Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION	
Predmet:	Mehki sistemi vodenja
Subject Title:	Fuzzy control systems

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Doktorski študij Tehnika – področje izobraževanja, 3. stopnja		2	zimski
Doctoral Study Education in Engineering, 3rd degree		2	winter

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15	10				155	**6**

Nosilec predmeta / Lecturer: Stanislav Avsec

Jeziki / Languages: **Predavanja / Lecture:** Slovenščina / Slovene; **Vaje / Tutorial:**

Pogoji za opravljanje študijskih obveznosti:

Osnovno znanje iz matematike in elektrotehnike.

Prerequisites:

Basic knowledge of mathematics and electrical engineering.

Vsebina:

Predavanja:

- Združitev numeričnih in jezikovnih informacij v sistemih vodenja.
- Razvrstitev mehkih logičnih sistemov.
- Opis in analiza mehkih logičnih sistemov.
- Učenje mehkih logičnih sistemov.
- Primerjava mehkih logičnih sistemov z nevronskimi mrežami.
- Stabilnost mehkih regulacijskih sistemov.
- Mehki adaptivni filtri.

Seminar:

Seminar aplikativno dopolnjuje vsebino predavanj z reševanjem praktičnih problemov.

Content (Syllabus outline):

Lectures:

- Numerical and linguistic information in control systems junction
- Classification of Fuzzy control systems
- Specification and analysis of Fuzzy logic systems
- Comparison between Fuzzy and Neural control systems
- Stability of Fuzzy control systems
- Fuzzy adaptive systems

Seminar:

Seminar work supplements the lectures with the solutions of the practical problems.

Temeljni literatura in viri / Textbooks:

Li-xin Wang: Adaptive fuzzy systems and control, Prentice Hall, 1994
D. Đonlagić: Osnove snovanja mehkih (fuzzy) regulacij, UM FERI Maribor, 1994
Marjan Golob, Nenad Muškinja: Osnove snovanja mehkih (fuzzy) regulacij, Vaje, UM FERI Maribor, 1994
Boris Aberšek: Problem based learning and proprioception, Cambridge Scholar Publishing, Newcastle upon Tyne, 2018

Cilji:

analizirati in evalvirati znanja in informacij o sodobnih mehkih sistemih vodenja v tehnični praksi
analiziratii praktično uporabo predhodno pridobljenih teoretičnih znanj na praktičnih primerih
spodbujati študente k kreativnemu in samostojnemu razmišljanju in razvijanju sposobnosti za kreativno reševanje inženirskih problemov s področja mehkih sistemov vodenja.

Objectives:

To analyse and evaluate knowledge and information about contemporary fuzzy control system used in technical praxes;
to analyse practical use of previously accumulated theoretical knowledge on the practical examples
to encourage the students to creative and independent thinking for developing and solving different problems from fuzzy control system.

Predvideni študijski rezultati:

Znanje in razumevanje:
Po zaključku tega predmeta bo študent sposoben:
opisati in razumeti mehke logične sisteme,
sposoben bo za dani problem zgraditi mehki logični sistem in ga v simulacijah z Matlabom oziroma s Simulinkom tudi analizirati,
uporabiti pridobljeno znanje za izgradnjo in študij regulacijskih algoritmov na določenih tehniških primerih,
izbrati in uporabiti postopke, metode in orodja za načrtovanje mehkih logičnih sistemov na konkretnih primerih v praksi,
sestaviti pisno poročilo o izvedeni seminarski nalogi.

Prenesljive/ključne spretnosti in drugi atributi:
Spretnosti komuniciranja: ustni zagovor laboratorijskih vaj, pisno izražanje pri poročilih o laboratorijskih vaj, na seminarju in na pisnem izpitu.
Uporaba informacijske tehnologije: uporaba programskih orodij za simulacijo in analizo tehniških sistemov.
Spretnosti računanja: reševanje računskih nalog pri seminarskih vajah, domačih nalogah in izpitih.
Reševanje problemov: Regulacija in analiza preprostih tehniških sistemov.

Intended learning outcomes:

Knowledge and understanding:
On completion of this course the student will be able to:
describe and understand of Fuzzy logic systems,
Develop a Fuzzy logic system for several case studies in simulation with Matlab or Simulink program tool,
use acquired knowledge for development and study of control algorithm implementation on similar engineering examples,
select and apply procedure, engineering methods and tools for Fuzzy control system design on practical cases,
construct technical report of accomplished seminar work.

Transferable/Key Skills and other attributes:
Communication skills: oral lab work defense, manner of expression at lab exercises, seminar reports and at written examination.
Use of information technology: use of software tools for engineering processes simulation and analysis.
Calculation skills: calculation of numerical exercises at tutorials, seminars, homework assignments and at written examination.
Problem solving: Control and analysis of simple engineering systems.

Metode poučevanja in učenja:

frontalna predavanja,
izdelava seminarske naloge.

Teaching and learning methods:

frontal lectures,
seminar work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment methods:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
seminarska naloga,	**30 %**	seminar work,
pisni izpit,	**30 %**	written examination,
ustni izpit.	**40 %**	oral examination.

Reference nosilca / Lecturer's references:

AVSEC, Stanislav, KOCIJANČIČ, Slavko. A path model of effective technology-intensive inquiry-based learning. Educational technology & society. 2016, vol. 19, issue 1, str. 308-320, ilustr., tabele. ISSN 1436-4522. http://www.ifets.info/journals/19_1/25.pdf, http://pefprints.pef.uni-lj.si/3314/. [COBISS.SI-ID 10877001], [JCR, SNIP, WoS do 13. 9. 2020: št. citatov (TC): 8, čistih citatov (CI): 5, Scopus do 29. 12. 2020: št. citatov (TC): 14, čistih citatov (CI): 11]

AVSEC, Stanislav, KAUČIČ, Branko. Eco-efficient decision support model of solid waste recycling. Environmental engineering and management journal. [Print ed.]. 2018, vol. 17, no. 5, str. 1149-1159, ilustr., tabele, graf. prikazi. ISSN 1582-9596. http://www.ecozone.ro/reviste.php?revista=21&volum=62&numar=202&RID=27591. [COBISS.SI-ID 12052809], [JCR, SNIP, WoS do 10. 8. 2020: št. citatov (TC): 3, čistih citatov (CI): 3, Scopus do 29. 11. 2020: št. citatov (TC): 3, čistih citatov (CI): 3]

AVSEC, Stanislav, SAJDERA, Jolanta. Factors influencing pre-service preschool teachers' engineering thinking : model development and test. International journal of technology and design education. 2019, vol. 29, issue 5, str. 1105-1132, ilustr., tabele. ISSN 1573-1804. https://link.springer.com/content/pdf/10.1007/s10798-018-9486-8.pdf, DOI: 10.1007/s10798-018-9486-8. [COBISS.SI-ID 12225865], [JCR, SNIP, WoS do 12. 7. 2020: št. citatov (TC): 1, čistih citatov (CI): 1, Scopus]

SZEWCZYK-ZAKRZEWSKA, Agnieszka, AVSEC, Stanislav. Predicting academic success and creative ability in freshman chemical engineering students : a learning styles perspective. International journal of engineering education. 2016, vol. 32, no. 2(a), str. 682-694, ilustr., tabele. ISSN 0949-149X. http://www.ijee.ie/latestissues/Vol32-2A/09_ijee3204ns.pdf. [COBISS.SI-ID 10946633], [JCR, SNIP, WoS do 10. 8. 2020: št. citatov (TC): 5, čistih citatov (CI): 3, Scopus do 10. 8. 2020: št. citatov (TC): 10, čistih citatov (CI): 5]

RUPNIK, Denis, AVSEC, Stanislav. Effects of a transdisciplinary educational approach on students' technological literacy. Journal of Baltic science education. 2020, vol. 19, no. 1, str. 121-140, tabele, graf. prikaz. ISSN 2538-7138. http://www.scientiasocialis.lt/jbse/files/pdf/vol19/121-141.Rupnik_JBSE_Vol.19_No.1.pdf, http://pefprints.pef.uni-lj.si/6170/, DOI: 10.33225/jbse/20.19.121. [COBISS.SI-ID 12798025], [JCR, SNIP, WoS, Scopus]