

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Obdelava biomedicinskih signalov
Course title:	Biomedical Signal Processing

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Biomedicinska tehnologija/Biomedical Technology 3. stopnja/3rd Degree		2	3 ali 4

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	20	10			105	5

Nosilec predmeta / Lecturer:

red. prof. dr. Aleš Holobar

Jeziki /

Predavanja / Lectures:

Slovenščina / Slovene

Languages:

Vaje / Tutorial:

Slovenščina / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

Kandidat mora doseči 300 ECTS na predhodnem študiju.

Graduate degree 300 ECTS

Vsebina:

Content (Syllabus outline):

- Zaznavanje in merjenje bioelektričnih signalov
- Principi računalniškega zajemanja, hranjenja in pregledovanja bioelektričnih signalov
- Zasnova in uporaba naprav za merjenje bioelektričnih signalov (EKG, EMG, EEG)
- Modeliranje nastanka bioelektričnih signalov, povezava s fiziologijo in medicinsko relevantnimi parametri
- Postopki za računalniško analizo bioelektričnih signalov
- Bioelektrični signali v diagnostiki in terapiji

- Detection and measurement of bioelectrical signals
- Principles of computer-assisted acquisition, storage and retrieval of bioelectrical signals
- Basics and utilisation of acquisition devices for bioelectrical signal measurements (ECG, EMG, EEG)
- Modelling of bioelectrical signal sources, connections with the physiology, and medically relevant parameters
- Fundamental approaches to the computer analysis of bioelectrical signals
- Bioelectrical signals v diagnostics and therapy

Temeljni literatura in viri / Readings:

- Roberto Merletti, Dario Farina (Eds.): Surface Electromyography: Physiology, Engineering and Applications", IEEE Press Series on Biomedical Engineering, 2016.
- Roberto Merletti, Aleš Holobar Dario Farina. Mathematical techniques for noninvasive muscle signal analysis and interpretation. V: NARAYAN, Roger (ur.). Encyclopedia of biomedical engineering. Amsterdam: Elsevier. cop. 2019, str. 95-111.
- Roberto Merletti, Dario Farina, Aleš Holobar. Surface electromyography (sEMG). V: WEBSTER, John G. (ur.). Wiley encyclopedia of electrical and electronics engineering. Chichester: Wiley. 2015, str. 1-24,
- Joseph D. Bronzino (Ed.): Biomedical Engineering Handbook. Boca Raton, Florida: CRC Press, Inc., 1995.
- Metin Akay (Ed.), et al.: Nonlinear Biomedical Signal Processing: Fuzzy Logic, Neural Networks, and New Algorithms, IEEE Press Series on Biomedical Engineering, 2000.

Cilji in kompetence:

Modeli, naprave in pristopi za računalniško zajemanje, analizo in interpretacijo bioelektričnih signalov.

Objectives and competences:

Models, devices and approaches to the computer assisted acquisition, analysis, and interpretation of bioelectrical signals.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

Razumevanje računalniških pristopov k obdelavi bioelektričnih signalov in sposobnost uporabe ustreznih diagnostičnih programov.

Prenesljive/ključne spretnosti in drugi atributi:

Principi pri obdelavi bioelektričnih signalov

Metode poučevanja in učenja:

Knowledge and understanding:

Comprehension of computer assisted approaches to biomedical signal processing and ability to use signal-based diagnostic programs.

Transferable/Key Skills and other attributes:

Principles of computer processing of bioelectrical signals.

Learning and teaching methods:

Predavanja z razlago teoretičnih vsebin, demonstracije in praktične vaje na računalnikih.

Lecturing with explanation of theoretical backgrounds, demonstrations, and practical exercises using computers

Delež (v %) /

Načini ocenjevanja:

Weight (in %) /

Assessment:

Projekt	50 %	Project
Ustni izpit	50 %	Oral examination

Reference nosilca / Lecturer's references:

HOLOBAR, Aleš, GALLEGÓ, J.A., KRANJEC, Jernej, ROCON, Eduardo, ROMERO, Juan P., BENITO-LEÓN, Julián, PONS, José L., GLASER, Vojko, et al. Motor unit-driven identification of pathological tremor in electroencephalograms. *Frontiers in Neurology*, ISSN 1664-2295. [Online ed.], October 2018, vol. 9, article 879, str. 1-15. [COBISS.SI-ID 21832982], kategorija: 1A2 (Z, A1/2); uvrstitev: SCI, Scopus

GLASER, Vojko, HOLOBAR, Aleš. Motor unit identification from high-density surface electromyograms in repeated dynamic muscle contractions. *IEEE transactions on neural systems and rehabilitation engineering*, ISSN 1534-4320. [Print ed.], Date of Publication: 17 December 2018, str. 1-9, ilustr., doi: 10.1109/TNSRE.2018.2885283. [COBISS.SI-ID 21986838], kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus

ŠAVC, Martin, GLASER, Vojko, KRANJEC, Jernej, CIKAJLO, Imre, MATJAČIČ, Zlatko, HOLOBAR, Aleš. Comparison of convolutive kernel compensation and non-negative matrix factorization of surface electromyograms. *IEEE transactions on neural systems and rehabilitation engineering*, ISSN 1534-4320. [Print ed.], 2018, vol. 26, no. 10, str. 1935-1944, ilustr., doi: 10.1109/TNSRE.2018.2869426. [COBISS.SI-ID 21717270], kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus