

UČNI NAČRT PREDMETA / COURSE SYLLABUS							
Predmet:		Izbrana poglavja iz numerične matematike					
Course title:		Topics in numerical mathematics					
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year		Semester Semester	
Magistrski študijski program Matematika		ni smeri		1 ali 2		prvi ali drugi	
Master's study programme Mathematics		none		1 or 2		first or second	
Vrsta predmeta / Course type				izbirni			
Univerzitetna koda predmeta / University course code:							
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS	
30	15	30			105	6	
Nosilec predmeta / Lecturer:		Marjetka Knez, prof. Bor Plestenjak, prof. Emil Žagar					
Jeziki / Languages:		Predavanja / Lectures:		slovenski/Slovene, angleški/English			
		Vaje / Tutorial:		slovenski/Slovene, angleški/English			
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:			
Vsebina:				Content (Syllabus outline):			

<p>Predavatelj izbere nekatere pomembne teme s področja numerične matematike, kot so na primer:</p> <p>Subdivizijske sheme.</p> <p>Krivulje s pitagorejskim hodografom.</p> <p>Metoda končnih elementov.</p> <p>Računanje z matrikami pri rudarjenju podatkov in razpoznavanju vzorcev.</p> <p>Regularizacija.</p> <p>Računanje s tenzorji, predstavitev tenzorjev in aproksimacija tenzorjev.</p> <p>Numerične metode za večparametrične probleme lastnih vrednosti.</p> <p>Nelinearni problemi lastnih vrednosti</p> <p>Numerično računanje funkcij matrik.</p>	<p>The lecturer chooses some important topics from numerical mathematics, e.g.:</p> <p>Subdivision schemes.</p> <p>Pythagorean-hodograph curves.</p> <p>Finite elements method.</p> <p>Matrix methods in data mining and pattern recognition.</p> <p>Regularization.</p> <p>Tensor computation, presentation of tensors and tensor approximation.</p> <p>Numerical method for multiparameter eigenvalue problems.</p> <p>Nonlinear eigenvalue problems.</p> <p>Numerical computation of matrix functions.</p>
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Temeljni literatura in viri / Readings:

N. Dyn: Subdivision Schemes in Computer-Aided Geometric Design, Advances in Numerical Analysis II Wavelets, Subdivision Algorithms and Radial Basis Functions, W. Light (ed.), Clarendon Press, Oxford, 36-104 (1992).

R. T. Farouki: Pythagorean-Hodograph Curves: Algebra and Geometry Inseparable, Geometry and Computing, vol. 1, Springer, Berlin, 2008.

J. N. Reddy: An introduction to finite elements method, McGraw-Hill, 1993.

L. Elden: Matrix Methods in Data Mining and Pattern Recognition, SIAM, Philadelphia, 2007.

N. J. Higham: Functions of matrices, Theory and Computation, SIAM, Philadelphia, 2008.

P. C. Hansen: Rank-Deficient and Discrete Ill-Posed Problems, SIAM, Philadelphia, 1998.

Cilji in kompetence:

Študent podrobneje spozna eno ali več pomembnejših področij numerične matematike. Pri tem spozna nekatere najnovejše rezultate z obravnavanega področja.

Objectives and competences:

The student sees the details of one or more important areas of numerical mathematics, and learns about some recent results in the subjects.

Predvideni študijski rezultati:

Znanje in razumevanje: Poglobljeno znanje na enem ali več področjih numerične matematike in je sposobnost reševati probleme, ki so v praksi vezani na širše znanje s tega področja. Znanje programiranja in uporabe računalniških orodij za reševanje tovrstnih problemov. Uporaba: Numerično reševanje matematičnih problemov. Refleksija: Razumevanje teorije na podlagi uporabe. Prenosljive spretnosti – niso vezane le na en predmet: Spretnost uporabe računalnika pri reševanju matematičnih problemov.

Intended learning outcomes:

Knowledge and understanding:
A deeper knowledge of one or several topics in numerical mathematics and capability of solving practical problems somehow connected with selected subjects. Knowledge of programming and usage of computer software for solving such problems.

Application: Numerical computation of mathematical problems.

Reflection: Understanding of the theory from the applications.

Transferable skills: The ability to solve mathematical problems using a computer.

Metode poučevanja in učenja:

Learning and teaching methods:

predavanja, vaje, domače naloge, konzultacije, projekti	Lectures, exercises, homeworks, consultations, projects
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

domače naloge ali projekt	20%	homeworks or project
pisni izpit	40%	written exam
ustni izpit	40%	oral exam

Reference nosilca / Lecturer's references:

Marjetka Knez:

- KRAJNC, Marjetka. Geometric Hermite interpolation by cubic G^1 splines. *Nonlinear Analysis, Theory, Methods and Applications*, ISSN 0362-546X. [Print ed.], 2009, vol. 70, iss. 7, str. 2614-2626 [COBISS.SI-ID 15508569]
- KRAJNC, Marjetka. Interpolation scheme for planar cubic G^2 spline curves. *Acta applicandae mathematicae*, ISSN 0167-8019, 2011, vol. 113, no. 2, str. 129-143 [COBISS.SI-ID 16215385]
- JAKLIČ, Gašper, KOZAK, Jernej, KRAJNC, Marjetka, VITRIH, Vito, ŽAGAR, Emil. High order parametric polynomial approximation of conic sections. *Constructive approximation*, ISSN 0176-4276, 2013, vol. 38, iss. 1, str. 1-18 [COBISS.SI-ID 16716121]

Bor Plestenjak:

- HOCHSTENBACH, Michiel E., KOŠIR, Tomaž, PLESTENJAK, Bor. A Jacobi-Davidson type method for the two-parameter eigenvalue problem. *SIAM journal on matrix analysis and applications*, ISSN 0895-4798, 2005, vol. 26, no. 2, str. 477-497 [COBISS.SI-ID 13613401]
- MUHIČ, Andrej, PLESTENJAK, Bor. On the quadratic two-parameter eigenvalue problem and its linearization. *Linear Algebra and its Applications*, ISSN 0024-3795. [Print ed.], 2010, vol. 432, iss. 10, str. 2529-2542 [COBISS.SI-ID 15469913]
- HOCHSTENBACH, Michiel E., MUHIČ, Andrej, PLESTENJAK, Bor. On linearizations of the quadratic two-parameter eigenvalue problem. *Linear Algebra and its Applications*, ISSN 0024-3795. [Print ed.], 2012, vol. 436, iss. 8, str. 2725-2743 [COBISS.SI-ID 16095065]

Emil Žagar:

– ŽAGAR, Emil. On G^2 continuous spline interpolation of curves in \mathbb{R}^d . BIT, ISSN 0006-3835, 2002, vol. 42, no. 3, str. 670-688 [COBISS.SI-ID 12027993]

– KOZAK, Jernej, ŽAGAR, Emil. On geometric interpolation by polynomial curves. SIAM journal on numerical analysis, ISSN 0036-1429, 2004, vol. 42, no. 3, str. 953-967 [COBISS.SI-ID 13398617]

– JAKLIČ, Gašper, KOZAK, Jernej, VITRIH, Vito, ŽAGAR, Emil. Lagrange geometric interpolation by rational spatial cubic Bézier curves. Computer Aided Geometric Design, ISSN 0167-8396, 2012, vol. 29, iss. 3-4, str. 175-188 [COBISS.SI-ID 16207449]