	UČNI NAČRT PREDMETA/COURSE SYLLABUS
Predmet	**Mehko računanje in naravni algoritmi**
Course title	**Soft Computing and Natural Algorithms**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Poslovna informatika / 1. stopnja	Računalništvo in informatika	3. letnik	5.
Business Informatics / 1st Cycle	Computer and Information Science	3rd year	5th

Vrsta predmeta/Course type modularni / module

Univerzitetna koda predmeta/University course code I_RI_3_M3_UN3

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: prof. dr. Andrej Dobnikar

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

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

- Vpis v tretji letnik študijskega programa.
- Študent mora pred izpitom pripraviti in predstaviti seminarsko nalogo.

Prerequisites:

- The prerequisite for inclusion is enrolment in the third year of study.
- Students have to successfully prepare and present a seminar paper before the examination.

Vsebina:

- *Uvod*: Vpliv naravnih zakonitosti na sodobne računalniške algoritme.
- *Učeči avtomati*: Osnovni pojmi. Stacionarno in naključno okolje. Učeči avtomati s fiksno in spremenljivo strukturo. Korekcijske sheme. Povezava z nevronskimi mrežami.
- *Umetne nevronske mreže*: Teoretične osnove. Naprej povezane, rekurentne in

Content (Syllabus outline):

- *Introduction*: Impact of natural legality on contemporary computer algorithms.
- *Learning Automata*: Basic definitions. Stationary and stochastic environment. Learning automata with invariable and changeable structure. Correction schemes. Connection with neural networks.

speciale mreže. Ekstrakcija znanja iz naučene nevronske mreže. Vpliv učenja na strukturne parameter. • *Evolucijsko računanje*: Genetski algoritmi. Evolucijske strategije. Evolucijsko programiranje. Genetsko programiranje. • *Mehka logika*: Lastnosti mehkih množic. Mehke relacije. Mehka pravila in mehko sklepanje. • *Hibridne metode*: Evolucijsko snovanje nevronskih mrež. Evolucijsko snovanje mehkih sistemov. Nevronski mehki sistemi. Mehki evolucijski algoritmi.	• *Artificial neural networks*: Theoretical basis. Feedforward, recurrent and special networks. Extraction of knowledge from taught neural networks. Impact of learning on structural parameters of networks. • *Evolutionary computing*: Genetic algorithms. Evolutionary strategies. Evolutionary programming. Genetic programming. • *Fuzzy logic*: Features of fuzzy logic. Fuzzy relations. Fuzzy rules and fuzzy inference. • *Hybrid methods*: Evolutionary design of neural networks. Evolutionary design of fuzzy systems. Neural fuzzy systems. Fuzzy evolutionary algorithms.

Temeljna literatura in viri/Readings:

Temeljna literatura/Basic literature
• Dobnikar, A.,B. Šter (2008). Mehko računanje za modeliranje, razpoznavanje in regresijo, Založba FE in FRI.

Priporočljiva literatura/Recommended literature
• Haykin, S. (1999). Neural Networks: A Comprehensive Foundation, 2. edition, Prentice Hall.
• Kasabov, N.K. (1998). Foundations of Neural Networks, Fuzzy Systems and Knowledge Engineering, A Bradford Book, MIT Press.

Cilji in kompetence:	Objectives and competences:
Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc: • usposobljenost za poglobljeno razumevanje računalništva in informatike, • usposobljenost za pridobivanje novih in poglabljanje pridobljenih strokovnih znanj računalništva in informatike, usposobljenost za analizo in načrtovanje sistemov, • pridobiti temeljno in aplikativno usposobljenost na področju računalništva in informatike, ki obsega osnovna teoretska znanja, bistvene za sodobno računalništvo in informatiko, • zmožnost opisati dano situacijo s pravilno uporabo matematičnih in računalniških simbolov ter zapisov.	*The learning unit mainly contributes to the development of the following general and specific competences:* • being qualified for in-depth understanding of computer science and informatics, • being qualified for acquiring new and deepening of acquired computer skills and informatics skills, qualification for analysis and system design, • acquiring the basic and applicative competence in the field of computer and information science, which comprises basic theoretical knowledge essential for modern computer science and informatics,

	• the ability to describe the given situation with the proper use of mathematical and computer symbols and records.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent/študentka:	*Students:*
• pozna alternativno procesiranje (prisotno v naravi) in naravne algoritme, ki omogočajo reševanje problemov, pri katerih deterministični in/ali stohastični postopki niso dovolj,	• know the alternative processing (present in nature) and natural algorithms that enable solving problems in which deterministic and / or stochastic procedures are not enough,
• razume, da mehko računanje predstavlja novo področje adaptivnih sistemov na osnovi umetnih in naravnih algoritmov,	• understand that soft computing is a new field of adaptive systems based on artificial and natural algorithms,
• razume, da je nove metode računanja mogoče s pridom uporabiti pri številnih problemih modeliranja, razpoznavanja, regresije in krmiljenja;,	• understand that new calculation methods can be used with a lot of problems in modeling, recognition, regression and control,
• spozna paralelno procesiranje oz. programiranje,	• get to know parallel processing or programming,
• se usposobi za kritično presojo in analizo sistemov, ki omogočajo pohitritev delovanja mnogih algoritmov in s tem povečanje njihove uporabnosti pri realnih in časovno zahtevnih problemih.	• are qualified for critical assessment and analysis of systems that enable the speeding up of many algorithms and thus increasing their usefulness in real and time-challenging problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• *predavanja* z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov),	• *lectures* with active student participation (explanation, discussion, questions, examples, problem solving),
• *seminarske vaje:* priprava, predstavitev in uspešen zagovor seminarske naloge, portfolio (reševanje problemov, študije primera, kritično presojanje, diskusija, refleksija izkušenj, vrednotenje, projektno delo, timsko delo).	• *seminar tutorial:* preparation, presentation and a successful defence of a seminar paper, portfolio (problem solving, case studies, methods of critical thinking, discussion, reflection of experience, evaluation, project work, teamwork).

Načini ocenjevanja:	Delež (v %) Weight (in %)	**Assessment:**
Načini: • izpit • izdelava, predstavitev in zagovor seminarske naloge	60 % 40 %	Types: • exam • preparation, presentation and defence of the seminar paper
Ocenjevalna lestvica: ECTS.		Grading scheme: ECTS.