



Subject card

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| Subject name and code | Engineering biomechanics II, PG_00033002 | | | | | | |
| Field of study | Medical and Mechanical Engineering, Mechanical and Medical Engineering | | | | | | |
| Date of commencement of studies | October 2020 | | Academic year of realisation of subject | | 2021/2022 | | |
| Education level | first-cycle studies | | Subject group | | Obligatory subject group in the field of study Subject group related to scientific research in the field of study | | |
| Mode of study | Full-time studies | | Mode of delivery | | at the university | | |
| Year of study | 2 | | Language of instruction | | Polish Not considered | | |
| Semester of study | 4 | | ECTS credits | | 3.0 | | |
| Learning profile | general academic profile | | Assessment form | | exam | | |
| Conducting unit | Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Wiktoria Wojnicz | | | | |
| | Teachers | | dr hab. inż. Wiktoria Wojnicz mgr inż. Katarzyna Pytka | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 15.0 | 0.0 | 0.0 | 0.0 | 30 |
| | E-learning hours included: 0.0 | | | | | | |
| | Adresy na platformie eNauczanie: Biomechanika inżynierska,Wykład,IMM,letni 2021-2022 (M:03516W2) - Moodle ID: 21665 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21665 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | | Self-study | SUM |
| | Number of study hours | 30 | | 5.0 | | 40.0 | 75 |
| Subject objectives | The aim of this subject is to acquire knowledge about the human body biomechanics. | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | K6_U05 | | A student can formulate a biomechanical model, define input and output data, specify which engineering tools should be used to solve the given problem | | [SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment | | |
| | K6_W05 | | A student can formulate a biomechanical problem and the method of solving this problem by using fundamentals of mechanics, strength of materials, biomechanics and modelling of mechanical system | | [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge | | |

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| Subject contents | Lectures (DSc PhD W.Wojnicz) (15h) 1. Biomechanics and clinical biomechanics. Principles of mechanics used to describe the activity of the human body. Mobility of biokinematic chain. 2. Reference systems used in biomechanics. Standard anatomical position. Types of human motions. Fundamentals of estimation of of position of centre of human body mass (de Levas method). 3. Biomechanics of muscle. Biomechanics of muscles system. 4. Principles of electromyography measurement. 5. Biomechanics of bone. Modelling of adaptation remodelling phenomenon of bone tissue. Methods of modelling of bone functional adaptation. Cantilevers of skeletal system. 6. Biomechanics of chondral tissue. Biomechanics of joints. 7. Reflex functioning of nervous system. Principals of movement coordination. 8. Biomechanics of hip joint. Models of hip joint load. Problems of hip joint biomechanics. Alloplastic reconstruction of hip joint. 9. Biomechanics of knee joint. Kinematics of knee joint. Fundamental problem of knee joint biomechanics. Alloplastic reconstruction of knee joint. 10. Biomechanics of glenohumeral joint. Alloplastic reconstruction of glenohumeral joint. Biomechanics of elbow joint. Alloplastic reconstruction of elbow joint. 11. Anatomy of spine. Defects of postures and scoliosis. Methods of spine testing. Biomechanics of spine. Systems of spine stabilization. 12. Osteosynthesis. Stabilizers used to stable osteosynthesis. Mechanical properties of stabilizers used to stable osteosynthesis. Types of stabilizers used to stable osteosynthesis. Tutorials (MSc Katarzyna Forysiak) (15h) 1. Assessment of mobility of biokinematic chain (1h). 2. Estimation of position of centre of human body mass (3h). 3. Muscle system biomechanics: static optimization task (2h). 4. Estimation of moments of inertia of the human body parts (1.5h). 5. Dynamic biomechanical models (3.5h). 6. Test (2h). 7. Repeat test (2h). | | |
| Prerequisites and co-requisites | Knowledge of mathematics, ,mechanics and strength of materials | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | pass of lectures | 50.0% | 50.0% |
| | pass of tutorials | 50.0% | 50.0% |
| Recommended reading | Basic literature | A.Chapman - Biomechanical analysis of fundamental human movements - Human Kinetics (2008) VM.Zatsiorsky - Kinetics of human motion - Human Kinetics (2002) A.Tozeren - Human body dynamics - Classical mechanics and human movement - Springer (2000) | |
| | Supplementary literature | Wojnicz W., Wittbrodt E., Modele dyskretne w analizie dynamiki mięśni szkieletowych układu ramię-przedramię (<i>Discrete models in dynamic analysis of skeletal muscles of the arm-forearm system</i>). Wydawnictwo Politechniki Gdańskiej, 2012, p. 1-212, ISBN 978-83-7348-424-5 Wojnicz W., Biomechaniczne modele układu mięśniowo-szkieletowego człowieka (<i>Biomechanical models of the human musculoskeletal system</i>). Wydawnictwo Politechniki Gdańskiej, 2018, p. 1-209, ISBN 978-83-7348-727-7 | |
| | eResources addresses | Biomechanika inżynierska,Wykład,IMM,letni 2021-2022 (M:03516W2) - Moodle ID: 21665 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21665 | |
| Example issues/ example questions/ tasks being completed | Describe the behaviour of musculoskeletal system of the upper limb | | |
| Work placement | Not applicable | | |