

	UČNI NAČRT PREDMETA/COURSE SYLLABUS
Predmet	Teorija informacij in sistemov
Course title	Theory of Information and Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Poslovna informatika / 1. stopnja	Računalništvo in informatika	2. letnik	4.
Business Informatics / 1 st Cycle	Computer and Information Science	2 nd year	4 th

Vrsta predmeta/Course type obvezni/obligatory

Univerzitetna koda predmeta/University course code I_RI_2_UN9

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30		30			90	6

Nosilec predmeta/Lecturer: doc. dr. Sebastian Lahajnar
Učni načrt pripravil prof. dr. Andrej Dobnikar

Jeziki/ Languages: **Predavanja/Lectures:** slovenski/Slovenian
Vaje/Tutorial: slovenski/Slovenian

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

<ul style="list-style-type: none"> • Vpis v drugi letnik študijskega programa. • Študent mora pred izpitom pripraviti in predstaviti seminarsko nalogo. 	<ul style="list-style-type: none"> • The prerequisite for inclusion is enrolment in the second year of study. • Students have to successfully prepare and present a seminar paper before the examination.
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Vsebina: **Content (Syllabus outline):**

<ul style="list-style-type: none"> • <i>Uvod:</i> Tri osnovna vprašanja informacijske teorije, komunikacijski sistem. • <i>Entropija:</i> definicija in lastnosti. Entropija diskretnih in zveznih naključnih spremenljivk. • <i>Informacija:</i> povprečna medsebojna informacija. 	<ul style="list-style-type: none"> • <i>Introduction:</i> Three basic questions of information theory. Communication system. • <i>Entropy:</i> Definition and characteristics. Entropy of discrete and continuous random variables. • <i>Information:</i> average mutual information.
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<ul style="list-style-type: none"> • <i>Diskretni vir informacije</i>: Entropija vira in ergodični viri brez in s spominom. • <i>Kodiranje vira informacij</i>: Shannonov teorem, Huffmanov kod. • <i>Komunikacijski kanal</i>: Diskretni in zvezni kanal, kapaciteta kanala brez spomina. • <i>Kodiranje/dekodiranje kanala</i>: dekodiranje z odkrivanjem in popravljanjem napak, optimalno dekodiranje. Kanalski kodni teorem. Varno kodiranje. Strojni kodirnik/dekodirnik. • <i>Kriptologija</i>: Kriptografija in kriptanaliza. Šifrirni sistemi. Informacija sporočil in varnost. • <i>Signali in sistemi</i>: Elementarni signali. Interakcija signalov in sistemov. Stabilnost sistemov. • <i>Transformacije</i>: Fourierova vrsta. Fourierova in Laplaceova transformacija. • <i>Sistemska prenosna funkcija</i>: Frekvenčni odziv sistema. • <i>Vzorčenje in Z-transformacije</i>: Semplirni teorem. Lastnosti Z-transformacije. Reševanje diferenčnih enačb z Z-transformacijo. 	<ul style="list-style-type: none"> • <i>Discrete source of information</i>: Entropy of source and ergodic source with and without memory. • <i>Coding of information source</i>: Shannon theorem, Huffman code. • <i>Communication channel</i>: Discrete and continuous channel, capacity of channel without memory. • <i>Coding/decoding of channel</i>: Decoding with detection and correction of error, optimal decoding. Channel coding theorem. Source coding. Machine coding/decoding. • <i>Cryptology</i>: Cryptography and cryptanalysis. Cipher systems. Information of messages and security. • <i>Signals and systems</i>: Elementary signals. Interaction of signals and systems. Systems stability. • <i>Transformations</i>: Fourier series. Fourier and Laplace transformation. • <i>System transfer function</i>. Frequency response of system. • <i>Sampling and Z-transformation</i>: Theorem of sampling. Z-transformation characteristics. Difference equation solving with Z-transformation.
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Temeljna literatura in viri/Readings:

Temeljna literatura/Basic literature

Dobnikar, A. (2009): Teorija informacij in sistemov, Založba FE in FRI.

Priporočljiva literatura/Recommended literature

- J.C.A. van der Lubbe (1997): Information Theory, Cambridge University Press, Cambridge.
- Pavešič N. (1997): Informacija in kodi, Založba FE in FRI.

Cilji in kompetence:

Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:

- usposobljenost za poglobljeno razumevanje računalništva in informatike,
- usposobljenost za uporabo pridobljenih znanj za samostojno reševanju strokovnih in tudi znanstvenih problemov računalništva in informatike,
- poznavanje in razumevanje sistemskih procesov v tehniško-tehnološkem ter

Objectives and competences:

The learning unit mainly contributes to the development of the following general and specific competences:

- being qualified for in-depth understanding of the most contemporary areas of computer science and informatics,
- the ability to use the acquired knowledge to independently solve professional and scientific problems in computer science and informatics,

<p>poslovnem okolju in sposobnost za njihovo analizo, sintezo in predvidevanje rešitev ter njihovih posledic.</p> <ul style="list-style-type: none"> • usposobljenost za pridobivanje novih in poglobljanje pridobljenih strokovnih znanj računalništva in informatike, • poznavanje dejstva, da informacije postajajo vedno pomembnejše na področju tradicionalnih sistemov in še posebej sodobnih inteligentnih sistemov. 	<ul style="list-style-type: none"> • knowledge and understanding of processes in the technical-technological and business environment, as well as the ability for their analysis, synthesis and prediction of the solutions and their consequences, • the ability to acquire new and deepen the acquired professional knowledge of computer science and informatics, • knowledge of the fact that information is becoming increasingly important in the area of traditional systems and modern intelligent systems in particular.
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Predvideni študijski rezultati:	Intended learning outcomes:
<p>Študent/študentka:</p> <ul style="list-style-type: none"> • razume, da je informacija osnovna veličina, na osnovi katere je mogoče graditi znanje in ustvarjati nove vrednote, • razume, da teorija informacij in sistemov opisuje osnovne lastnosti informacij in njenih prenosov od izvora k ponoru, • pozna, da so nosilci informacij, po poti od izvora k ponoru, signali, ki jih je skupaj s njihovimi preslikavami mogoče opisovati v jeziku matematičnih transformacij, • razvije osnovne sposobnosti opisa delovanje informacijskih procesov z matematičnim jezikom, • razume, da informacije postajajo vedno pomembnejše tudi v luči sodobnih inteligentnih sistemov. 	<p>Students:</p> <ul style="list-style-type: none"> • understand that information is the basic quantity on the basis of which it is possible to build knowledge and create new values, • understand that the theory of information and systems describes the basic characteristics of information and its transmissions from the source to the drain, • know that the information carriers, along the path from the source to the drain, are signals that can be described in the language of mathematical transformations together with their mappings, • develop the basic abilities of describing the operation of information processes with mathematical language, • understand that information is becoming increasingly important in the light of modern intelligent systems.

Metode poučevanja in učenja:	Learning and teaching methods:
<ul style="list-style-type: none"> • <i>predavanja</i> z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov), • <i>seminarske vaje</i>: priprava, predstavitev in uspešen zagovor seminarske naloge, portfolio (reševanje problemov, študije primera, kritično presojanje, diskusija, 	<ul style="list-style-type: none"> • <i>lectures</i> with active student participation (explanation, discussion, questions, examples, problem solving), • <i>seminar tutorial</i>: preparation, presentation and a successful defence of a seminar paper, portfolio (problem solving, case studies, methods of critical thinking,

refleksija izkušenj, vrednotenje, projektno delo, timsko delo).	discussion, reflection of experience, evaluation, project work, teamwork).
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Načini ocenjevanja:	Delež (v %) Weight (in %)	Assessment:
<p>Načini:</p> <ul style="list-style-type: none"> • izpit • izdelava, predstavitev in zagovor seminarske naloge <p>Ocenjevalna lestvica: ECTS.</p>	<p>60 %</p> <p>40 %</p>	<p>Types:</p> <ul style="list-style-type: none"> • exam • preparation, presentation and defence of the seminar paper <p>Grading scheme: ECTS.</p>