UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Izokinetika
Course title:	Isokinetics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Doktorski študijski program		**1**	**1 ali 2**
Doctoral study program		**1**	**1 or 2**

Vrsta predmeta / Course type	Izbirni/elective
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	**45**			**65**		**5**

Nosilec predmeta / Lecturer:	doc. dr. Edvin Dervišević, dr. med.

Jeziki / Languages:	**Predavanja / Lectures:**	**Slovenski/Slovene**
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Izpolnjevanje pogojev za vpis na doktorski študij Kineziologija. In znanje s področja osnov anatomije in fiziologije kot tudi živčno-mehanskih osnov gibanja.	General conditions for enrolment into the Doctoral Programme of Kinesiology. With a basic knowledge of the basics of anatomy and physiology as well as the neuromechanical basic of movement.

Vsebina:	**Content (Syllabus outline):**
1. Fiziološki in biomehanski aspekti izokinetike a. Osnovni principi (razmerje dolžina-sila, jakost) b. Odnos med navorom in kotno hitrostjo pri dinamični kontrakcij skeletne mišice i. mišična tenzija in hitrost kontrakcije ii. navor in kotne hitrosti iii. razmerje ekscentrična/koncentrična jakost iv. dinamično kontrolno razmerje c. Odnos med navorom in kotno hitrostjo pri pasivnem gibanju i. spastičnost in pareza d. Tipi testiranja i. večsklepno testiranje	Physiological and biomechanical aspects of isokinetics: b. Basic principles (length/force ratio, strength). c. Relationship between torque and angular velocity in dynamic contraction of the skeletal muscle: i. muscular tension and contraction speed; ii. torque and angular velocity; iii. ratio of eccentric/concentric strength; iv. dynamic control ratio. d. Relationship between torque and angular velocity in passive movement: i. spasticity and paresis. e. Test types:

ii. večsklepna zmogljivost in izokinetično testiranje
iii. Obremenitev sklepa med dinamičnim naporom

2. Naprave, testni parametri in izvedba meritev
   a. Izokinetične naprave
   b. Kontrolni parametri in parametri zgmoljivosti
      i. Kontrolni parametri testiranja mišične jakosti (od sklepa odvisni in od sklepa neodvisni dejavniki)
      ii. Parametri zmogljivosti (oblika krivulje navor-kotni položaj sklepa, računanje navora)
      iii. Testiranje utrudljivosti in vzdržljivosti
3. Ponovljivost izokinetičnih meritev
   a. Tipi napak, merilna skala in ponovljivost
   b. Testne indice, ki se uporabljajo za oceno ponovljivosti (t-test i korelacijski koeficient)
   c. Absolutni in relativni indikatorji ponovljivosti
   d. Sodobni koncepti ocene ponovljivosti (Bland- Altmanova krivulja koeficient variance standardne deviacije, standardna mera napake)
4. Aplikacija izokinetičnega testiranja mišične jakosti in izokineitčnega treninga v rehabilitaciji
   a. Uporabnost izokinetike za sledenje pacientom po poškodbah gibal (kdaj testirati, pri katerih hitrostih, koliko ponovitev)
   b. Fiziološke interakcije pri treningu skeletne mišice
   c. Specifičnost treninga skeletne mišice (tip kontrakcije, vpliv kotnih hitrosti, odprta in zaprta kinetična veriga, bilateralni učinki in navzkrižno učenje, prenos jakosti izven obsega gibanja med treningom – overshot)
   d. Prikaz uporabe izokinetičnega treninga v rehabilitaciji (prikaz primerov)
5. Sodno medicinske aplikacije izokinetike
   a. uporaba izokinetike pri oceni delazmožnosti in posledic poškodb mišično skeletnega sistema
   b. primerjava izometričnih in izokinetičnih metod ocene funkcionalnih posledic poškodb gibal

i. multi-joint tests;
ii. multi-joint capacity and isokinetic tests;
iii. loading of joint during a dynamic exercise.

Devices, test parameters and implementation of measurements:
   a. Isokinetic devices;
   b. Control parameters and capacity parameters:
      i. control parameters of muscular strength testing (joint-dependent and joint-independent factors);
      ii. capacity parameters (shape of the torque-joint angular position curve, calculation of torque);
      iii. testing of fatigue and endurance.

Repeatability of isokinetic measurements:
   a. types of errors, measuring scale and repeatability;
   b. test indices used in the assessment of repeatability (t-test and correlation coefficient);
   c. absolute and relative indicators of repeatability;
   d. modern concepts of the repeatability assessment (Bland-Altman curve, variance coefficient of standard deviation, standard error rate).

Application of isokinetic testing of muscular strength and isokinetic training in rehabilitation:
   a. applicability of isokinetics for patient follow-up after the limb injury (time of testing, speed of testing, number of repetitions);
   b. physiological interactions in the training of skeletal muscle;
   c. specificity of training of skeletal muscle (type of contraction, effect of angular velocity, open and closed kinetic chain, bilateral effects and cross-learning, transfer of strength outside the scope of movement during training – overshot);
   d. demonstration of the use of isokinetic training in rehabilitation (presentation of cases).

Forensic medical applications of isokinetics:
   a. use of isokinetics in the assessment of capacity to work and the consequences

c. kvantitativna ocena okvare in stopnje prizadetosti 6. Izokinetično testiranje kolena a. Postopek testiranja za izbrani sklep i. uravnava biološke in mehanične osi, testni položaji, stabilizacija, kotne hitrosti ii. Reprezentativne vrednosti 7. Izokinetično testiranje gležnja i. uravnava biološke in mehanične osi, testni položaji, stabilizacija, kotne hitrosti ii. Reprezentativne vrednosti 8. Izokinetično testiranje trupa i. uravnava biološke in mehanične osi, testni položaji, stabilizacija, kotne hitrosti ii. Reprezentativne vrednosti 9. Izokinetično testiranje ramenskega sklepa i. uravnava biološke in mehanične osi, testni položaji, stabilizacija, kotne hitrosti Reprezentativne vrednosti	of injuries of the muscle-skeletal system; b. comparison of isometric and isokinetic methods for assessing functional consequences of limb injuries; c. quantitative assessment of injury and degree of damage Isokinetic knee tests: a. test procedure for selected joint; i. alignment of biological and mechanical axes, test positions, stabilisation, angular velocities; ii. representation values. Isokinetic ankle tests: i. alignment of biological and mechanical axes, test positions, stabilisation, angular velocities; ii. representation values. Isokinetic trunk tests: i. alignment of biological and mechanical axes, test positions, stabilisation, angular velocities; ii. representation values. Isokinetic shoulder joint tests: i. alignment of biological and mechanical axes, test positions, stabilisation, angular velocities; Representation values.

Temeljni literatura in viri / Readings:

Zeevi Dvir. 1. Isokinetics, 2nd Edition, Churchill Livingstone. 2004

Davies GJ. A Compendium of Isokinetics in Clinical Usage and Rehabilitation Techniques. 4th ed. Onalaska, WI: S & S Publishing; 1992

Journal of Isokinetics and Exercise Science

Cilji in kompetence:	**Objectives and competences:**
Usposobiti študente za poglobljeno poznavanje izokinetičnih meritev v smislu izbire primerne meritvene hitrosti, meritvenega položaja, števila ponovitev in časa premora med meritvenimi nizi. Temeljni cilj je usposabljanje študenta za oceno rezultatov izokinetičnih meritev in načrtovanje ter prilagodba vadbenih programov v skladu z rezultati meritev.	The aim of the course is to impart to the postgraduate students the knowledge of isokinetic measurements which have been used for years for assessing muscular strength both in medicine and sport. Today, over 3,000 scientific articles are available which in one way or another report about the use of isokinetic measurements in their methodology. For this reason, this course is a novelty in the postgraduate study of kinesiology as, for the first time, it will be presented systematically and in greater depth.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje:	Knowledge and understanding:
Študent se usposobi za načrtovanje, izvajanje in interpretacijo izokinetičnih meritev. Študent bo bo opravljenem izpitu sposoben samostojno izbirati in načrtovati primerne meritvene protokole, katerih bo rezultate sposoben primerno ovrednotiti ter uporabit za načrtovanje vadbenega procesa.	Students learn about planning, implementing and interpreting of isokinetic measurements. After passing the examination, students will be able to independently select and plan appropriate measurement protocols, correctly evaluate their results and use them in the planning of a training process.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in praktične vaje.	Lectures and practical work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Ustni izpit, seminar	**100 %**	Type (examination, oral, coursework, project): Oral examination, seminar.

Reference nosilca / Lecturer's references:

Sattler, T., Sekulic, D., Spasic, M., Osmankac, N., João, P. V, Dervisevic, E., & Hadzic, V. (2014). Isokinetic knee strength qualities as predictors of jumping performance in high-level volleyball athletes; multiple regression approach. *The Journal of Sports Medicine and Physical Fitness*.

Hadzic, V., Ursej, E., Kalc, M., & Dervisevic, E. (2012). Reproducibility of shoulder short range of motion isokinetic and isometric strength testing. *Journal of Exercise Science and Fitness*, *10*(2), 83–89. doi:10.1016/j.jesf.2012.10.005

Hadzic, V., Sattler, T., Veselko, M., Markovic, G., & Dervisevic, E. (2014). Strength asymmetry of the shoulders in elite volleyball players. *Journal of Athletic Training*, *49*(3), 338–344.

Dervišević, E., & Hadžić, V. (2012). Quadriceps and hamstrings strength in team sports: Basketball, football and volleyball. *Isokinetics and Exercise Science*, *20*(4), 293–300.

DERVIŠEVIĆ, Edvin, BILBAN, Marjan, VALENČIČ, Vojko. The influence of low frequency electrostimulation and isokinetic training on the maximal strength of m. quadriceps femoris. Isokinet. exerc. sci., 2002, vol. 10, no. 4, str. 203-209, DERVIŠEVIĆ, Edvin, HADŽIĆ, Vedran, BURGER, Helena. Reproducibility of trunk isokinetic strength findings in healthy individuals. Isokinet. exerc. sci., 2007, vol. 15, no. 2, str. 99-109.