



UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Industrijska avtomatizacija za informatiko

Course title: Industrial automation for informatics

Študijski program in stopnja

Študijska smer

Študijsko leto

Study programme and level

Study field

Academic year

NOO projekt piloti: Naprednejša računalniška znanja (nivo: visokošolski strokovni študijski program)	Digitalizacija, internet stvari ter industrijska avtomatizacija	2022/23
RRP pilot project: Advanced computer skills (level: first cycle professional study programme)	Digitalization, Internet of Things, and Industrial Automation	2022/23

Vrsta predmeta / Course type

Obvezni/obligatory

Univerzitetna koda predmeta / University course code:

NOO-DISIA-VS-IAI-2022-23

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

Nosilec predmeta / Lecturer:

Doc. dr. Boštjan Pregelj

Jeziki /

**Predavanja /
Lectures:**

Slovenski / Angleški



Languages: Vaje / Tutorial:

Slovenski / Angleški

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

Za vključitev v delo mora študent osvojiti vsebine predmetov Uvod v programiranje in Informatični sistemi.

Prerequisites:

The course requires knowledge obtained within the courses Introduction to Programming 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

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, feedback regulators, tuning of regulators)
- Higher level of management in industry (process, production, business)
- Examples of automation and implementation of process management in practice

Temeljni literatura in viri / Readings:

Obvezna literatura

- J. Kocijan in S. Strmčnik: Osnove avtomatskega vodenja, Založba Univerze v Novi Gorici, 2016.

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:

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.

Objectives and competences:

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:

Intended learning outcomes:



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 zaprtizančnega vodenja procesa.

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:

- Predavanja z aktivno udeležbo študentov (razlaga, diskusija, primeri, reševanje problemov);
- vaje z aktivno udeležbo študentov (razlaga, diskusija, primeri, refleksija, reševanje problemov);

Predmet je oblikovan na kombinirani način študija in vključuje tudi aktivnosti preko elektronskega okolja (diskusije, repozitorij izbranih materialov, iskanje preko spleta).

Learning and teaching methods:

- Lectures including the participation of students (explanation, discussion, questions, problems & challenges)
- Exercises, performed with the active participation of students (explanation, discussion, examples, reflection, questions, problems)

The course is formed to combine, on-site and online activities, that include forum discussions, repository of selected materials and search of web databases.

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:

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. 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)]

GERKŠIČ, Samo, PREGELJ, Boštjan, ARIOLA, Marco. Model predictive control of resistive wall mode for ITER. *Fusion engineering and design*. [Print ed.]. 2020, vol. 160, str. 111877-1-111877-17. ISSN 0920-3796. DOI: [10.1016/j.fusengdes.2020.111877](https://doi.org/10.1016/j.fusengdes.2020.111877). [COBISS.SI-ID [24211715](https://www.cobiss.si/id/24211715)]

DOLANC, Gregor, PREGELJ, Boštjan, PETROVČIČ, Janko, SAMSUN, Remzi Can. Control of an afterburner in a diesel fuel cell power unit under variable load. *Journal of power sources*. 2017, vol. 338, str. 117-128. ISSN 0378-7753. DOI: [10.1016/j.jpowsour.2016.10.082](https://doi.org/10.1016/j.jpowsour.2016.10.082). [COBISS.SI-ID [30059047](https://www.cobiss.si/id/30059047)]

PREGELJ, Boštjan, VREČKO, Darko, JOVAN, Vladimir. Improving the operation of a fuel-cell power unit with supervision control-a simulation study. *Journal of power sources*. 2011, vol. 196, no. 22, str. 9419-9428. ISSN 0378-7753. DOI: [10.1016/j.jpowsour.2011.06.077](https://doi.org/10.1016/j.jpowsour.2011.06.077). [COBISS.SI-ID [24858151](https://www.cobiss.si/id/24858151)]

PREGELJ, Boštjan, GERKŠIČ, Samo. Hybrid explicit model predictive control of a nonlinear process approximated with a piecewise affine model. *Journal of process control*. [Print ed.]. 2011, vol. 20, no. 7, str. 832-839. ISSN 0959-1524. DOI: [10.1016/j.jprocont.2010.05.002](https://doi.org/10.1016/j.jprocont.2010.05.002). [COBISS.SI-ID [23705895](https://www.cobiss.si/id/23705895)]

PREGELJ, Boštjan, STRMČNIK, Stanko, GERKŠIČ, Samo. Pattern recognition-based supervision of indirect adaptation for better disturbance handling. *ISA transactions*. 2007, vol. 46, no. 4, str. 561-568. ISSN 0019-0578. [COBISS.SI-ID [20965671](https://www.cobiss.si/id/20965671)]