



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

**Predmet:** Robotika v tehniki

**Course title:** Robotics in engineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester
Enovit magistrski študijski program Predmetni učitelj 2. stopnje	Izobraževalna tehnika in Izobraževalno računalništvo	3ali5	5ali10
Five-year master's degree program Subject Teacher	Technical education and Computer science in education		

**Vrsta predmeta / Course type**

Obvezni / Obligatory

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30	15		15		60	4

**Nosilec predmeta / Lecturer:**

Nenad Muškinja

**Jeziki / Predavanja / Lectures:** slovenski / slovene

**Languages: Vaje / Tutorial:** slovenski / slovene

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

**Prerequisites:**

Priporočena so osnovna znanja iz fizike, matematike, elektrotehnike in elektronike.

Basic knowledge of physics, mathematics, electrical engineering and electronics are recommended.

**Vsebina:**

**Predavanja:**

- Delovanje osnovnih elektronskih vezij;
- Digitalno in analogno izražanje podatkov;
- Fizikalne in tehniške lastnosti senzorjev;
- Osnove regulacije in vodenja procesov;
- Povezanost elektronike in robotike s fiziko in matematiko.

**Vaje in seminar:**

- spoznavanje osnovnih elektronskih vezij;
- spoznavanje s senzorji in meritvami neelektričnih veličin;
- zajemanje in obdelava signalov;
- regulacija prek povratne zanke;
- izdelava mobilnih robotov za določeno nalogo;
- izdelava seminarske naloge.

**Content (Syllabus outline):**

**Lectures:**

- Operation of basic electronic circuits;
- Digital and analogue data expression;
- Physical and technical sensor characteristic;
- Basics of process regulation and control;
- Relationship of electronics and robotics with Physics and Mathematics.

**Tutorials and seminar:**

- become familiar with basic electronic circuits;
- become familiar with the sensors and the measurement of non-electrical quantities;
- signal capturing and processing;
- closed loop control;
- for the specific task mobile robot construction;
- seminar work.

**Temeljni literatura in viri / Readings:**

1. S. Kocjančič, L. Hajdinjak: Učni načrt. Izbirni predmet : program osnovnošolskega izobraževanja. Robotika v tehniki, Ministrstvo za šolstvo, znanost in šport, Zavod RS za šolstvo, Ljubljana, 2002.
2. D. Đonlagić, D. Đonlagić: Merjenja temperatur in tlakov, Univerza v Mariboru, Fakulteta za elektrotehniko, računalništvo in informatiko, Maribor: 1995.
3. D. Đonlagić, D. Đonlagić: Merjenja pretokov fluidov, Univerza v Mariboru, Fakulteta za elektrotehniko, računalništvo in informatiko, Maribor, 1998.
4. J. Kocjan: Elementi za avtomatiko in robotiko : gradivo za laboratorijske vaje, Fakulteta za elektrotehniko, Ljubljana, 2002.
5. A. Belič: Elementi za avtomatiko in robotiko. Praktikum za univerzitetni študijski program, Fakulteta za elektrotehniko, Ljubljana, 2006.

**Cilji in kompetence:**

**Objectives and competences:**

- osvojiti temeljna teoretična znanja s področja robotike v tehniki in tehnologiji;
- motivirati za izobraževanje in usposabljanje na širšem tehniškem področju;
- ob praktičnem delu pridobiti izkušnje za ločevanje med vzrokom in posledico;
- razvijati sposobnosti za delo v skupini in sodelovanje s strokovnjaki iz različnih strokovnih področij;
- razvijati ustvarjalno mišljenje in sposobnosti analiziranja.

- conquer the fundamental theoretical knowledge in the field of electrical engineering in the energetics and technology;
- motivation for education and training in the broader field of engineering;
- acquire practical work experience to distinguish between cause and consequence;
- develop the ability to work in a team and cooperation with experts from various professional fields;
- develop creative thinking skills and analysis.

#### **Predvideni študijski rezultati:**

##### **Znanje in razumevanje:**

Po zaključku tega predmeta bo študent sposoben:

- spoznavanje karakteristik in vloge posameznih komponent in podsistemov;
- osvojiti sistemski pristop, ki je značilen za sodobno delo na področju elektronike in robotike;
- sestavljanje podsistemov v sisteme z vnaprej izbrano funkcijo;
- reševanje problemov in pridobivanje veščine opazovanja in sklepanja;
- vrednotenje rezultatov in lastnih zamisli ter iskanje najboljših rešitev.

##### **Prenesljive/ključne spretnosti in drugi atributi:**

- sodelovanje v skupini;
- govorno, pisno in grafično sporazumevanje in delo po navodilih;
- uporaba opreme in orodja, telesna koordinacija ter merjenje in vrednotenje merskih podatkov;
- sprejemanje odločitev, načrtovanje, iskanje informacij, reševanje problemov in vrednotenje rezultatov dela in kakovost izdelka.

#### **Intended learning outcomes:**

##### **Knowledge and understanding:**

On completion of this course the student will be able to:

- learn about the characteristics and role of individual components and subsystems;
- gain a systemic approach, which is characteristic of the modern work in the field of electronics and robotics;
- assembly of the subsystems in the systems with pre-selected function;
- solving problems and acquiring the skills of observation and conclusion;
- evaluation of results and their own ideas and find the best solution.

##### **Transferable/Key Skills and other attributes:**

- collaboration in the group work;
- spoken, written and graphic communication skills, and work according to instructions;
- use of equipment and tools, physical coordination, and measurement and evaluation of measurement data;
- decision-making, planning, information retrieval, problem solving and evaluation of results and product quality.

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

<ul style="list-style-type: none"> <li>• frontalna predavanja,</li> <li>• skupinsko delo;</li> <li>• izdelava seminarske naloge,</li> <li>• diskusije v elektronskem forumu, e-učenje.</li> </ul>	<ul style="list-style-type: none"> <li>• frontal lectures,</li> <li>• work in small groups;</li> <li>• seminar work,</li> <li>• discussion in electronic forums, e-learning.</li> </ul>
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Delež (v %) /

**Načini ocenjevanja:****Weight (in %)****Assessment:**

• ustni izpit;	40 %	• oral exam;
• laboratorijske vaje;	30 %	• laboratory work;
• seminarska naloga.	30 %	• seminar work.

**Reference nosilca / Lecturer's references:**

1. MUŠKINJA, Nenad, RIŽNAR, Matej, GOLOB, Marjan. Optimized fuzzy logic control system for diver's automatic buoyancy control device. *Mathematics*. 2023, vol. 11, no. 1, 15 str. ISSN 2227-7390. DOI: [10.3390/math11010022](https://doi.org/10.3390/math11010022). [COBISS.SI-ID [136246787](https://www.cobiss.si/id/136246787)], [JCR, SNIP, WoS, Scopus]  
financer: ARRS, Program, P2-0028, SI

2. BERK, Peter, BELŠAK, Aleš, STAJNKO, Denis, LAKOTA, Miran, MUŠKINJA, Nenad, HOČEVAR, Marko, RAKUN, Jurij. Intelligent automated system based on a fuzzy logic system for plant protection product control in orchards. *International journal of agricultural and biological engineering*. 2019, vol. 12, no. 3, str. 92-102, ilustr. ISSN 1934-6344. <https://www.ijabe.org/index.php/ijabe/article/view/4476>, DOI: [10.25165/j.ijabe.20191203.4476](https://doi.org/10.25165/j.ijabe.20191203.4476). [COBISS.SI-ID [4583468](https://www.cobiss.si/id/4583468)], [JCR, SNIP, WoS do 5. 11. 2022: št. citatov (TC): 6, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 0,86]

3. GOLOB, Marjan, BRATINA, Božidar, ROTOVNIK, Milan, MUŠKINJA, Nenad. IIoT laboratory model for remote control system applications. V: AUER, Michael E. (ur.), BHIMAVARAM, Kalyan Ram, YUE, Xiao-Guang. *Online engineering and society 4.0 : Proceedings of the 18th International Conference on Remote Engineering and Virtual Instrumentation*. 18th International Conference on Remote Engineering and Virtual Instrumentation, February 24-26, 2021, online. Cham: Springer, cop. 2022. Str. 225-236. Lecture notes in networks and systems (Print), 298. ISBN 978-3-030-82528-7, ISBN 978-3-030-82529-4. ISSN 2367-3370. DOI: [10.1007/978-3-030-82529-4\\_22](https://doi.org/10.1007/978-3-030-82529-4_22). [COBISS.SI-ID [78293251](https://www.cobiss.si/id/78293251)], [SNIP, WoS, Scopus do 27. 3. 2023: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,50]

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