

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	8.013	SEMESTER	8 th
COURSE TITLE	Biomedical Informatics		
COURSEWORK BREAKDOWN		TEACHING WEEKLY HOURS	ECTS Credits
Theory (Lectures)		4	3
Tutorial/Exercises		1	1
TOTAL		5	4
COURSE UNIT TYPE	General knowledge		
PREREQUISITES	3.005 – Introduction to databases 5.002 – Software engineering		
LANGUAGE OF INSTRUCTION/EXAMS	Greek		
COURSE DELIVERED TO ERASMUS STUDENTS	YES (in English)		
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE129/		

(2) LEARNING OUTCOMES

Learning Outcomes
<p>In recent years there has been a rapid increase in the production of biomedical data which can be used for better medical care and the production of new knowledge. To promote research in the field of health, better utilization of the electronic health record data, and a series of connected data (medical images, biosignals, and biological data) is needed.</p> <p>This course is introductory to the field of biomedical informatics and covers the basic modules that are necessary to familiarize the student with this field. The course examines the characteristics of biomedical data derived from the clinical practice and life sciences and presents methods and tools for their analysis. It consists of three main sections. The section of biomedical informatics, the section of e-health services (eHealth & mHealth), and that of medical decision support systems.</p> <p>Upon completion of the course, the student will have acquired the necessary knowledge and skills to:</p> <ul style="list-style-type: none"> • Understand different types of biomedical data and related standards and management methods • Implement methods and algorithmic approaches for the analysis of large volume biodata • Design and develop modern information systems as well as medical decision support systems • Understand the directions and perspectives of biomedical informatics research as well as the interdisciplinary research • Overall, upon completion of the course students will be sufficiently familiar with the field of biomedical informatics, with the technological standards that concern it and will be properly equipped with knowledge and skills to design and develop modern portable and wearable systems of biomedical informatics and eHealth services (eHealth & mHealth)
General Skills
<ul style="list-style-type: none"> • Search, analysis, and synthesis of data and information, using the necessary technologies • Design and project management • Decision making • Autonomous work • Teamwork • Production of free, creative, and inductive thinking

(3) SYLLABUS

Theoretical part of the course

The course is introductory to the field of biomedical informatics and covers the basic modules that are necessary to familiarize the student with this field. It consists of three main sections. The section of biomedical informatics, the section of e-health services (eHealth & mHealth), and that of medical decision support systems.

The first section focuses on the following:

- Medical information: Types and characteristics of (multimedia) biomedical data
- The decision-making process in medicine - the hypothetical-inferential approach to medical problems
- Specialized multimedia information systems (medical image / video / audio / cardiogram / encephalogram, etc.)
- The Electronic Health Record
- Coding of medical terms and medical information classification systems
- Interoperability and related technological standards of Medical Informatics
- Multimedia biomedical information (Biomedical signals and medical imaging, and related technological standards)
- Medical knowledge and decision support systems

The second section focuses on the following:

- eHealth services and applications. Mobile eHealth services (mHealth)
- Wireless sensor networks and their application in biomedicine (Body Area Networks (BANs) and related technological standards)
- Systems and services for the prevention or management of chronic diseases. Each semester the course will focus on some of the following (Cardiovascular Diseases, Diabetes, Respiratory Diseases, Mental Disorders (Depression, Bipolar Syndrome, Anxiety).
- Services and technologies for the elderly. Each year the course will focus on one of the following fall and position detection, motion estimation, gait, and posture estimation
- The Personal Health Record (PHR)
- Technological, financial, and organizational aspects of e-health services. Security issues, institutional and ethical dimensions

The third section focuses on the following:

- Principles of design and development of computer systems to support diagnostic and therapeutic decisions.
- Methodologies for applying statistical principles, signal processing, decision theory, artificial intelligence methods, and simulation and prediction models to support medical decisions.
- Knowledge-based systems and learning systems
- Methods for reviewing and evaluating computer systems for medical decision support systems

Laboratory part of the course

The laboratory part of the course focuses on the practical application of the above fields. Emphasis is given on a) the application and familiarization with the technological standards of the field, b) the design and implementation of modern information systems and IT apps with application in the field of biomedicine, and c) the design and development of multimedia, interactive e-health services (eHealth & mHealth) for mobile devices (mobile computing).

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of information and communication technology in teaching Use of information and communication technology in laboratory teaching Use of information and communication technology for communicating with the students using the electronic platform eClass	
TEACHING ORGANIZATION	Method description / Activity	Semester Workload
	Lectures	26
	Coaching lectures	13
	Small individual practice tasks	26
	Group project	26
	Independent study	29
	Total Contact Hours	120
ASSESSMENT METHODS	<p>Theory: Final written exam on the entire syllabus (100%). The exam includes theory questions (from 3 to 5) and practical exercises (from 1 to 2).</p> <p>Laboratory: The final grade results from the laboratory exercises (50%) and the project (50%).</p> <p>The assessment criteria are clearly stated in the detailed description of the course located in the relevant course area in eClass.</p>	

(5) RECOMMENDED BIBLIOGRAPHY

Suggested Bibliography:

- *J.H. van Bommel, and M.A. Musen (Eds.), Handbook of Medical Informatics, Springer, Houten/Diegem (1997)*
- *Lecture slides of the course will also be available in eClass. Appropriate scientific articles are given as material in each thematic unit of the course.*
- *Instructor Notes*

Related scientific journals:

- *IEEE Biomedical and Health Informatics*
- *International Journal of Biomedical Informatics*
- *International Journal of Medical Informatics (Elsevier)*
- *Computer Methods and Tools in Biomedicine (Elsevier)*