

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	PRETH52	YEAR OF STUDY	1 st (2 nd semester)
MODULE TITLE	Computational Biology and Applied Statistics 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>		HOURS	CREDITS
Hours per week (32-33 hours) x 13 weeks		420	15
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 laboratory 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=337		

(2) LEARNING OUTCOMES

Learning Outcomes

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

- Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.
- Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and

APPENDIX B

- Guidelines for writing Learning Outcomes

Upon successful completion of PRETH52, students will be able to:

- Describe and use appropriate statistical methods for the analyzing medical data,
- Solve problems arising in precision medicine through classical and modern statistical methods
- Interpret and validate the obtained results using statistical analysis
- Use Statistical methods and mathematical models and methods for estimating adaptive treatment strategies

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 (Other.....citizenship, spiritual freedom, social

Introduction of innovative research

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

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awareness, altruism etc.)

- ✓ Search for, analysis and synthesis of data and information by the use of appropriate technologies
- ✓ Adapting to new situations
- ✓ Individual/Independent work
- ✓ Decision-making
- ✓ Working in an interdisciplinary environment
- ✓ Individual/Independent work
- ✓ Group/Team work
- ✓ Development of free, creative and inductive thinking

(3) MODULE CONTENT

"Precision Medicine" is the emerging model of medicine that uses basic principles from personalized medicine by taking into account the individual's environment, response to a treatment, in addition to his/hers genetic profile. The rapid advancement of sciences leads

to a continuous increase of the volume of data and their heterogeneity. As a result, Precision Medicine allows for more targeted strategies in terms of prevention, diagnosis and treatment. This is achievable by considering computational biology approach and the application of statistical methods for or the design, the study and the analysis of the big data. Through traditional and modern methods of statistical analysis significant knowledge is obtained/ extracted, while appropriate “tools” are provided to the clinician, researcher, physician, aiming for the better understanding of the results.

Moreover, mathematical modelling can help in the study and the refinement of the treatment modalities at all phases of either drug research or development, and in routine patient care.

Students will be familiar with Precision Medicine and will understand basic statistical methods for designing the study and analyzing data from medical precision experiments. They will be able to set up a mathematical models, and deeply understand and interpret various biological processes and complex diseases in a medical precision experiment under study

Laboratory Module Subjects:

1. Systems biology
2. Algorithms of molecular biology
3. Statistical analysis (methods, models)
4. Applications of Statistics software in precision medicine (e.g. R, Galaxy)
5. Mathematical modelling

(4) TEACHING METHODS - ASSESSMENT

<p>MODES OF DELIVERY <i>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</i></p>	<p>Distance learning by conducting three Group Counseling Meetings (GCMs) and tutoring GCMs, during the academic semester on weekends.</p>	
<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY <i>Use of ICT in teaching, Laboratory Education, Communication with students</i></p>	<p>In GCMs and teaching we use:</p> <ul style="list-style-type: none"> - Remote meetings tools (Webex, Cisco etc.) - Presentation software (e.g. power point, animations etc.) - Specialized software in the subjects under study (NCBI PubMed, NCBI Blast, EndNote, etc.) <p>In addition, students use office automation tools, web browsers and 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 <i>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop,</i></p>	<p>Activity/Method</p>	<p>Semester workload</p>
	<p>3 GCMs x 4 hours</p>	<p>12</p>
	<p>2 educational activities (x 10 hours)</p>	<p>20</p>
	<p>2 Semester Assignments (x 30 hours)</p>	<p>60</p>

<p><i>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>	Tutoring sessions	5
	Final examination	4
	Individual study	319
	Total module workload (hours)	420
<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 – Module Grade</p> <p>a. Two (2) multiple-choice (quiz) educational activities (Q), which contribute equally to the final grade with a value of 5% each.</p> <p>b. Two (2) Semester Assignments (A) which contribute equally to the final grade with a value of 15% each.</p> <p>The scoring of educational activities and assignments is activated only if the student succeeds an overall score equal to or above the base (≥ 5) in the final or repeat exams.</p> <p>c. Final or repeat exams (E) contributing to the final grade of the module by 60%.</p> <p>The Final Grade of the module, within scale 1-10 (10 is the excellent), is calculated as follows: $\text{Final Grade} = (Q1 \times 0.05) + (Q2 \times 0.05) + (A1 \times 0.15) + (A2 \times 0.05) + (E \times 0.6)$</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>	

(5) SUGGESTED BIBLIOGRAPHY

Text books and e-books

1. Edda Klipp, Wolfram Liebermeister, Christoph Wierling, Axel Kowald, 2016, Systems Biology: A Textbook, 2nd Edition, USA: Wiley-Blackwel, ISBN: 978-352-733-636-4
2. An Introduction to Systems Biology: Design Principles of Biological Circuits, από Alon, Uri, ISBN: 9781439837177
3. Precision Medicine , Tools and Quantitative Approaches, : Hans-Peter Deigner Matthias Kohl ISBN 978-0-12-805364-5
4. <https://www.elsevier.com/books/precision-medicine/deigner/978-0-12-805364-5>
5. Kirkwood BR, Sterne JAC. Essential Medical Statistics. Wiley-Blackwell, 2nd ed., 2003.
6. Bulmer MG. Principles of Statistics. Dover Publications Inc., 2003. (Originally published 1965).

7. Bowers D. Medical Statistics from Scratch. John Wiley & Sons, 2nd ed., 2008.
8. Altman D. Practical Statistics for Medical Research. Chapman & Hall, 1990
9. Applied Statistics for Network Biology: Methods in Systems Biology από Dehmer, Matthias; Emmert-Streib, Frank; Graber, Armin... John Wiley & Sons, Incorporated 2011, ISBN: 3527327509, 9783527327508

Related scientific journals

NATURE REVIEWS MOLECULAR CELL BIOLOGY

Molecular Cancer

Cellular & Molecular Immunology

MOLECULAR CELL

NATURE STRUCTURAL & MOLECULAR BIOLOGY

MOLECULAR ASPECTS OF MEDICINE

TRENDS IN MOLECULAR MEDICINE

EMBO Molecular Medicine

MICROBIOLOGY AND MOLECULAR BIOLOGY REVIEWS

EXPERIMENTAL AND MOLECULAR MEDICINE

Molecular Therapy-Nucleic Acids

CELLULAR AND MOLECULAR LIFE SCIENCES

CELLULAR & MOLECULAR BIOLOGY LETTERS

CRITICAL REVIEWS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY

Molecular Metabolism

Journal of Molecular Cell Biology

INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES

Molecular Oncology

MOLECULAR & CELLULAR PROTEOMICS

BIOMACROMOLECULES

BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR BASIS OF DISEASE

MOLECULAR NUTRITION & FOOD RESEARCH

International Review of Cell and Molecular Biology

MOLECULAR MEDICINE

MOLECULAR CANCER RESEARCH

INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES

JOURNAL OF MOLECULAR BIOLOGY

Frontiers in Molecular Biosciences

Biomolecules

MACROMOLECULAR BIOSCIENCE

INTERNATIONAL JOURNAL OF MOLECULAR MEDICINE

JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS

BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR AND CELL BIOLOGY

HUMAN MOLECULAR GENETICS

MOLECULAR AND CELLULAR BIOLOGY

MOLECULES