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**				
2.2 Holder of course activities			**Prof. dr. CAVALU SIMONA**				
2.3 Holder of seminar activities / laboratory / project			Asist. Dr. Chirla Razvan Lecturer 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	**5**

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. ***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.
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.

6. Specific skills acquired	
Professional skills	1. Knowledge, understanding concepts, theories and methods of the discipline, their proper use in professional communication and understanding next level of knowledge. 2. Using basic knowledge to explain and interpretation of various sorts of concepts, situations, processes, projects in associated field. 3. Practical skills according to the laboratory works and theoretic background in the frame of interdisciplinarity. 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.
Transversal skills	Identification of 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 tisseues and structures.
7.2 Specific objectives	To demonstrate the properties of biological structures and fluids in relation to function.To provide exposure to more advances 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 in the classroom/online platform	Number of Hours /Observations
1. Introduction. **Biological thermodinamics**.1.1. Principles of thermodinmics applied to living organisms.1.2.Conversion of energy.1.3. Basic concepts of biological thermodynamics. Bioenergetics. 1.4 Basal metabolic rate.	Exposure based on PowerPoint presentation with engaging students in dialogue, applications and case studies.	**3**
2. Biomechanics. 2.1.Biophysics of muscle contraction. Structure of the cross-striated muscle. 2.2.Biochemical mechanism of muscle contraction. 2.3. Energy income and energy expenditure.		**3**
3. The eye and vision. 3.1.Structure and function of the eye.The optical system. 3.2 Accomodation. 3.2. Optical defects and their correction. 3.2 Basic concepts of ophtalmic/refractive surgery:Intraocular lens.		**3**
4. The ear and hearing. 4.1. Structure and function of the ear. 4.2. Transmision and measurement of the sound. Decibel levels.The ear's response. 4.3 Defects of hearing. Hearing loss and the audiogram.		**3**
5. Biomembranes. 5.1.Structure of biological membranes. Fluid 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.		**3**
6. Neurobiophysics.6.1.Biopotentials. Resting and action potentials. 6.2 The cardiovascular system and electrocardiogram. 6.3. Other electrical potential measurement-muscle activity, brain activity. Functional explorations.Importance of biophysics knowleges.		**3**
7. Optical fiber and lasers. 9.1. Fiber optics. Transmision and image formation. Endoscopy. 9.2 Laser effect, uses of lasers in medicine. Laser surgery. Laser microscopy.9.3 Laser in spectroscopy techniques.		**3**
8. Ultrasonics. 8.1**.** Generation and detection of ultrasound. Piezoelectric efect.8.2. Ultrasound in the body.Doppler methods. 8.3 Physiological effects of ultrasound. Medical techniques using ultrasounds.	Exposure based on PowerPoint presentation with engaging students in dialogue, applications and case studies.	**3**
9. **Ionising radiation.** 9.1. The nature of X-rays. Interaction of radiation with matter. 9.2. X ray equipment. Computer Tomography.		**3**
10.Radiotherapy. Radioisotopes. 10.1.The nature and properties of nuclear radiations.Radioactive decay.10.2. Production of radioisotopes. Nuclear medicine-basic elements.		3

11. Measuring and controling radiation.11.1.Biological effects of radiations, dosimetry, 11.2. Radiation levels, radiation protection.		3
12. **Biomaterials in medicine**.12.1.Clasification of biomaterials. 12.2.Biomaterials designed to orthopedic and dental implants.12.3. Biomaterials for controled drug delivery. Biomaterials for tissue regeneration.		3
13. Basic Principle of MRI. 13.1. Theoretical background of magnetic resonance.13.2.Image formation.Applications.		3
14. Project presentation		**3**

Bibliography:

1. Roland Glaser, Biophysics-An introduction, Springer, Berlin, second edition, 2012.
2. Stephan Wieneke, Christoph Gerhard, Lasers in medical diagnosis and therapy, IOP Publishing, Bristol, UK, 2018.
3. Roberts Gordon (ed), Encyclopedia of Biophysics, Springer, 2013.
4. Berhardt Leon V., Advances in Medicine & Biology, Nova Science Publisher Inc. 2016.

8.2 Seminar	Teaching methods	Number of Hours /Observations
8.3 Laboratory		
1. Determination of surface tension coefficient using Traube stalagmometer	Overview of theoretical concepts with specific themes laboratory work. Perform the practical work and interpretation of results. Individual work and documentation.	2
2. Determination of viscosity coefficient of biological fluids using Ostwald viscosimeter.		2
3. Calorimetric measurements		2
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. 7. Calculation of hemoglobin and methemoglobin percent in a blood sample using photocolorimetric methods.		2 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 12. Electrical devices in medical surgery:electrocautery		2 2
13. Recovery		2
14. Practical exam.		2

Bibliography

1. 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.
2. Amador Kane, Suzanne (2009). Introduction to Physics in Modern Medicine, Second Edition. CRC Press.
3. Razvan Chirla, Hands-on biophysics, Ed. Universitatii Oradea, 2018

* 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, thermodinamics. - 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	80%
10.5 Seminar			
10.6Laboratory	Periodical evaluation by tests, continuos evaluation throughtout the semester, asignments and essays. - knowledge for grade 5: Determination of the basic parameters of biological liquids: surface tension and viscosity coeficient, density, refractometry and optical properties.		20%

	- knowledge for grade 10: Using advances tools such as UV-VIS and FTIR-spectroscopy in medical applications and interpretation of the results.		
10.7 Project			
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
28.09.2020

Prof. Dr. SIMONA CAVALU

S.L. DR. Oswald Ioan

Asist. Dr. Chirla Razvan

The date of receipt in the Department
28.09.2020

Signature of Head of Department

Conf. Dr. DANA ZAHA

Signature Dean

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