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# DESCRIPTION/Syllabi of Curricula/Module

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

| Teacher(s) | Department |
|---|---|
| **Coordinating:** Sergey Podliesnyi, PhD<br>**Others:** | Department of Computer and Information Technology (CIT) |

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

| Form of delivery<br>(theory/lab/exercises) | Duration<br>(weeks/months) | Language(s) |
|---|---|---|
| Lectures, lab | 15 weeks | Ukrainian / English |

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

| ECTS (Credits of the module) | Total student workload hours | Contact hours | Individual work hours |
|---|---|---|---|
| 4,0 | 120 | 45 | 75 |

| Aim of the module (course unit): competencies foreseen by the study programme | | |
|---|---|---|
| Students must be able to:<br>• to analyze the kinematics and dynamics of motor actions on the basis of materials of objective registration of physical exercises;<br>• quantify the biomechanical characteristics of the human body and its motor actions;<br>• to quantify the level of development of basic motor qualities;<br>• to simulate the biomechanical characteristics of individual rational technology and tactics of motor activity;<br>• use modern biomechanical technologies to quantitatively control, evaluate and train (correct) motor actions. | | |
| **Learning outcomes of module (course unit)** | **Teaching/learning methods**<br><br>**(theory, lab, exercises)** | **Assessment methods**<br><br>**(written exam, oral exam, reports)** |
| **Knowledge:**<br>• tasks and methods of biomechanics;<br>• biomechanical characteristics of the human motor apparatus and its motor activity;<br>• biomechanical substantiation and evaluation of human motor qualities;<br>• biomechanical features of different types of motor function of a person in the process of physical education, rehabilitation, recreation and sports activities;<br>• individual and group features of the structure and motor functions of the motor apparatus and motor skills;<br>• biomechanical substantiation of technique and tactics of different types of motor activity. | Work with the lecture notes as well as on the available fundamental subject literature | Knowledge test |
| **Skills:**<br>- solid scientific knowledge in the field of biomechanics, navigate in the complex of its modern scientific problems;<br>- 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 | Lectures, lab, consultation | Active attendance on lectures, individual project and presentation |

| | | |
|---|---|---|
| research, process, analyze and present the data;<br>- 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. | | |
| **Competences:**<br>- 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;<br>- the ability to apply computer modeling technologies in biomechanics;<br>- the ability to use instrumental research methods when conducting scientific experiments to study the biomechanical laws of motor actions;<br>- 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. | Lectures, practiacl work, consultation | Individual project and presentation |

| **Themes** | **Contact work hours** | | | | | | | **Time and tasks for individual work** | |
|---|---|---|---|---|---|---|---|---|---|
| | Lectures | Consultations | Seminars | Practiacl work | Laboratory work | Placements | **Total contact work** | **Individual work** | **Tasks** |
| 1. Introduction. Biomechanics as an educational and scientific discipline. History of biomechanics development. Areas of development of biomechanics as a science. | 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 |
| **Total** | **30** | | | **15** | | | **45** | **75** | |

| **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 |
|---|---|---|---|---|
| **Compulsory literature** | | | | |
| 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 |
| **Additional literature** | | | | |
| Андрєєва 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. |