

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Vizualizacija podatkov
<b>Course title:</b>	Data visualization

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

**Vrsta predmeta / Course type** Obvezni / Obligatory

**Univerzitetna koda predmeta / University course code:** 2-PZ-MAG-VP-2024-01-31

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	-	35	-	-	105	5

**Nosilec predmeta / Lecturer:** doc. dr. Nuša Erman

**Jeziki / Languages:**

<b>Predavanja / Lectures:</b>	Slovenski, angleški / Slovene, English
<b>Vaje / Tutorial:</b>	Slovenski, angleški / Slovene, English

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

Ni posebnih pogojev za vključitev v delo.

Pogoj za pristop k pisnemu izpitu je pravočasna oddaja in pozitivno ocenjena seminarska naloga.

**Prerequisites:**

There are no special prerequisites for the inclusion in work.

Student has to submit seminar work within the due time. If the seminar work is positively graded, he/she is allowed to write the exam.

**Vsebina:**

- Uvod v uporabo programskega okolja R: vrste podatkov v R, vektor, faktor, seznam, matrika, podatkovni okvir.
- Proučitev podatkov pred njihovo vizualizacijo.
- Načrtovanje vizualizacije: izbira ustreznega grafičnega prikaza.
- Vizualizacija z uporabo osnovnih R ukazov.

**Content (Syllabus outline):**

- Introduction to R software environment: data types in R, vector, factor, list, matrix, data frame.
- Exploring the data before visualizing them.
- Planning for visualization: selecting the appropriate graphic display.
- Visualization using R Base commands.

- Vizualizacija z uporabo izbranih R paketov (lattice, ggplot2).
- Dinamični in interaktivni prikazi s pomočjo R Shiny.

- Visualization using selected R packages (lattice, ggplot2).
- Dynamic and interactive displays using R Shiny.

### Temeljni literatura in viri / Readings:

- Wilke, C.O. (2019): *Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures*. California: O'Reilly Media.  
Dostopno prek: <https://clauswilke.com/dataviz/>
- Chang, W. (2018): *R Graphics Cookbook: Practical Recipes for Visualizing Data. 2nd edition*. California: O'Reilly Media.  
Dostopno prek: <https://r-graphics.org/>
- Wickham, H. (2016): *ggplot2: Elegant Graphics for Data Analysis*, 2nd ed. Springer.
- Resnizky, H.G. (2015): *Learning Shiny*. Packt Publishing.
- Wickham, H. (2020): *Mastering Shiny*. California: O'Reilly Media.  
Dostopno prek: <https://mastering-shiny.org/>
- Erman, N.: Prosojnice iz predavanj in gradiva z vaj pri predmetu Vizualizacija podatkov. Moodle, FIŠ.

### Cilji in kompetence:

*Učna enota prispeva k razvoju naslednjih splošnih in predmetno specifičnih kompetenc:*

*Splošne kompetence:*

- Sposobnost skrbeti za kakovost strokovnega dela skozi avtonomnost, samoiniciativnost, (samo)kritičnost, (samo)refleksivnost in (samo)evalviranje.
- Sposobnost fleksibilne uporabe znanja v praksi.
- Uporaba ustreznih metodoloških pristopov za izvajanje, koordiniranje in organiziranje raziskav.

*Predmetno-specifične kompetence:*

- obvladanje vizualizacijskih metod, postopkov in procesov
- sposobnost logičnega sklepanja, ocenjevanja velikostnega reda rezultata, natančnosti izražanja, pisanja in razmišljanja
- usposobljenost za uporabo sodobnih vizualizacij podatkov

### Objectives and competences:

*The instructional unit contributes to the development of the following general and subject-specific competences:*

*General competences:*

- The ability to manage quality of professional work through autonomy, initiative, as well as (self-)criticism, (self-)reflection and (self-)evaluation.
- The ability of flexible usage of knowledge in practice.
- Utilization of adequate methodological approaches to conduct, coordination and organisation of research

*Subject-specific competences:*

- competence in visualization methods, procedures and processes
- ability to make logical conclusions, to estimate the order of magnitude of the results well as the ability to express oneself, write and think in an accurate manner
- ability to use modern data visualizations

### Predvideni študijski rezultati:

### Intended learning outcomes:

Znanje in razumevanje:

Sposobnost študenta/študentke bo:

- poznavanje enega izmed najbolj prilagodljivih orodij za statistično analizo in grafični prikaz podatkov;
- sposobnost njegove praktične uporabe;
- poznavanje osnovnih in naprednih funkcij in pristopov k vizualizaciji podatkov.

Knowledge and understanding:

The ability of the student:

- acquaintance with onw of the most flexible tools for statistical analysis and graphics of data;
- ability to use it in practice;
- knowledge of basic and advanced functions and approaches to data visualization.

**Metode poučevanja in učenja:**

- *predavanja* z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov)
- *vaje*, kjer študentje na enostavnih primerih ponovijo temeljne koncepte in metode, predstavljene na predavanjih
- *laboratorijske vaje*, kjer se študenti seznanijo s programskimi orodji za zbiranje in analiziranje podatkov

**Learning and teaching methods:**

- *lectures* with active students participation (explanations, discussion, questions, examples, problem solving);
- *tutorials* (students will recall, reinforce, and shed light on the concepts and methods taught on lectures);
- *lab work* (students will learn state of the art software for data collection and analysis.

**Načini ocenjevanja:**

Način:

- projektna naloga (izdelava aplikacije za vizualizacijo podatkov) in njen zagovor

Delež (v %) /

Weight (in %)

100 %

**Assessment:**

Type:

- project work (data visualization application) and its presentation

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

- ERMAN, Nuša, ROJKO, Katarina, LESJAK, Dušan. Traditional and new ICT spending and its impact on economy. *Journal of computer information systems*. 2022, vol. 62, iss. 2, str. 384-396
- ROJKO, Katarina, ERMAN, Nuša. The Impact of the Covid-19 Pandemic on Higher Education Students' Perceptions of Educational Applications and Platforms. *International Journal of Cognitive Research in Science, Engineering and Education*. 2023, vol. 11, no. 2, str. 267-279
- ROJKO, Katarina, LESJAK, Dušan, ERMAN, Nuša. The COVID-19 Pandemic Crisis : impact on ICT spending. *Journal of computer information systems*. 2022, vol. , iss. , str. 1-16
- ROJKO, Katarina, ERMAN, Nuša, JELOVAC, Dejan. Impacts of the transformation to industry 4.0 in the manufacturing sector : the case of the U.S. Organizacija: revija za management, informatiko in kadre. *Noc*. 2020, vol. 53, no. 4, str. 287-305

- ERMAN, Nuša, TODOROVSKI, Ljupčo. The effects of measurement error in case of scientific network analysis. *Scientometrics*, aug. 2015, vol. 104, iss. 2, str. 453-473.