

LABORATORY MODULE OUTLINE

(1) GENERAL INFORMATION

SCHOOL	School of Science and Technology		
PROGRAM COURSE	Precision Medicine and Novel Therapies (PRETH)		
LEVEL OF STUDY	Postgraduate		
MODULE CODE	PRETH63	YEAR OF STUDY	2nd
MODULE TITLE	Bioinformatics for Precision Medicine		
INDEPENDENT TEACHING ACTIVITIES <i>in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits</i>	TEACHING HOURS	CREDITS	
Hours per week: 28-29 hours x 13 weeks (distance learning) and 50 hours x 1 week (laboratory learning)	420	15 ECTS	
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4</i>			
MODULE TYPE Compulsory, Optional, Optional mandatory	Compulsory		
PREREQUISITE MODULES:	NO		
LANGUAGE OF INSTRUCTION AND EXAMS:	English		
THE MODULE IS OFFERED TO ERASMUS STUDENTS	Yes		
MODULE WEBSITE (URL)	https://www.eap.gr/en/preth/ Each module has its own space in the Learning Management System of EAP, with controlled access (use of code) for students and teaching staff. https://courses.eap.gr/course/view.php?id=254		

(2) LEARNING OUTCOMES

<p>Learning Outcomes</p> <p>The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult: APPENDIX A</p> <p>Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.</p> <p>Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B</p> <p>Guidelines for writing Learning Outcomes</p>
<p>Learning Outcomes</p> <p>The trainees are expected to:</p> <ul style="list-style-type: none"> - Describe fundamental principles of Bioinformatics - implement suitable artificial intelligence, machine learning and optimization algorithms

- solve Bioinformatics problems that focus on knowledge extraction, (e.g.DBMS, OLAP),
- translate the artificial intelligence and machine learning results into the field of Bioinformatics

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, Adapting to new situations

Decision-making

Individual/Independent work

Group/Team work

Working in an international environment

Working in an interdisciplinary environment

Development of innovative research ideas

Project planning and management

Respect for diversity and multiculturalism

Environmental awareness

Social, professional and ethical responsibility and sensitivity to gender issues

Critical thinking

Development of free, creative and inductive thinking

The general skills that the students will acquire are:

- Expand the professional network by engaging with individuals who possess a wide range of work experience and extensive professional contacts
- Gain valuable insights into a research environment
- Work in an international environment
- Work in an interdisciplinary environment
- Production of new research ideas
- Search, analysis and synthesis of data and information, using the necessary technologies
- Promoting free, creative and inductive thinking

(3) MODULE CONTENT

Module Objectives

Bioinformatics, the unification of the two important scientific fields of Molecular Biology and Informatics and it has a rapid development in recent decades. Modern approaches in the field of Bioinformatics include data mining, artificial intelligence and machine learning methods, as well as data optimization methods.

Students should be familiar with the principles of Bioinformatics and understand basic algorithms of artificial intelligence, machine learning and data optimization that are directly applicable in the field of Bioinformatics.

- Introduction to bioinformatics
- Big data analytics for Precision Medicine
- AI algorithms and machine learning techniques in precision medicine
- Pattern recognition
- Genome sequencing, analysis, transcription profiling, protein structure - RNA sequencing

(4) TEACHING METHODS - ASSESSMENT

MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.

Distance learning by conducting three Group Counseling Meetings (GCMs) during the academic semester on weekends. Five-days face-to-face lab training at the end of the semester, with 10 hours/day of lab practice.

<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</p> <p><i>Use of ICT in teaching, Laboratory Education, Communication with students</i></p>	<p>In the GCMs and/or in teaching we use:</p> <ul style="list-style-type: none"> • remote meeting tools (cisco webex) • presentation software (powerpoint type) • specialized software for the objects under training (e.g. Excel). <p>During laboratory training students are trained in the use of specialized software, which is installed on the computers of individual scientific instruments, to familiarize with the experimental design and evaluation of results.</p> <p>In addition, students use office automation tools, web browsers as well as e-readers for digital books.</p> <p>Distance learning and communication with the students is supported by:</p> <ul style="list-style-type: none"> - the (Hellenic Open University (HOU) digital platform http://courses.eap.gr (course information, educational material postings, announcements, messages, exam results, user groups, discussion forums, etc.). - Electronic mail (e-mail) 															
<p>MODULE DESIGN</p> <p><i>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.</i></p> <p><i>The study hours for each learning activity as well as the hours of selfdirected study are given following the principles of the ECTS.</i></p>	<table border="1"> <thead> <tr> <th><i>Activity/Method</i></th> <th><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td>3 GCMs (x 4 hours)</td> <td>12</td> </tr> <tr> <td>2 Educational activities (x 10 hours)</td> <td>20</td> </tr> <tr> <td>2 semester assignments (x 30 hours)</td> <td>60</td> </tr> <tr> <td>Individual study</td> <td>278</td> </tr> <tr> <td>Laboratory training (5 days x 10 hours)</td> <td>50</td> </tr> <tr> <td>Total workload (hours)</td> <td>420</td> </tr> </tbody> </table>		<i>Activity/Method</i>	<i>Semester workload</i>	3 GCMs (x 4 hours)	12	2 Educational activities (x 10 hours)	20	2 semester assignments (x 30 hours)	60	Individual study	278	Laboratory training (5 days x 10 hours)	50	Total workload (hours)	420
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<p>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</p> <p><i>Detailed description of the evaluation procedures:</i></p> <p><i>Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other.....etc.</i></p> <p><i>Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.</i></p>	<p>Student Evaluation – Laboratory Module Grade</p> <p>The specific instructions for each exercise in lab module PRETH63 are available on the digital educational platform of HOU and are sent to students upon enrollment.</p> <p><u>Through the distance learning platforms of HOU</u></p> <ul style="list-style-type: none"> • The schedules for training and online activities, the electronic resources for each laboratory module, and the contact details of the Advisors - Professors of laboratory modules are available on the digital educational platforms of HOU. • During the semester, students are required to complete two Written Assignments (W.A.). The average score of these assignments contributes to the final score of the module by 30%. Additionally, they successfully finish two (2) sets of Educational Activities (E.A.) throughout the semester, and the average score from these activities contributes 10% to the final score of the module. 															

- Establishment of participation right in the face to face laboratory exercise:

Participation in the face to face laboratory exercise will be allowed, if:

1. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in the points above;
2. at least 3 of the 4 Activities and Assignments should be submitted.

Attendance to hands-on laboratory practice in the Laboratories of the Biomedical Research Foundation of the Academy of Athens (BRFAA), HOU labs or cooperating institutes

- Specific instructions for each laboratory exercise/protocol in each laboratory module are available on the digital distance learning platforms of HOU and in the corresponding lab module, which are sent to students upon enrollment.
- For each workshop, students will receive assistance and support from their supervisor (Advisor – Professor). Nevertheless, possessing theoretical and methodological expertise is essential for successfully conducting experiments in the laboratory, gathering observations and/or measurements, analyzing them, and deriving meaningful results and conclusions.
- Upon completion of each activity, students will be required to analyze experimental results by completing a worksheet. The worksheet is provided to the supervisor (Advisor – Professor) upon the student's departure following each workshop. Not delivering the worksheet is essentially the same as not finishing the task.
- The typical duration for each laboratory exercise, which includes completing the worksheet, ranges from 4 to 5 hours. Based on the specific needs of the laboratory exercises sometimes, time employed in the lab may differ from the predetermined.
- The student's laboratory performance in each exercise will be evaluated by the supervising Advisor - Professor. The evaluation is obtained based on the student's theoretical knowledge, experimental skills, and the quality of the work sheet submitted.
- Students are encouraged to complete all exercises of the laboratory module. To successfully complete each laboratory module, the average score of the student in the sum of the laboratory exercises/worksheets must be equal to or exceeding five (≥ 5.0). Alternatively, they will need to re-enroll at the laboratory module in the next following semester, fulfilling all educational and

	<p>financial responsibilities. In case students re-enroll in the laboratory module and don't successfully complete the face to face laboratory exercise, they must re-enroll in the laboratory module with fulfilling all educational and financial responsibilities. The laboratory exercises contribute to the overall grade of the laboratory module with a weightage of 60%.</p> <p>Language of evaluation: English</p> <p>The evaluation criteria are explicitly mentioned in the web published study guide (https://www.eap.gr/education/odigos-spoudwn-eap/), as well as in the educational platform (http://courses.eap.gr), with controlled access (use of code) for students.</p>
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(5) SUGGESTED BIBLIOGRAPHY

<p>Books</p> <ul style="list-style-type: none"> - Translational Biomedical Informatics: A Precision Medicine Perspective, Shen, Bairong; Jiang, Xiaoqian; Tang, Haixu, Springer, 2017, ISBN: 9811015023, 9789811015021 EISBN: 9811015031, 9789811015038 - Translational Bioinformatics and Systems Biology Methods for Personalized Medicine Yan, Qing, ISBN 9780128043288 - Interactive Knowledge Discovery and Data Mining in Biomedical Informatics: State-Of-the-Art and Future. Holzinger, Andreas; Jurisica, Igor; Kittler, Josef, Springer 2014, ISBN 3662439670, EISBN 9783662439678 DOI 10.1007/978-3-662-43968-5 - Data Mining for Bioinformatics, Dua, Sumeet; Chowriappa, Pradeep 2013 by Taylor & Francis Group, LLC 9781420004304 - Precision Medicine Methods in Molecular Biology, Springer Nature 2020 ISBN: 1071609033, DOI 10.1007/978-1-0716-0904-0 - Realizing the Promise of Precision Medicine: The Role of Patient Data, Mobile Technology, and Consumer., Cerrato, Paul; Halamka, John 2017, ISBN 9780128116357 - Precision Health and Medicine: A Digital Revolution in Healthcare, Shaban-Nejad, Arash; Michalowski, Martin, 2019 ISBN: 783030244088, 3030244083, EISBN: 3030244091, 9783030244095
