

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	University Politehnica of Bucharest (PUB)
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Applied Electronics and Information Engineering Department
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License (engineering)
1.6 Program of studies/Qualification	Applied Electronics (English)

2. Course identification information

2.1 Name of the course		Medical Electronics and Informatics (MEI)					
2.2 Lecturer		Prof. Dr. Ing. Strungaru Rodica					
2.3 Instructor for practical activities		S.l. Dr. Ing. Țarălungă Dragoș Daniel					
2.4 Year of studies	IV	2.5 Semester	I	2.6 Evaluation type	Exam	2.7 Course choice type	Mandatory

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	2	3.3 practical activities	2
3.4 Total hours in the curricula, out of which	56	3.5 course	28	3.6 practical activities	28
Distribution of time					hours
Study according to the manual, course support, bibliography and hand notes					35
Supplemental documentation (library, electronic access resources, in the field, etc)					4
Preparation for practical activities, homework, essays, portfolios, etc.					5
Tutoring					0
Examinations					4
Other activities					0
3.7 Total hours of individual study		48			
3.9 Total hours per semester		104			
3.10 Number of ECTS credit points		4			

4. Prerequisites (if applicable)

4.1 curricular	Signals and Systems, Information Transmission Theory, Fundamentals of Electronic Circuits
4.2 competence-based	Knowledge on signal acquisition and processing, decision and estimation, and also programming knowledge.

5. Requisites (if applicable)

5.1 for running the course	not applicable
5.2 for running of the applications	Attending the labs (according to "regulamentului studiilor universitare de licență în UPB" – Romanian version only)

6. Specific competences

Professional competences	C6 Problem solving in electronics and informatics applied in medical electronic devices and systems.
Transversal competences	CT3 Adaptation to new technologies, professional and personal development by long-life learning using printed documentation, specialized software, and electronic resources both in Romanian and in an international language.

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	The course introduces medical applications of electronic, artificial intelligence and computer science to the students, building the mandatory common language with the medical staff. The curriculum includes the electric and magnetic phenomena in the body, the basic knowledge for medical applications, allowing students to understanding, study, design, and correctly use the electronic systems to establish diagnostic tools to investigate the spontaneous and evoked activity, to build intelligent prosthetic systems, and to implement rehabilitation and therapy systems.
4.2 Specific objectives	The laboratory introduces the students in the field of biomedical signals acquisition and processing (i.e. electrocardiogram - ECG, electromyogram - EMG, electroencephalogram - EEG, muscle contraction force, photoplethysmography blood pulse, blood pressure).

8. Content

8.1 Lectures	Teaching techniques	Remarks
Introduction	The teaching strategy is based on oral communication, multimedia facilities and direct, interactive problematization. Available teaching resources include lecture notes and presentations.	1 hour
Blood pressure measurements		3 hours
Electrical phenomena in the human body		4 hours
Magnetic phenomena in the human body and magnetic measurements		5 hours
Transducers for electrophysiological signals measurements		3 hours
Electrophysiological Amplifiers		4 hours
Noise cancellation from electric and magnetic physiological signals.		4 hours
Recording and processing the cardiac activity		1 hour
Recording and processing the neuromuscular activity		1 hour
Electrical stimulation of the tissues.		2 hours
Bibliography <ul style="list-style-type: none"> • Course notes – R. Strungaru • http://www.bem.fi/book/ - Bioelectromagnetism – J. Malmivuo, R. Plonsey • http://www.evicab.eu/ - European Virtual Campus for Biomedical Engineering • Advances in Biomedical Engineering – P. Verdonck (ed), Elsevier, 2009. • Introduction to Biomedical Engineering 3rd Edition – J. D. Enderle, J. D. Bronzino, Elsevier, 2012. 		
8.2 Practical applications	Teaching techniques	Remarks
Electrosecurity. Acquisition and processing	- oral presentation of the theoretical	4 hours

system for biomedical applications (BIOPAC)	part of the laboratory; - individual studying of the laboratory works contained in the Laboratory Guide, available online. - the students configure the hardware and software for the acquisition system - the students measure the parameters specified in the laboratory works. - the students process the recorded signals and complete the lab sheet. - the homework consists in filling in the laboratory sheet, reaching conclusions on the results and answering the mentioned questions.	
Acquisition and processing of the electrocardiogram (ECG)		4 hours
Acquisition and processing of the electromyogram (EMG)		4 hours
Acquisition and processing of the electroencephalogram (ECG)		4 hours
Acquisition and processing of the blood pressure.		4 hours
Acquisition and processing of the photoplethysmographic pulse, correlated with the ECG signal.		4 hours
Practical application evaluation		4 hours
Bibliography <ul style="list-style-type: none"> • https://elmed.pub.ro/?student – secured access (the login data are offered in the first lab session) - here are the laboratory works and the software required by the BIOPAC acquisition system available in the lab. • Instrumentație biomedicală. Măsurarea și analiza biopotențialelor, Tarălungă Dragoș, Ed. Matrix, București, 2013 		

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

Many of the problems confronting medical staff today are very important for the engineers as they involve basic aspects regarding the analysis of devices and systems, their design, and their use. The problems varies highly, from very simple to complex ones, looking for relatively small and handy devices, good recording electrodes and transducers able to monitor the activity of specific physiological processes, and for developing large-scale medical systems, e.g. (national) hospital information systems.

The curriculum meets exactly the current developing and evolving requirements derived from the medical electronics and informatics services required by the world economy. Considering the current technological progress, the electronics and medical applications require intense medical informatics advancement.

The graduate students get the appropriate skills according to the current qualifications, and a modern, high quality and competitive scientific and technical training, enabling them acquiring a working place after the graduation. The course fits therefore perfectly to the Bucharest Polytechnic University policy, considering both its content and structure, and the skills and international openness it offers to students.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- the knowledge of basic theoretical concepts; - the knowledge of the	Oral examination in the exams period	60

	application of theory to specific problems; - comparative analysis of the theoretical techniques and methods.		
10.5 Practical applications	- the knowledge of acquiring various types of biomedical signals - the data processing and interpretation knowledge	Final test comprising a theoretical and a practical part. The theoretical knowledge is evaluated by a multiple choice test, and the practical one by setting up the hardware and software of the Biopac acquisition system to measure a particular type of biosignal.	40
10.6 Minimal performance standard			
- understanding the theoretical and practical problems, as evidenced by obtaining at least 50% of each score.			

Date

1.10.2015

Lecturer

Prof.Dr.Ing. Rodica Strungaru

Instructor for practical activities

Ș.L: Dr. Ing. Dragoș Țărălungă




Date of department approval

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Director of Department,

Prof.Dr.Ing, Sever Pașca