1. GENERAL INFORMATION			
1.1. Course teacher	Assist. Prof. Mario Kasović, Ph.D.	1.6.Year of the study programme	1
1.2.Name of the course	**BIOMECHANICS**	1.7.Credits (ECTS)	6.5
1.3.Associate teachers		1.8.Type of instruction (number of hours L + S + E + e-learning)	75 (45L + 30S)
1.4.Study programme (undergraduate, graduate, integrated)	Integrated	1.9.Expected enrolment in the course	280
1.5.Status of the course	Mandatory	1.10.Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	10%

2. COURSE DESCRIPTION	
2.1.Course objectives	To introduce the students to the methodology of approach to biomechanics of human movement and to empower them with the knowledge which they will be able to apply throughout their studies, but also in research and professional work. The students will be taught basic principles of biomechanical modeling and measurement procedures.
2.2. Course enrolment requirements and entry competences required for the course	No enrolment requirements.
2.3. Learning outcomes at the level of the programme to which the course contributes	- Understanding the application of biomechanics in kinesiology; - developing knowledge and competencies regarding the application of biomechanical approach within the analysis of athletic-related and pathological locomotion; - critically adopting the possibilities of applying biomechanics within various problems of certain kinesiological disciplines and other related areas (ergonomics, medicine, bioengineering etc.).
2.4. Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	The students will be able to: - understand the basic methodology of biomechanical human movement analysis; - interpret, within limits of the available equipment, the experimental findings; - critically relate to the current methods of modeling and measurement of human locomotion; - independently conduct basic biomechanical analysis of certain movement structures. Biomechanical competencies will create a necessary relationship between anatomical and physiological cognitions regarding the locomotor system and the kinesiological properties of various movement structures.
2.5. Course content broken down in detail by weekly class schedule (syllabus)	**Lectures and seminars** 1. The definition of biomechanics, interdisciplinary nature, concepts of research and development of measurement techniques. The most important historical occurrences and personalities. (2L) 2. Biomechanics laboratory. (2L) 3. Geometrical characteristics of human body. The basics of kinematics and dynamics of rigid bodies and the system of rigid bodies. The basics of fluid mechanics. (2L) 4. Biomechanical properties of bones, joints and skeletal muscles as components of the human musculo-skeletal system. (2L)

<table>
<tr><td></td><td colspan="6">5. Kinematic chains. The mechanisms of movement. (2L)
6. Biomechanical modeling of the human body. Anthropomorphic models. (2L)
7. Anthropometry and segmental parameters estimation. (2L+2S)
8. Kinematic measurement. Types of measurement systems. (2L+2S)
9. Acquisition and storing kinematic data, signal digitalization, derivation of linear and angular displacements. (2L+2S)
10. Measurements of force and torque. Converters. Force platforms. Measurement of pressure distribution. (2L+2S)
11. Inverse dynamics procedure. Estimation of force, torque and impulse components of segments and of a system as a whole. (2L+2S)
12. Confidence limits of inverse dynamics procedure. (2L+2S)
13. Surface electromyography (EMG). Genesis, detection and signal amplification. Telemetric procedures. (2L+2S)
14. EMG signal processing. (2L+2S)
15. Biomechanics of skeletal muscle. Modeling and simulation. Force-velocity and length-tension relationships. Neural control of muscle. (2L+2S)
16. Neuromuscular systems. Neuro- and mio-cybernetics. (2L+2S)
17. Artificial limbs and anthropomorphic robotics. Functional electrical stimulation. (2L+2S)
18. Movement performance assessment - examples from various sports. (2L+2S)
19. Gait analysis. Standardization of measurement procedures. (2L+2S)
20. Application of gait analysis in kinesiology and medicine. (2L+2S)
21. Spectral analysis of biomechanical signals and application in kinesiology. Estimation of local muscle fatigue from EMG signals. (2L+2S)
22. A reference to the future of biomechanics in kinesiology. (L3)</td></tr>
<tr><td>2.6. Format of instruction:</td><td colspan="2">☒ lectures
☒ seminars and workshops
☐ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="2">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td>2.7. Comments:</td></tr>
<tr><td>2.8. Student responsibilities</td><td colspan="5">To attend all classes on a regular basis, to work individually and/or in a group during seminars, to perform individually on tests</td></tr>
<tr><td rowspan="5">2.9. Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(other)</td><td></td></tr>
<tr><td>Tests</td><td>0.5</td><td>Oral exam</td><td>3</td><td>(other)</td><td></td></tr>
<tr><td>Written exam</td><td>2</td><td>Project</td><td></td><td>(other)</td><td></td></tr>
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2.10. Grading and evaluating student work in class and at the final exam	Class attendance 15%. Tests 10%. Written exam 30%. Oral exam 45%.		
2.11. Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Medved, V. (1995). Analiza elektromiograma u športu. u: Pećina, M., Heimer, S. (ur.) Športska medicina. Odabrana poglavlja. Zagreb: Naprijed, 64-70.		
	Mejovšek, M. (1995). Dinamička analiza gibanja u športu. u: Pećina, M., Heimer, S. (ur.) Športska medicina. Odabrana poglavlja. Zagreb: Naprijed.		
	Nikolić, V. i sur. Principi biomehanike, poglavlja: Kinematika i kineziologija lokomocije i Kineziološka elektromiografija (autor V. Medved), Zagreb: Naklada Ljevak. (u tisku)		
2.12. Optional literature (at the time of submission of study programme proposal)	1. Enoka, R. (2006). Neuromechanics of human movement - Third Edition, Human Kinetics. 2. Medved, V., Kasović, M. (2007). Biomehanička analiza ljudskog kretanja u funkciji sportske traumatologije. Hrvatski športskomedicinski vjesnik, 22 (1): 40-47 3. Medved, V. (2001). Measurement of human locomotion. Boca Raton, Fl.: CRC Press. 4. Mejovšek, M. (1990). Prijedlog modela za kinetičku analizu gibanja sportaša. Kineziologija, 22: 5-11. 5. Mejovšek, M. (1997). Biomehanika sporta. u: Milanović , D. (ur.) Priručnik za sportske trenere, Zagreb: Fakultet za fizičku kulturu, 359-394.		
2.13. Quality assurance methods that ensure the acquisition of exit competences	Anonymous student survey		