UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Numerična matematika
Course title:	Numerical mathematics

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	Drugi
The second cycle masters study programme Data Sciences	-	First	Second

Vrsta predmeta / Course type	Izbirni / Elective
Univerzitetna koda predmeta / University course code:	2-PZ-MAG-IP-NM-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. Vesna Andova

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Specifičnih pogojev za vključitev v delo ni. Priporočeno je poznavanje osnovnih pojmov matematične analize in linearne algebre. Pogoj za pristop k pisnemu izpitu je pravočasna oddaja in pozitivna ocena domačih nalog.	There are no specific requirements for this subject. Knowledge of basic notions from calculus and linear algebra is recommended. Student has to submit homework assignments within the due time. If the assignments are positively graded, he/she is allowed to write the exam.

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

- Teorija napak.
- Numerično reševanje nelinearnih enačb. Iterativne metode.
- Numerično reševanje linearnih in nelinearnih sistemov. Iterativne metode.
- Približevanje, interpolacija, interpolacija z zlepki in krivuljami.
- Metoda najmanjših kvadratov.
- Numerično odvajanje in integriranje.
- Numerično reševanje diferencialnih enačb.

- Error theory.
- Numerical solution of nonlinear equations. Iterative methods.
- Numerical solving of linear and nonlinear systems. Iterative methods.
- Approximation, interpolation, interpolation with splines and curving.
- Least squares method.
- Numerical differentiation and integration.
- Numerical solutions of differential equations.

Temeljni literatura in viri / Readings:

- B. Plestenjak, Razširjen uvod v numerične metode, DMFA-založništvo, 2015.
- J. Kozak, Numerična analiza, DMFA-založništvo, 2008.
- J. Mathews, K. Fink, Numerical Methods using MatLab, Prentice Hall, 1999.
- S. C. Chapra, R. P. Canale, Numerical Methods for Engineers, Mc Graw Hill, New York, 2006.
- S. C. Chapra, Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill Science/Engineering/Math, 3rd ed., 2012.
- W. Y. Yang, W. Cao, T. Chung, J. Morris , Applied Numerical Methods using Matlab, A John Wiley & Sons, Inc., Publication, 2015.

Cilji in kompetence:

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

Splošne kompetence:

- Sposobnost analitičnega in algoritmičnega razmišljanja.
- Sposobnost fleksibilne uporabe znanja v praksi.
- Obvladovanje sodobnih visoko zmogljivih orodij in specifične programske opreme za obdelavo podatkov.

Predmetno-specifične kompetence:

- Poznavanje najpogosteje uporabljenih numeričnih metod.
- Sposobnost izbire najprimernejše metode na podlagi numerične natančnosti, učinkovitosti in stabilnosti.
- Sposobnost konstruiranja matematičnih modelov in uporaba različnih metod za numerično reševanje različnih problemov v inženirstvu, naravoslovju in družbenih vedah.

Objectives and competences:

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 of flexible usage of knowledge in practice.
- Mastering cutting edge high performance tools and corresponding software for data processing.

Subject-specific competences:

- Knowledge of the most frequently used numerical methods.
- Ability to select the most suitable method based on numerical precision, efficiency and stability.
- Ability to create mathematical models and applying various methods for numerical solving of problems in engineering, natural and social sciences.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Študentje bodo spoznali zahtevnejše pojme in principe numerične matematike. • Študentje bodo sposobni prepoznati praktične probleme in jih reševati z orodji numerične matematike. • Poznali in razumeli bodo poglavitne izreke numerične matematike. • Sposobni bodo uporabe obravnavanih metod za reševanje problemov s pomočjo programskih jezikov Matlab ali R. Prenosljive spretnosti: • Pridobljeno znanje bo prenosljivo na druga področja, predvsem na področja, ki uporabljajo metode, katerih podlaga so numerične rešitve.	Knowledge and understanding: • Students will get acquainted with advanced notions and principles of numerical analysis. • Students will be able to recognize practical problems and solve them with numerical analysis tools. • They will know and understand fundamental theorems of numerical analysis. • They will be able to apply learnt methods for solving problems using programming languages Matlab or R. Transferable skills: • Acquired knowledge will be transferable to other areas using methods which are based on numerical solutions.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri). • Vaje (reševanje problemov).	• Lectures with active students' participation (explanations, discussion, questions, examples) • Exercises (problem solving).

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Domače naloge • Pisni izpit	30 % 70 %	• Homework assignments • Written exam

Reference nosilca / Lecturer's references:

- V.Andova, M. Knor, R. Škrekovski, Distances based indices on nanotubical graphs: part 2, J. Math. Chem. 56 (2018) 3076-3088.
- V.Andova, M. Knor, R. Škrekovski, Distances based indices on nanotubical graphs: part 1, J. Math. Chem. 56 (2018) 2801-2815.
- V.Andova, B. Lidický, B. Lužar, R. Škrekovski, On facial unique-maximum (edge-)coloring, Discrete Applied Math. 237 (2018) 26-32.

- V. Andova, S. Atanasova, E. Jovcevska, V. Jordanova, I. Tolovski, M.Rizov, Projecting a hydrographic map of Republic of Macedonia, J. Electrical Engineering and Information Technologies, 1-2 (2016) 93-100.
- V.Andova, D. Orlić, R. Škrekovski, Leapfrog fullerenes and Wiener index, Appied Math. Comp. 309 (2017) 281-288.
- V.Andova, M. Knor, R. Škrekovski, Distances on nanotubical graphs, J.Math. Chem. 54(8) (2016) 1575-1584.
- V. Andova, F. Kardoš, R. Škrekovski, Mathematical aspect on fullerenes, Ars Mathematica Contemporanea, 11 (2016) 353-379.
- V.Andova, D. Blenkuš, T. Došlić, F. Kardoš, R. Škrekovski, On diameter of nanotubical fullerene graphs, MATCH Commun. Math. Comput. Chem. 73 (2015) 529–542.
- V. Andova, F. Kardoš, R. Škrekovski, Sandwiching saturation number of fullerene graph, MATCH Commun. Math. Comput. Chem. 73 (2015) 501–517.
- Y. Alizadeh, V. Andova, S. Klavžar, R. Škrekovski, Wiener Dimension: Fundamental Properties and (5,0)-Nanotubical Fullerenes, MATCH Commun. Math. Comput. Chem. 72 (2014) 279–294.