

GUIDELINES FOR PREREQUISITE EXAM/NAVODILA ZA DIFERENCIALNI IZPIT Biomechanics / Biomehanika

PROFESSORS/NOSILCI:
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Vsebina:

Uvod:

- Opredelitev biomehanike in njena vloga v športu in kineziologiji
- Osnovna terminologija področja
- Osnovne mere in enote

Biomehanika mišično-skeletnega sistema

- Kinematika (sistem točkastega in togega telesa, hitrost, pospešek, kroženje in kotna hitrost, kotni pospešek, kinematična obravnava metov, skokov in drugih gibalnih vzorcev, enodimenzionalna in večdimenzionalna gibanja)
- Sile in navori (Newtonovi zakoni, odnos med silo in navorom, kompresijske, strižne, natezne in rotacijske sile, trenje in sile na podlago, gibalna količina in sunek sile, trki in njihova kvaliteta, upor med različnimi gibanji ter v različnih medijih, centrifugalna in centripetalna sila, težišče telesa in center pritiska)
- Delo, moč in energija (odnos med delom in energijo, odnos med delom in silo, moč in učinkovitost gibanja, kinetična, potencialna in prožnostna energija)
- Biomehanika gibanja (analiza in razumevanje cikličnih, balističnih in manipulativnih gibanj, ter statičnih položajev z vidika obremenitev)

Content:

Introduction:

- The definition of biomechanics and its role in sport science and physiotherapy
- Basic terminology
- Basic physical quantities and units

The biomechanics of musculoskeletal system:

- Kinematics (the body as a dotted or rigid system, velocity, acceleration, angular and linear kinematics, the kinematic analysis of throwing, jumping and other movements, unidimensional and multidimensional movements)
- Forces and torques (Newton's laws, the relationship between forces and torques, compressive, shear, tensile and rotational forces, friction and ground reaction forces, collisions and their quality, resistance during different movements and in different mediums, centrifugal and centripetal force, the center of mass and the center of pressure)
- Work, power and energy (the relationship between work and energy, and between work and force, power and movement efficiency, the kinetic, potential and elastic energy)
- The biomechanics of movement (the analysis of cyclic, ballistic and

- Kompresijske in strižne sile v hrbtenici v različnih položajih
- Sile reakcije podlage med različnimi gibanji (hoja, tek, doskoki, poskoki)
- Sile in navori v sklepih med različnimi gibalnimi nalogami

Biomehanika kardio-respiratornega sistema in notranjih organov

- Tlak
- Mehanika tekočin (hidrostatični zakoni, vzgon, upor tekočin, viskoznost in viskoelastičnost, gibanje tekočin)
 - Mehanizmi regulacije krvnega tlaka
 - Vazodilatacija in vazokonstrikcija
 - Upornost žil in interakcija s krvnim tlakom
- Termodinamika (zakoni termodinamike, specifična toplota, entropija, izparilna toplota)
 - Fizikalne zakonitosti in mehanizmi ohlajanja telesa
 - Vadba v vročem in hladnem okolju

Človek in fizikalne lastnosti okolja:

- Svetloba (valovna dolžina in frekvenca, osvetljenost in svetilnost, barva in kontrast)
 - Vpliv svetlobe na človeško telo
 - Zaznavanje svetlobe in barv
- Zvok (glasnost, frekvenca)
 - Vpliv zvoka in hrupa na človeško telo
 - Zaznavanje zvoka

Osnove elektromagnetizma

- Elektromagnetno valovanje, električni naboj, napetost in tok
- Elektromagnetizem v človeškem telesu

Biomehanska analiza gibanja

- Kinematična analiza gibanja (2D in 3D kinematična analiza, analiza hoje in teka, obsega gibov, izračuni hitrosti in pospeškov telesa ter telesnih segmentov, analiza metov in skokov, doskokov ter poskokov)

manipulative movements, as well as static positions regarding the load they impose

- Compressive and shear forces imposed to the spine during various positions
- Ground reaction forces during different movements (walking, running, landing, hopping)
- Joint forces and torques during different movements

The biomechanics of cardiorespiratory system and internal organs

- Pressure
- The mechanics of fluids (hydrostatic laws, buoyance, the resistance of fluids, viscosity and viscoelasticity, the movement of fluids)
 - Blood pressure regulation mechanisms
 - Vasodilatation and vasoconstriction
 - Vascular resistance and its relation to blood pressure
- Thermodynamics (the laws of thermodynamics, heat capacity, entropy, the enthalpy of vaporization)
 - The mechanisms of body temperature regulation
 - Workout in hot or cold environments

The human body and the physical properties of the environment:

- The lightning (wavelength and frequency, luminance and luminous energy, the colors and the contrasts)
 - The effect of the lightning on the human body
 - Lightning and color perception
- Sounds (frequency, volume)
 - The influence of sound and noise on the human body
 - Sound perception

- Merjenje sil in navorov (osnove dinamometrije, pritiskovnih plošč in drugih senzorjev sil)
- Elektromiografija (osnovni koncepti zajema elektromiografskih meritev, interpretacija signalov, uporabnost)

Basics of electromagnetism

- Electromagnetic waves, electrical charge, voltage and current
- Electromagnetism in human body

Biomechanical analysis of human motion

- Kinematics analysis (2D and 3D kinematics, gait analysis, range of motion measurement, calculation of velocities and accelerations of the body and individual body segments, kinematic analysis of jumps, throws, landings and hop)
- Force and torque measurements (dynamometry, force plates, other force sensors)
- Electromyography (basic concepts of electromyography, the interpretation of the signals, the usefulness of electromyography)

Temeljna literatura in viri / Readings:

Obvezna/Required

- McGinnis, P. M. (2013). Biomechanics of Sport and Exercise - 3rd Edition. Human Kinetics, Champaign, IL, ZDA.
- Supej, M. (2011). Biomehanika 1. Univerza v Ljubljani, Fakulteta za Šport.

Dopolnilna in dodatna literatura

- Kranjc, T., Kuščer, I. & Moljk, A. (1999). FIZIKA ZA SREDNJE ŠOLE, 1. del, učbenik za fiziko 1. oz. 2. letniku gimnazijskega in srednjega tehniškega oz. strokovnega izobraževanja. Državna založba Slovenije, Ljubljana.
- McCaw, S. (2014). Biomechanics for dummies. John Wiley & Sons, Hoboken, New Jersey, ZDA.
- Young, H. D., Freedman, R. A. & Ford, A. L. (2011). Sears and Zemansky's University Physics with Modern Physics, 13th Edition. Addison-Wesley, Boston, Massachusetts, ZDA.
- Humphrey, J. D. & Sherry, D. (2015). An Introduction to Biomechanics. Springer Publishing Company, New York, NY, ZDA.
- Robertson, G., Caldwell, G., Hamill, J. Kamen, G. & Whittlesey, S. N. (2014). Research Methods in Biomechanics-2nd Edition. Human Kinetics, Champaign, IL, ZDA.
- Watkins, J. (2014). Fundamental biomechanics of sport and exercise. Routledge, New York, NY, ZDA.
- Bartlett, R. (2014). Introduction to Sports Biomechanics – Third Edition. Routledge, New York, NY, ZDA.

Načini ocenjevanja: Pisni ali ustni izpit	Assessment: Written or oral exam
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