petros Kolovos
Contact details:	Email: fadoulog@mbg.duth.gr; apapage@mbg.duth.gr; pkolovos@mbg.duth.gr
Supervisors: (1)	Yes
Evaluation methods: (2)	Homework (35%). Written Assignment (65%)
Implementation Instructions: (3)	As described in Article 12 of Annex 7 ("Examination Regulations") of the Rules of Procedure of Democritus University of Thrace.

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.