

UČNI NAČRT PREDMETA / COURSE SYLLABUS**Predmet:** Industrijska avtomatizacija za informatiko**Course title:** Industrial automation for informatics

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester

Informatika v sodobni družbi, visokošolski strokovni študijski program prve stopnje	-	Drugi ali tretji	Četrta ali šesta
Informatics in Contemporary Society, first cycle Professional Study Programme	-	Second or third	Fourth or sixth

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

1-ISD-VS-IP-IAI-2024-09-12

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	work		Individ. work	
30	/	30	/	/	120	6

Nosilec predmeta / Lecturer: Doc. dr. Boštjan Pregelj**Jeziki / Predavanja /**
Languages: Lectures: Slovenski / Angleški**Vaje / Tutorial:** Slovenski / Angleški**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:****Prerequisites:**

Za vključitev v delo mora študent osvojiti vsebine predmetov Programiranje 1 in Informacijski sistemi.

The course requires knowledge obtained within the courses Programming 1 and Information Systems.

Vsebina:

- Industrijski proces in sistem vodenja
- Osnovni principi avtomatskega vodenja procesov
- Gradniki sistemov avtomatskega vodenja (signali, merilni in izvršni členi)
- Dinamični sistemi (osnovne lastnosti, model, simulacija)
- Načrtovalski pogled na sisteme vodenja
- Sistemi logičnega in sekvenčnega vodenja
- Načrtovanje vodenja dinamičnih sistemov (tipi regulatorjev, zvezni regulatorji, uglaševanje regulatorjev)
- Višji nivoji vodenja v industriji (procesni, proizvodni, poslovni)
- Primeri avtomatizacije in izvedbe vodenja procesov v praksi, koncept hišne avtomatizacije

Content (Syllabus outline):

- The process and the system management
- Basic concepts of automatic process management
- Building blocks of automatic control systems (signals, sensors, actuators)
- Dynamical systems (basic properties, model, simulation)
- Design aspect of control systems
- Logic and sequential control systems
- Management planning of dynamic systems (types of regulators, federal regulators, tuning of regulators)
- Higher level of management in industry (process, production, business)
- Examples of automation and implementation of process management in practice, home automation concept

Temeljni literatura in viri / Readings:

Obvezna literatura

- J. Kocijan in S. Strmčnik: Osnove avtomatskega vodenja, Založba Univerze v Novi Gorici, 2021.

Priporočena literatura

- G. Mušič: Avtomatika, Založba FE in FRI, 2014. <http://msc.fe.uni-lj.si/Books.asp?book=1>
- S. Strmčnik: Celostni pristop k računalniškemu vodenju procesov, Fakulteta za elektrotehniko v Ljubljani, 1998. https://dsc.ijs.si/si/objave/celostni_pristop/
- R.C.Dorf, R.H. Bishop: Modern Control Systems (12th edition), Prentice Hall New Yersy, 2010
- Katsuhiko Ogata : System Dynamic, 4th edition, Pearson Prentice Hall New Yersy ISBN: 1292026081 , 2013

Cilji in kompetence:

Objectives and competences:

Splošne kompetence:

- Poznavanje in razumevanje širokega nabora aplikacij informacijsko komunikacijske tehnologije v sodobni družbi.
- Sposobnost fleksibilne in aplikativne uporabe teoretičnega znanja.
- Razvoj (samo)kritične presoje.

Predmetno-specifične kompetence:

- Poznavanje bistvenih konceptov avtomatskega vodenja in osnovne terminologije na tem področju.
- Razumevanje proizvodnih sistemov in v njih prevladujočih konceptov vodenja.
- Sposobnost ugotavljanja problema avtomatizacije in oblikovanja načelnega pristopa k reševanju le-tega.
- Poznavanje osnov logičnih sistemov in principov vodenja
- Poznavanje osnov dinamičnih sistemov, modeliranja in simulacije.
- Poznavanje osnovnih pristopov načrtovanja vodenja dinamičnih sistemov.
- Poznavanje hierarhije sistemov vodenja v industriji.

General competences:

- Knowledge and understanding of a wide range of applications of information communication technology in the modern society.
- Ability to flexibly apply knowledge in practice.
- Development of (self)critical judgement.

Subject-specific competences:

- Knowledge of basic concepts of automatic control and related terminology.
- Understanding of production systems and prevailing control principles.
- Ability to identify the automatic control problem and formulate a control design approach.
- Knowledge of basic principles of logic systems and control.
- Basic understanding of dynamic systems, modelling and simulation.
- Knowledge and understanding of dynamic system control design.
- Knowledge of higher levels of control in the industry.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Poznavanje osnovnih gradnikov avtomatskih sistemov avtomatskega vodenja procesov.
- Razumevanje medsebojnih odvisnosti in dinamik teh gradnikov vključno z modelom in načrtovanjem regulatorjev.
- Sposobnost prikaza načrtovanja zaprtozančnega vodenja procesa.

Intended learning outcomes:

Knowledge and understanding:

- Knowledge of the building blocks of automatic control systems.
- Understanding interdependencies and dynamics of building blocks, including the model and controller design.
- The ability to demonstrate design of a closed-loop control system.

Metode poučevanja in učenja:**Learning and teaching methods:**

<ul style="list-style-type: none"> • Predavanja z aktivno udeležbo študentov (razlaga, diskusija, primeri, reševanje problemov); • vaje z aktivno udeležbo študentov (razlaga, diskusija, primeri, refleksija, reševanje problemov); <p>Predmet je oblikovan na kombinirani način študija in vključuje tudi aktivnosti preko elektronskega okolja (diskusije, repozitorij izbranih materialov, iskanje preko spleta).</p>	<ul style="list-style-type: none"> • Lectures including participation of students (explanation, discussion, questions, problems & challenges) • Exercises, performed with active participation of students (explanation, discussion, examples, reflection, questions, problems) <p>The course is formed to combine, on-site and online activities, that include forum discussions, repository of selected materials and search of web databases.</p>
---	--

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

Način (pisni izpit, seminarska naloga):		Type (examination, oral, coursework, project):
Pisni izpit	100 %	Written exam

Reference nosilca / Lecturer's references:

STRŽINAR, Žiga, PREGELJ, Boštjan, ŠKRJANC, Igor. Soft sensor for non-invasive detection of process events based on Eigenresponse Fuzzy Clustering. *Applied soft computing*. [Online ed.]. Jan. 2023, vol. 132, str. 1-12, ilustr. ISSN 1872-9681. DOI: [10.1016/j.asoc.2022.109859](https://doi.org/10.1016/j.asoc.2022.109859). [COBISS.SI-ID [131913475](https://www.cobiss.si/id/131913475)]

JOVAN, David Jure, DOLANC, Gregor, PREGELJ, Boštjan. Utilization of excess water accumulation for green hydrogen production in a run-of-river hydropower plant. *Renewable energy*. [Print ed.]. [in press] 2022, 34 str. ISSN 0960-1481. DOI: [10.1016/j.renene.2022.06.079](https://doi.org/10.1016/j.renene.2022.06.079). [COBISS.SI-ID [112296195](https://www.cobiss.si/id/112296195)]

PREGELJ, Boštjan, DEBENJAK, Andrej, DOLANC, Gregor, PETROVČIČ, Janko. A diesel-powered fuel cell APU : reliability issues and mitigation approaches. *IEEE transactions on industrial electronics*. [Print ed.]. 2017, vol. 64, no. 8, str. 6660-6670. ISSN 0278-0046. DOI: [10.1109/TIE.2017.2674628](https://doi.org/10.1109/TIE.2017.2674628). [COBISS.SI-ID [30661159](https://www.cobiss.si/id/30661159)]

JOVAN, David Jure, DOLANC, Gregor, PREGELJ, Boštjan. Cogeneration of green hydrogen in a cascade hydropower plan : er. *Energy conversion and management*. X. 2021, vol. 10, str. 100081-1-100081-12. ISSN 2590-1745. DOI: [10.1016/j.ecmx.2021.100081](https://doi.org/10.1016/j.ecmx.2021.100081). [COBISS.SI-ID [60142851](https://www.cobiss.si/id/60142851)]

GERKŠIČ, Samo, PREGELJ, Boštjan. Finite-word-length FPGA implementation of model predictive control for ITER resistive wall mode control. *Fusion engineering and design*. [Print ed.]. 2021, vol. 100, str. 105001-1-105001-12. ISSN 0924-6460. DOI: [10.1016/j.fusengdes.2021.105001](https://doi.org/10.1016/j.fusengdes.2021.105001). [COBISS.SI-ID [60142851](https://www.cobiss.si/id/60142851)]

ed.]. 2021, vol. 169, str. 112480-1-112480-9. ISSN 0920-3796.

DOI: [10.1016/j.fusengdes.2021.112480](https://doi.org/10.1016/j.fusengdes.2021.112480). [COBISS.SI-ID [55752963](#)]