

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 17.09.2012					

## Anexa 6

### THE DISCIPLINE

#### 1. Information about the program

1.1 Higher education institution	UNIVERSITY OF ORADEA
1.2 Faculty	OF MEDICINE AND PHARMACY
1.3 Department	PRECLINICAL DISCIPLINES
1.4 Field of study	HEALTH
1.5 Study cycle	LICENSE
1.6 The program of studies / qualification	MEDICINE

#### 2. Information about the discipline

2.1 Discipline name	BIOPHYSICS AND MEDICAL PHYSICS						
2.2 Holder of course activities	Prof. dr. CAVALU SIMONA						
2.3 Holder of seminar activities / laboratory / project	Prof. Dr. CAVALU SIMONA Conf. Dr. Mincic Adina S. I. dr. Oswald Ioan						
2.4 Year of study	I	2.5 Semester	1	2.6 The type of evaluation	Ex.	2.7 Discipline regime	R

(R) Required; (O) Optional; (F) Facultative

#### 3. The total estimated time (hours per semester of teaching)

3.1 Number hours a week	5	of which: course	3	practical work	2
3.4 Total hours of the curricula	70	of which: course	42	practical work	28
Time distribution					hours
Study by manual, course support, bibliography and notes					34
Additional documentation in the library, electronic platforms and on the ground					14
Training seminars / labs, homework, essays, portfolios and essays					10
Tutor					7
Examinations					5
Other activities .....					
3.7 Total hours of individual study	70				
3.9 Total hours per semester	140				
3.10 Number of credits	6				

#### 4. Preconditions (where applicable)

4.1 of curriculum	Basic physics, mathematics and biology
4.2 of skills	Basic laboratory skills

#### 5. Conditions (where applicable)

5.1. of the course	Senate regulation with respect to the student's responsibility regarding requisites: attendance at the lecture is not mandatory, but is regulated according to the internal rules. <i>Students are invited to contact the course instructor if they require material in an alternate format or if any other arrangements can make this course more accessible.</i>
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5.2. conduct of seminar / laboratory / project	Attendance is mandatory. Unless the students have either the requisites for the laboratory or written special permission from the Dean to enroll in it, they may be removed from this course and it will be deleted from their record. No adjustment to the fees in the event that they are dropped from a course for failing to have the necessary prerequisites. The missing topics are to be recovered during the semester.
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6. Specific skills acquired	
Professional skills	<ol style="list-style-type: none"> <li>1. Knowledge, understanding concepts, theories and methods of the discipline, their proper use in professional communication and understanding next level of knowledge.</li> <li>2. Using basic knowledge to explain/ interpretation of various sorts of concepts, situations, processes, projects in associated field.</li> <li>3. Practical skills according to the laboratory works and theoretic background in the frame of interdisciplinarity.</li> <li>4. The lab offers an opportunity to work on the assignments with a teaching assistant or lecturer who is available to answer questions. Our role as tutors is to facilitate learning without short-cutting the thinking process.</li> </ol>
Transversal skills	Identification of the objectives to be achieved, the resources available, conditions completion of their work stages and working times, deadlines and associated risks. Encourage their participation to extra-curricular activities in domain.

### 7. The objectives of discipline (based on specific skills gained grid)

7.1 The overall goal of the discipline	Motivating students to develop skills in integrating the concepts of Biophysics for interpreting the behavior of tissues and structures.
7.2 Specific objectives	To demonstrate the properties of biological structures and fluids in relation to function. To provide exposure to more advanced tools such as biospectroscopy, microscopy, conductometry to solve problems in an interdisciplinary context. The focus in this course is restricted to human biology and biophysics. Our intent is to learn about the true mechanical behavior of tissues and materials, and to recognize these qualities when making assumptions, predicting behavior and solving problems. To understand the environmental effects on human body by quantifying, measuring and controlling radiation level.

### 8. Content \*

8.1 Course	Teaching methods	Number of Hours /Observations
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<b>1. Introduction. Biological thermodynamics.</b> 1.1. Principles of thermodynamics applied to living organisms. 1.2. Conversion of energy. 1.3. Basic concepts of biological thermodynamics.	Exposure based on PowerPoint presentation with engaging students in dialogue, applications and case studies.	3
<b>2. Biomechanics.</b> 2.1. Biophysics of muscle contraction. 2.2. Biochemical mechanism of muscle contraction. 2.3. Energy income and energy expenditure.		3
<b>3. The eye and vision.</b> 3.1. Structure and function of the eye. The optical system. 3.2. Optical defects and their correction.		3
<b>4. The ear and hearing.</b> 4.1. Structure and function of the ear. 4.2. Transmission and measurement of the sound. The ear's response. 4.3. Defects of hearing.		3
<b>5. Biomembranes.</b> 5.1. Structure of biological membranes. Fluid mosaic model. 5.2. Classification of transport phenomena through biological membranes. 5.3. Passive transport. Fick's laws. Osmosis, importance of osmosis in urine formation and glandular secretion processes. 5.4. Active transport. Ionic pumps. Ionic channels. 5.5. Cellular signaling.		6
<b>6. Neurobiophysics.</b> 6.1. Biopotentials. Resting and action potentials. 6.2. The cardiovascular system and electrocardiogram. 6.3. Other electrical potential measurement-muscle activity, brain activity.		3
<b>7. Optical fibre and lasers.</b> 9.1. Transmission and image formation. Endoscopy. 9.2. Laser effect, uses of lasers in medicine		3
<b>8. Ultrasonics.</b> 8.1. Generation and detection of ultrasound. Piezoelectric effect. 8.2. Ultrasound in the body. Doppler methods. Physiological effects of ultrasound.	Exposure based on PowerPoint presentation with engaging students in dialogue, applications and case studies.	3
<b>9. Ionising radiation.</b> 9.1. The nature of X-rays. Interaction of radiation with living matter. 9.2. X-ray equipment.		3
<b>10. Radiotherapy. Radioisotopes.</b> 10.1. The nature and properties of nuclear radiations. 10.2. Types of radioisotopes and their use in medicine.		3
<b>11. Measuring and controlling radiation.</b> 11.1. Biological effects of radiations, dosimetry, radiation protection.		3
<b>12. Biomaterials in medicine.</b> 12.1. Classification of biomaterials. 12.2. Biomaterials designed for orthopedic and dental implants. 12.3. Biomaterials for controlled drug delivery.		3
<b>13. Basic Principle of MRI.</b> 13.1. Theoretical background of magnetic resonance. 13.2. Image formation. Applications.		3
<b>Bibliography:</b>		
1. Suzanne Amador Kane, Introduction to Physics in Modern Medicine, Second Edition. CRC Press. 2009.		

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1. Rodney Cotterill, Biophysics- an introduction, John Wiley&Sons, England, 2005.
2. Philip Nelson, Biological Physics, W.H. Freeman&Co (ed), New York, USA, 2004.
3. Simona Cavalu, Medical Biophysics and electronic medical devices, Ed Univ. Oradea, 2005.
4. Roberts Gordon (ed), Encyclopedia of Biophysics, Springer, 2013.

8.2 Seminar	Teaching methods	Number of Hours /Observations
<b>8.3 Laboratory</b>		
1. Determination of surface tension coefficient using Traube stalagmometer. Determination of viscosity coefficient of biological fluids using Ostwald viscosimeter.	Overview of theoretical concepts with specific themes laboratory work. Perform the practical work and interpretation of results. Individual work and documentation.	2
2. Calorimetric measurements		2
3. Optical microscope. Fluorescence techniques.		4
4. Determination of the density of biological liquids using by using densitometers or picnometer method.		2
5. Refractometry- determination of the concentration of some biological liquids using Abbe refractometer.		2
6. Conductometric measurements- concomitant pH, conductivity, and temperature meter.		2
7. Calculation of hemoglobin and methemoglobin percent in a blood sample using photocolorimetric methods.		2
8. UV-VIS spectroscopy in drug analysis.		2
9. Geiger-Muller detector.		2
10. Polarimetry: determination of the concentration of optic active biological liquids		2
11. Electrophoresis. Separation of the blood components		2
1. Practical aspects measuring biopotentials: EKG, EMG.		2
12.		2
13. Recovery		2
14. Practical exam.	xx	

#### Bibliography

2. Guibelalde E., Christofides S., Caruana C. J., Evans S. van der Putten W (2012). Guidelines on the Medical Physics Expert' a project funded by the European Commission.
3. Amador Kane, Suzanne (2009). Introduction to Physics in Modern Medicine, Second

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Edition. CRC Press.

4. Simona Cavalu, Bat Loredana, L. Pop, Ghid practic de biofizica medicala, Ed. Univ. Oradea, 2005.

\* It will detail the content, i.e. the number of hours allocated to each course/seminar/lab/project during the 14 weeks of each semester of the academic year.

### 9. Cross-checking the contents of the discipline with the expectations of the epistemic community representatives, professional associations and employers ' representative from the programme

The content of the **BIOPHYSICS AND MEDICAL PHYSICS** is consistent and similar with the same discipline taught at the other universities in the country / abroad. Workshops were held attended by academics and representatives of professional associations which syllabus was adapted to market demands discipline. The content of the discipline will provide exposure to more advanced tools such as specific software/ electronic devices to solve complex biomedical problems.

### 10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final mark
10.4 Course	- knowledge for grade 5: knowing the basic concepts, theories and methods of the discipline: biomechanics, thermodynamics and optics. - knowledge for grade 10: .Using basic knowledge to explain the biophysical events, interpretation of various sorts of concepts, situations, processes, in an interdisciplinary associated field	Written examination	70%
10.5 Seminar			
10.6 Laboratory	Periodical evaluation by tests, continuous evaluation throughout the semester, assignments and essays. - knowledge for grade 5: Determination of the basic parameters of biological liquids: surface tension and viscosity coefficient, density, refractometry and optical properties. - knowledge for grade 10: Using advanced tools such as UV-VIS -spectroscopy in medical applications and interpretation of the results.	Practical	20%
10.7 Project	Title of project by choice from available list presented in the first week.	PPT presentation or essay	10%
10.8 Minimum Standard of performance			
The student will get the basic and supplementary knowledge of Biophysics, he/she will know to perform an experiment, to interpret the result and to write an essay.			

Date of completion  
26.09.2014

Prof. Dr. SIMONA CAVALU

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Data avizării în departament  
29.09.2014

Semnătura directorului de departament

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Semnătură Decan

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