

## DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code Date (Month / Year)	DSEA/ P11 Sept 2020
TITLE OF THE MODULE	Code
Biomechanics	2.1.3

Teacher(s)	Department
Coordinating: Sergey Podliesnyi, PhD  Others:	Department of Computer and Information Technology (CIT)

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsory/selective)
Bachelor	3 <sup>th</sup> semester for Bachelor	selective

Form of delivery (theory/lab/exercises)	Duration (weeks/months)	Language(s)
Lectures, lab	15 weeks	Ukrainian / English

Prerequisites	
Prerequisites:  the study of the disciplines „Higher Mathematics“, „Physics“, „Technical mechanics“	Co-requisites (if necessary):  Mathcad, Programming skills

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
4,0	120	45	75
<b>Aim of the module (course unit): competencies foreseen by the study programme</b>			
<p>Students must be able to:</p> <ul style="list-style-type: none"> <li>• to analyze the kinematics and dynamics of motor actions on the basis of materials of objective registration of physical exercises;</li> <li>• quantify the biomechanical characteristics of the human body and its motor actions;</li> <li>• to quantify the level of development of basic motor qualities;</li> <li>• to simulate the biomechanical characteristics of individual rational technology and tactics of motor activity;</li> <li>• use modern biomechanical technologies to quantitatively control, evaluate and train (correct) motor actions.</li> </ul>			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
<p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>• tasks and methods of biomechanics;</li> <li>• biomechanical characteristics of the human motor apparatus and its motor activity;</li> <li>• biomechanical substantiation and evaluation of human motor qualities;</li> <li>• biomechanical features of different types of motor function of a person in the process of physical education, rehabilitation, recreation and sports activities;</li> <li>• individual and group features of the structure and motor functions of the motor apparatus and motor skills;</li> <li>• biomechanical substantiation of technique and tactics of different types of motor activity.</li> </ul>	Work with the lecture notes as well as on the available fundamental subject literature	Knowledge test	
<p><b>Skills:</b></p> <ul style="list-style-type: none"> <li>- solid scientific knowledge in the field of biomechanics, navigate in the complex of its modern scientific problems;</li> <li>- the methodology of scientific knowledge, be able to determine relevance, formulate the purpose and objectives of the study, choose adequate methods and techniques of scientific</li> </ul>	Lectures, lab, consultation	Active attendance on lectures, individual project and presentation	

<p>research, process, analyze and present the data;</p> <ul style="list-style-type: none"> <li>- the skills of applying modern technical means and research methods in the field of biomechanics, the ability to use computer technology for collecting, analyzing and processing experimental data.</li> </ul>		
<p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>- the ability to use an adequate mathematical apparatus for describing and modeling the movement of biomechanical systems, as well as processing the results of experimental studies;</li> <li>- the ability to apply computer modeling technologies in biomechanics;</li> <li>- the ability to use instrumental research methods when conducting scientific experiments to study the biomechanical laws of motor actions;</li> <li>- the ability to conduct a research experiment to study the biomechanical laws of the formation of motion systems and mechanisms providing them, evaluate the results of the study according to generally accepted criteria, propose new assessment criteria, formulate ways and methods of adjusting the technique of motor actions.</li> </ul>	<p>Lectures, practical work, consultation</p>	<p>Individual project and presentation</p>

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
<p>1. Introduction. Biomechanics as an educational and scientific discipline. History of biomechanics development. Areas of development of biomechanics as a science.</p>	2						2	2	Study credit/complete exercise

2. Human body topography. General information about the human body.	4			2			6	8	Study credit/ complete exercise
3. Kinematics. Elements of description of movement of the person.	4			2			6	10	Study credit/ complete exercise
4. Dynamics.	4			2			6	12	Study credit/ complete exercise
5. Mechanical properties. Deformation. Methods of deformation. Types of deformation. Strength. Hardness. Destruction. Mechanical properties of biological tissues.	6			4			10	16	Study credit/ complete exercise
6. Modeling in biomechanics. Mathematical modeling. Static and kinetostatic design schemes and models of organs and structures. Dynamic design schemes and models of organs and structures of the human body. Kinematic design schemes and models of organs and systems.	10			5			15	27	Study credit/ complete exercise
<b>Total</b>	<b>30</b>			<b>15</b>			<b>45</b>	<b>75</b>	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
written exam theory	40%	during the semester / exam	Good response to the questions
Practical exam	60%	during the semester / exam	the work is done completely without mistakes or minor errors

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
<b>Compulsory literature</b>				
Margareta Nordin, Dirsci, Victor H. Frankel	2011	Basic Biomechanics of the Musculoskeletal System		Williams & Wilkins
Ronald L. Huston	2013	Fundamentals of Biomechanics		CRC Press, ISBN 978146651037
Zdero R	2016	Experimental Methods in Orthopaedic Biomechanics		Elsevier, ISBN 978-0-12-803802-4
Ami Drory	2017	Computer Vision and Machine Learning for Biomechanics Applications		Research School of Engineering College of Engineering and Computer Science The Australian National University
<b>Additional literature</b>				
Андреева Р.	2015	Біомеханіка і основи метрології		Херсон: ПП Вишемирський В. С., 2015.
Бегун П.И.	2004	Моделирование в биомеханике.		Учеб. Пособие. – М.: Высш. Шк., - 390 с.