UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Visoko zmogljivo računalništvo
Course title:	High Performance Computing

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Podatkovne znanosti, magistrski študijski program druge stopnje	-	Drugi	Četrti
The second cycle masters study programme Data Sciences	-	Second	Fourth

Vrsta predmeta / Coursetype — Obvezni / Obligatory

Univerzitetna koda predmeta / Universitycoursecode: — 2-PZ-MAG-VZR-2020-06-30

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje work**	**Druge oblike študija**	**Samost. delo Individ. work**	**ECTS**
30	-	30	-	-	90	5

Nosilec predmeta / Lecturer: izr. prof. dr. Biljana Mileva Boshkoska

Jeziki / **Languages:**	**Predavanja /** **Lectures:**	Slovenski / Slovenian, Angleški / English
	Vaje / Tutorial:	Slovenski / Slovenian, Angleški / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Ni posebnih pogojev za vključitev v delo. Pogoj za pristop k izpitu so opravljene vse obveznosti na vajah ter priprava in zagovor projektne naloge.	There are no special prerequisites for the inclusion in work. To attend the exam students will have to prepare and present a project assignment.

Vsebina:	**Content (Syllabus outline):**

Pri predmetu bodo predstavljena in obdelana izbrana poglavja z naslednjih področij:	At the course selected chapters from the following areas will be presented and analyzed:

• visoko zmogljivo paralelno procesiranje na gručah, omrežjih in v oblakih, • računanje na heterogenih sistemih (grafične procesne enote, koprocesorji), • Hadoop (Uvod, MapReduce, distribuirani datotečni sistem Hadoop, razvijanje hadoop aplikacije za analizo vele podatkov)	• high performance parallel computing with clusters and cloud networks, • computing with heterogeneous systems (e.g. graphical processing units – GPUs, coprocessors) • Hadoop (Introduction, MapReduce, The Hadoop distributed file system, developing a hadoop application for analyzing massive data)

Temeljni literatura in viri / Readings:

- Kirk, D. B., Hwu, W. W. (2016): Programming Massively Parallel Processors, 3rd. Ed. Morgan Kaufman.
- Holmes, A. (2014): Hadoop in Practice, Manning.
- Leskovec, J. Rajaraman, A., Ullman, J. D. (2020): Mining of Massive Datasets, 3rd ed., Cambridge University Press. Dostopno prek: http://www.mmds.org/
- White T. (2015): Hadoop: The Definitive Guide, 4th ed., O'Reilly Media, Inc.
- Mileva Boshkoska, B.: Prosojnice s predavanj pri predmetu Visoko zmogljivo računalništvo. Moodle, FIŠ.

Cilji in kompetence:	**Objectives and competences:**
Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc: *Splošne kompetence:* • sposobnost analitičnega in algoritmičnega razmišljanja; • sposobnost obvladovanja in pretvorbe realnega problema v obliki lažje predstavljivega modela; *Predmetno-specifične kompetence:* • napredna znanja s področja visoko zmogljivih računalnikov, paralelnega procesiranja ter HADOOP; • teoretična znanja bodo znali uporabiti v praksi ter z ustreznimi metodološkimi pristopi reševati probleme na predlaganih področjih.	*The instructional unit contributes to the development of the following general and subject-specific competences:* *General competences:* • the ability of analytical and algorithmic thinking. • the ability to manage and transform a real problem into a simplified model; *Subject-specific competences:* • advanced knowledge from the fields of High performance computing, parallel processing and HADOOP; • Students will be able to apply theoretical knowledge in practice and use appropriate methodological approaches to solve problems in the proposed areas.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: • Osvojitev naprednih znanj s področij visoko zmogljivega računalništva, paralelnega procesiranja ter HADOOP. • Konfiguracija HADOOP, izraba paralelnih sistemov. • Razumevanje primernosti teoretičnih metod za reševanje praktičnih problemov ter njihovih omejitev, sposobnost analitičnega razmišljanja, sposobnost analize in reševanja kompleksnih praktičnih problemov. • Kombiniranje znanj pridobljenih pri predmetih s področja strojne opreme, programske opreme, algoritme ter programiranja.	*Knowledge and understanding:* • Advanced knowledge from the fields of high performance computing, parallel processing and HADOOP. • Configuration of HADOOP, optimal exploitation of parallel systems. • Understanding of the appropriateness of theoretical methods to solve practical problems and their limits, the ability of analytical thinking, ability to analyse and solve complex practical problems. • Combining the knowledge gained from courses in the areas of hardware, software, algorithms, programming.

Metode poučevanja in učenja:

• predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov); • vaje (reševanje različnih problemov, implementacija algoritmov).	• lectures with active students participation (explanations, discussion, questions, examples, problem solving); • exercises (solving various problems, implementation of algorithms).

Learning and teaching methods:

Delež (v %) /
Načini ocenjevanja: Weight (in %) **Assessment:**

• pisni izpit • projektna naloga	50 % 50 %	• written exam • project work

Reference nosilca / Lecturer's references:

• ZHAO, Guoqing, LIU, Shaofeng, LOPEZ, Carmen, LU, Haiyan, ELGUETA, Sebastian, CHEN, Huilan, MILEVA BOSHKOSKA, Biljana. Blockchain technology in agri-food value chain management : a synthesis of applications, challenges and future research directions. *Computers in industry*, ISSN 0166-3615. [Print ed.], 2019, vol. 109, str. 83-99

• BOŠKOSKI, Pavle, DEBENJAK, Andrej, MILEVA BOSHKOSKA, Biljana. Rayleigh copula for describing impedance data - with application to condition monitoring of proton exchange membrane fuel cells. *European journal of operational research*, ISSN 0377-2217. [Print ed.], 2018, vol. 266, no. 1, str. 269-277

• GRAŠIČ, Valerij, KOS, Andrej, MILEVA BOSHKOSKA, Biljana. Classification of incoming calls for the capital city of Slovenia smart city 112 public safety system using open Internet of Things data. International journal of distributed sensor networks, ISSN 1550-1477. [Online ed.], 2018, vol. 14, no. 9, str. 1-12, ilustr.

• MILEVA-BOSHKOSKA, Biljana, BOHANEC, Marko, BOŠKOSKI, Pavle, JURIČIĆ, Đani. Copula-based decision support system for quality ranking in the manufacturing of electronically commutated motors. *Journal of intelligent manufacturing*, ISSN 0956-5515, 2015, vol. 26, no. 2, str. 281-293.

• MILEVA-BOSHKOSKA, Biljana, BOŠKOSKI, Pavle, DEBENJAK, Andrej, JURIČIĆ, Đani. Dependence among complex random variables as a fuel cell condition indicator. Journal of power sources, ISSN 0378-7753, jun. 2015, vol. 284, str. 566-573.