SYLLABUS [1]

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	Politehnica University of Timisoara
1.2 Faculty[2]/ Department [3]	Mechanics / Mechanics and Strength of Materials
1.3 Chair	—
1.4 Field of study (name/code[4])	Applied Engineering Sciences / 270
1.5 Study cycle	Undergraduate
1.6 Study program (name/code/qualification)	Medical Engineering / 10

2. Information about the discipline

2.1 Name of discipline/ formative category[5]			Biological Systems				
2.2 Coordinator (holder) of course activities			Alin TOTOREAN, PhD, Lecturer				
2.3 Coordinator (holder) of applied activities[6]			Alin TOTOREAN, PhD, Lecturer				
2.4 Year of study[7]	III	**2.5** Semester	5	**2.6** Type of evaluation	E	**2.7** Type of discipline[8]	DD

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [9]

3.1 Number of fully assisted hours / week	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	28
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	3 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			1
		training seminars / laboratories, homework and papers, portfolios and essays			1
3.7* Number of hours of unassisted activities / semester	42 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			14
		hours of individual study after manual, course support, bibliography and notes			14
		training seminars / laboratories, homework and papers, portfolios and essays			14
3.8 Total hours / week [10]	7				
3.8* Total hours /semester	98				
3.9 Number of credits	3				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• Calculus, Linear Algebra, Special Mathematics, Programming, Fundaments of Automatization

[1] The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.
[2] The name of the faculty which manages the educational curriculum to which the discipline belongs
[3] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[4] The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.
[5] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[6] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] Year of studies in which the discipline is provided in the curriculum.
[8] Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).
[9] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[10] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.2 Competencies	• Computer skills

5. Conditions (where applicable)

5.1 of the course	•
5.2 to conduct practical activities	•

6. Specific competencies acquired through this discipline

Specific competencies	• C1. Identification and characterization of dynamic systems components. • C2. Modelling and analyze the human body as a dynamic system. • C3. Students will achieve knowledge regarding the principles of human body physiology and they will be able to understand the principles of artificial organs and equipments that supply organs' functions.
Professional competencies ascribed to the specific competencies	• C1. Appropriate use of the basic theoretical knowledge in Applied Engineering Sciences - Medical Engineering. • C2. Use of specialized software for analysis and simulation of dynamic systems. • C3. Characterization of the modeling methods used for biological / biomechanical systems..
Transversal competencies ascribed to the specific competencies	• C1. Applying the values and ethics of the engineering profession and responsible execution of professional tasks. • C2. Fullfiling activities and exercising the specific roles of teamwork on different hierarchical levels; promoting the spirit of initiative, dialogue, cooperation, positive attitude and respect others, diversity and multiculturalism, as well as the continuous improvement of personal activity. • C3. Identification and permanent documentation on continuing training opportunities in the field of activity and related fields, in correlation with the needs of the labor market. •

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Analyzing and modeling the human body as a biologic and cybernetic system
7.2 Specific objectives	• Understanding the medical physiological principles of cardiovascular, respiratory and renal human body systems. • Identifying the components and the data flow of a human body system making analogy with technical systems. • Modeling the human body systems and physiological processes using engineering tools, mathematical and computational models.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
Introduction to biological systems and cybernetics	2	PowerPoint presentations, demonstrations, discussions, e-learning-Virtual Campus UPT
Characteristics and classification of biological systems	2	
Methods used in biological systems analysis and modeling	6	
Transport phenomena in biological systems	4	
Cardiovascular system	8	
Respiratory system	4	
Renal system	2	

[11] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[12] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

Bibliography [13] 1. Anghelescu V., Sisteme biologice, Politehnica Publishing House, Timisoara, 2005.
2. Bernad S., Hemodinamica patologiei arterelor coronare, Krista Publishing House, Timisoara, 2016.
3. Kasper D. L., et al, Harrison's Principles of Intemal Medicine, McGraw-Hill Medical Publishing Division, 2005.

8.2 Applied activities [14]	Number of hours	Teaching methods
Introduction to Matlab and Matlab-Simulink	4	PowerPoint presentations, demonstrations, simulations, discussions, e-learning-Virtual Campus UPT
Transfer functions	2	
Modeling the regulation of blood glucose level	2	
Modeling the decay rate of radiotracer activity used in medical imaging techniques	2	
Modeling the cardiovascular system	10	
Modeling the respiratory system	2	
Modeling the renal system	2	
Modeling the metabolic processes	2	
Population dynamics	2	

Bibliography [15] 1. Anghelescu V., Sisteme biologice, Politehnica Publishing House, Timisoara, 2005.
2. Bernad S., Hemodinamica patologiei arterelor coronare, Krista Publishing House, Timisoara, 2016.
3. Kasper D. L., et al, Harrison's Principles of Intemal Medicine, McGraw-Hill Medical Publishing Division, 2005.
4. Matlab-Simulink User Manual.

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- The corroboration of the educational offer with the needs of employers is in a permanent process of updating by maintaining permanently open lines of bilateral communication and by updating the content of the discipline in relation to the news and trends in the field. Based on the medical and engineering knowledge achieved through this discipline's activities students will be able to understand the principles of designing artificial organs and equipments for organ and life support.
  - https://ocw.mit.edu/courses/biological-engineering/20-330j-fields-forces-and-flows-in-biological-systems-spring-2007/syllabus/

10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Exam	Written exam	66 %
10.5 Applied activities	**S:**		
	L: Students will be organized in teams and will analyze and model different human body physiological processes using engineering tools.	Presentation of the team work analysis.	34 %
	P[17]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [18])			

[13] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[14] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[15] At least one title must belong to the discipline team.
[16] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)
[17] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

- To pass the exam a minimum 50% of topics should be correctly solved.
- To pass the applied activity, students should present accurate data associated to their analysis.

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
18.09.2020	……	……
Head of Department (signature)	**Date of approval in the Faculty Council** [19]	**Dean (signature)**
……		……

[18] It will not explain how the promotion mark is awarded.
[19] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.