UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Internet stvari in inovativne tehnologije
Course title:	Internet of Things and Innovative Technologies

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in spletne tehnologije, magistrski študijski program druge stopnje	-	Prvi	Drugi
Computer Science and Web Technologies, second cycle Masters Study Programme	-	First	Second

Vrsta predmeta / Course type | Izbirni / Elective

Univerzitetna koda predmeta / University course code: | 2-RST-MAG-IP-ISIT-2020-07-31

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	20	-	-	100	5

Nosilec predmeta / Lecturer: | izr. prof. dr. Andrej Škraba, doc. dr. Davorin Kofjač

Jeziki / **Languages:**	**Predavanja /** **Lectures:**	Slovenski / Slovene
	Vaje / Tutorial:	Slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Ni posebnih zahtev.	No special requirements.

Vsebina:

- Opredelitev naprednih konceptov interneta stvari
- Pregled strojne opreme (Arduino, Raspbery PI, ESP8266, C.H.I.P., BeagleBone)
- Pregled oblačnih servisov in možnosti izkoriščanja storitev v oblaku za razvoj rešitev interneta stvari
- Internet stvari in oblačni informacijski sistemi
- Povezava z Google Cloud, IBM Watson
- Uporaba naprednih analitičnih metod za optimiranje delovanja interneta stvari

Content (Syllabus outline):

- Definition of advanced concepts of the Internet of Things
- Overview of the hardware (Arduino, Raspbery PI ESP8266, C.H.I.P., BeagleBone)
- Review of cloud services and the potential of exploitation of cloud services for the development of the Internet of Things solutions
- Internet of Things and cloud IT systems
- Link with Google Cloud IBM Watson
- Use of advanced analytical techniques to optimize the operation of the Internet of Things

• Okolje cloud9 IDE, nodejs, socket.io, websocket • MQTT protokol • Iskanje naprav interneta stvari v omrežjih • Serijski, I2C, SPI protokoli • Spremljanje vrednosti senzorjev v realnem času • Knjižnica OpenCV za uporabo metod strojnega vida v okolju nodejs • Prepoznavanje osnovnih geometričnih oblik in barv v povezavi s strojno opremo • Prepoznava govora s pomočjo oblačnih servisov ter integracija s strojno opremo • Razvoj sistema za upravljanje interneta stvari • Opis primerov uporabe v praksi in možnosti za razvoj novih sistemov interneta stvari	• IoT environment: Cloud9 IDE, nodejs, socket.io, WebSocket • MQTT protocol • Search for IoT devices in networks • Serial, I2C and SPI protocols • Monitoring of sensors in real-time • OpenCV library for machine vision in the nodejs environment • Identification of basic geometric shapes and colors in conjunction with hardware • Speech Recognition using cloud services and integration with hardware • Development of a system for the management of the Internet of Things • Description of use cases in practice and opportunities for the development of new systems of the Internet of Things

Temeljni literatura in viri / Readings:

• Kranz M. (2016) Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry, Wiley.
• Bahga A., Madisetti V. (2014). Internet of Things: A Hands-On Approach, 1st edition. VPT.
• Guinard D., Trifa V. (2016). Building the Web of Things: With examples in Node.js and Raspberry Pi, 1st edition. Manning Publications.
• Greengard S. (2015) The Internet of Things, The MIT Press Essential Knowledge series.

Cilji in kompetence:	Objectives and competences:
Učna enota prispeva k razvoju naslednjih splošnih in predmetno specifičnih kompetenc:	*The instructional unit contributes to the development of the following general and subject-specific competences:*
• poznavanje in razumevanje širokega nabora aplikacij informacijsko komunikacijske tehnologije v sodobni družbi; • spoznanje osnovnih pojmov in gradnikov interneta stvari ter razumevanje, kako so gradniki med sabo povezani, tako s tehničnega kot tudi tehnološkega vidika; • spoznanje oblačne stortive in razumevanje povezave le-teh z internetom stvari;	• knowledge and understanding of a wide range of applications of information communication technology in the modern society; • acquired knowledge of the basic concepts and building blocks of the Internet of Things, and to understand how the elements are interlinked, from both technical as well as technological point of view;

• pridobljeno osnovno znanje o razpoznavi govora in uporabi oblačnih platform za uporabo le-tega; • pridobljeno osnovno znanje o strojnem vidu in uporabi le-tega v kontekstu interneta stvari; • pridobljeno praktično in teoretično znanje, ki bo slušateljem omogočilo zasnovo novih informacijskih sistemov v okolju industrije 4.0.	• recognize and understand cloud services and their interconnection to the Internet of things; • acquired basic knowledge of speech recognition and the use of cloud platform for its application; • acquired basic knowledge of machine vision and its application in the context of the Internet of Things; • acquired practical and theoretical knowledge which will allow students to design new information systems in the industry 4.0 environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • razumevanje osnovnih principov delovanja interneta stvari • poznavanje tehničnega in tehnološkega vidika interneta stvari za uspešno realizacijo projektov s tega področja • razumevanje osnovnih principov delovanja oblačnih storitev v povezavi z internetom stvari • razumevanje osnovnih principov strojnega vida v povezavi z internetom stvari • znanje o razvoju in uvedbi projektov v realnem okolju z vidika interneta stvari Prenesljive/ključne spretnosti in drugi atributi: • pridobljeno znanje bo slušateljem omogočilo takojšnjo izvedbo projekta interneta stvari in integracijo v informacijski sistem izbrane organizacije	Knowledge and understanding: • understanding the basic principles of the Internet of Things • knowledge of the technical and technological aspects of IoT for the successful realization of projects in this field • understanding the basic principles of cloud services and speech recognition in connection with the Internet of Things • understanding the basic principles of machine vision in relation to the Internet of Things • knowledge of the development and deployment of projects in the real environment in from of the Internet of Things viewpoint Transferable/Key Skills and other attributes: • the acquired knowledge will enable students to immediate realization of the IoT project and its integration in the information system of the selected organization

Metode poučevanja in učenja:	**Learning and teaching methods:**
• predavanja v opremljeni računalniški predavalnici • vaje	• lectures in computer lecture room • tutorials

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): • pisni izpit • seminarska naloga	 80 20	Type (examination, oral, coursework, project): • written exam • seminar work

Reference nosilca / Lecturer's references:

- ŠKRABA, Andrej, STOJANOVIĆ, Radovan, ZUPAN, Anton, KOLOŽVARI, Andrej, KOFJAČ, Davorin. Speech-controlled cloud-based wheelchair platform for disabled persons. Microprocessors and microsystems, ISSN 0141-9331. [Print ed.], nov. 2015, vol. 39, no. 8, pp. 819-828. http://www.sciencedirect.com/science/article/pii/S0141933115001581, doi: 10.1016/j.micpro.2015.10.004.
- ŠKRABA, Andrej, KOLOŽVARI, Andrej, KOFJAČ, Davorin, STOJANOVIĆ, Radovan, STANOVOV, Vladimir V., SEMENKIN, Eugene S. Streaming pulse data to the cloud with bluetooth LE or NODEMCU ESP8266. V: STOJANOVIĆ, Radovan (ur.), JÓŹWIAK, Lech (ur.), LUTOVAC, Budimir (ur.). Proceedings - research monograph, 5th Mediterranean conference on Embedded computing (MECO), Bar, Montenegro, June 12th - 16th 2016. Podgorica: Montenegrian Association for New Technologies - MANT, 2016, str. 428-431.
- ŠKRABA, Andrej, KOLOŽVARI, Andrej, KOFJAČ, Davorin, STOJANOVIĆ, Radovan. Wheelchair maneuvering using leap motion controller and cloud based speech control : prototype realization. V: STOJANOVIĆ, Radovan (ur.), JÓŹWIAK, Lech (ur.), JURIŠIĆ, Dražen (ur.). Proceedings, 4th Mediterranean Conference on Embedded Computing (MECO), June 14th-18th, 2015, Budva, Montenegro. [Podgorica]: Montenegrian Association for New Technologies, cop. 2015, pp. 391-394.
- ŠKRABA, Andrej, KOLOŽVARI, Andrej, KOFJAČ, Davorin, STOJANOVIĆ, Radovan. Prototype of speech controlled cloud based wheelchair platform for disabled persons. V: STOJANOVIĆ, Radovan (ur.), JÓŹWIAK, Lech (ur.), JURIŠIĆ, Dražen (ur.). Proceedings, 3rd Mediterranean Conference on Embedded Computing (MECO), June 15th-19th, 2014, Budva, Montenegro. [Podgorica: Montenegrian Association for New Technologies], cop. 2014, pp. 162-165.