

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
<b>Predmet:</b>	Izbrana poglavja iz računalniške matematike					
<b>Course title:</b>	Topics in mathematical foundations of computer science					
<b>Študijski program in stopnja</b> <b>Study programme and level</b>	<b>Študijska smer</b> <b>Study field</b>		<b>Letnik</b> <b>Academic year</b>	<b>Semester</b> <b>Semester</b>		
3MaFi	Matematika		1 ali 2	prvi ali drugi		
3MaFi	Mathematics		1 or 2	first or second		
<b>Vrsta predmeta / Course type</b>				izbirni		
<b>Univerzitetna koda predmeta / University course code:</b>				M3120		
<b>Predavanja</b> <b>Lectures</b>	<b>Seminar</b> <b>Seminar</b>	<b>Vaje</b> <b>Tutorial</b>	<b>Klinične vaje</b> <b>work</b>	<b>Druge oblike študija</b>	<b>Samost. delo</b> <b>Individ. work</b>	<b>ECTS</b>
30					150	6
<b>Nosilec predmeta / Lecturer:</b>				doc. Matija Pretnar, prof. Alexander Keith Simpson, prof. Andrej Bauer, prof. Marko Petkovšek, prof. Sergio Cabello Justo		
<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	slovenski/Slovene, angleški/English				
	<b>Vaje / Tutorial:</b>	slovenski/Slovene, angleški/English				
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<p>Izbrane bodo nekatere standardne teme iz podiplomske računalniške matematike, kot so:</p> <p>simbolno računanje, teorija izračunljivosti, računska geometrija, logika v računalništvu, teorija programskih jezikov, algoritmi in podatkovne strukture, kriptografija, analiza omrežij idr. Izbira je odvisna od interesov in raziskovalne usmeritve študentov.</p>	<p>The content consists of a selection of standard topics in graduate-level computational mathematics such as: symbolic computation, computability theory, computational geometry, logic in computer science, theory of programming languages, algorithms and data structures, cryptography, network analysis, etc. The choice depends on students' research interests.</p>
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**Temeljni literatura in viri / Readings:**

M. Petkovšek, H. S. Wilf, D. Zeilberger, A=B, Wellesley, Massachusetts, A K Peters, 1996.  
 J. Matoušek: Lectures on Discrete Geometry, Springer-Verlag, 2002.  
 T. H. Cormen, C. E. Leiserson, R. L. Rivest: Introduction to Algorithms, McGraw-Hill, 1990.  
 D. R. Stinson: Cryptography. Theory and practice, 3. izdaja, CRC Press, 2006.  
 B. C. Pierce: Types and Programming Languages, MIT Press, 2002.  
 M. Huth, Mark Ryan: Logic in Computer Science: Modelling and Reasoning about Systems, Cambridge University Press, 2000.  
 H. Rogers: Theory of Recursive Functions and Effective Computability, MIT Press, 1987.  
 P. Doreian, V. Batagelj, A. Ferligoj: Generalized Blockmodeling, Cambridge University Press, 2005.  
 S. Wasserman, K. Faust: Social Network Analysis: Methods and Applications, Cambridge University Press, 1994.

**Cilji in kompetence:**

Namen predmeta je seznaniti študente z nekaterimi pomembnimi temami računalniške matematike.

**Objectives and competences:**

The main goal of the course is to provide students with some important topics in computational mathematics.

**Predvideni študijski rezultati:**

**Intended learning outcomes:**

Znanje in razumevanje predstavljenih konceptov.  
Sposobnost uporabe pridobljenega znanja in spretnosti.

Knowledge and comprehension of presented concepts.  
Ability to use acquired knowledge and skills.

**Metode poučevanja in učenja:**

Predavanja, konzultacije, reševanje problemov

**Learning and teaching methods:**

Lectures, consultations, problem sessions

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

<p>Pisni izpit (domače naloge), ustni izpit</p> <p>Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)</p>	<p>100 %</p>	<p>Written exam (homeworks), oral exam</p> <p>Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)</p>
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**Reference nosilca / Lecturer's references:**

Andrej Bauer:

- BAUER, Andrej, PETKOVŠEK, Marko. Multibasic and mixed hypergeometric Gosper-type algorithms. Journal of symbolic computation, ISSN 0747-7171, 1999, let. 28, št. 4-5, str. 711-736 [COBISS.SI-ID 9210969]
- AWODEY, Steve, BAUER, Andrej. Propositions as [Types]. Journal of logic and computation, ISSN 0955-792X, 2004, vol. 14, no. 4, str. 447-471 [COBISS.SI-ID 13374809]
- BAUER, Andrej, STONE, Christopher A. RZ: a tool for bringing constructive and computable mathematics closer to programming practice. Journal of logic and computation, ISSN 0955-792X, 2009, vol. 19, no. 1, str. 17-43 [COBISS.SI-ID 15325785]
- BAUER, Andrej, CVETKO-VAH, Karin. Stone duality for skew Boolean algebras with intersections. Houston journal of mathematics, ISSN 0362-1588, 2013, vol. 39, no. 1, str. 73-109 [COBISS.SI-ID 16620377]

Sergio Cabello Justo:

- CABELLO, Sergio. Many distances in planar graphs. *Algorithmica*, ISSN 0178-4617, 2012, vol. 62, no. 1-2, str. 361-381 [COBISS.SI-ID 15702873]
- CABELLO, Sergio. Hardness of approximation for crossing number. *Discrete & computational geometry*, ISSN 0179-5376, 2013, vol. 49, iss. 2, str. 348-358 [COBISS.SI-ID 16340313]
- CABELLO, Sergio, GIANNOPOULOS, Panos. The complexity of separating points in the plane. *Algorithmica*, ISSN 0178-4617, 2016, vol. 74, iss. 2, str. 643-663 [COBISS.SI-ID 17195097]

Marko Petkovšek:

- BAUER, Andrej, PETKOVŠEK, Marko. Multibasic and mixed hypergeometric Gosper-type algorithms. *Journal of symbolic computation*, ISSN 0747-7171, 1999, let. 28, št. 4-5, str. 711-736 [COBISS.SI-ID 9210969]
- ABRAMOV, Sergei A., PETKOVŠEK, Marko. Polynomial ring automorphisms, rational (w, [sigma])-canonical forms, and the assignment problem. *Journal of symbolic computation*, ISSN 0747-7171, 2010, vol. 45, no. 6, str. 684-708 [COBISS.SI-ID 15580505]
- KLAUVŽAR, Sandi, MOLLARD, Michel, PETKOVŠEK, Marko. The degree sequence of Fibonacci and Lucas cubes. *Discrete Mathematics*, ISSN 0012-365X. [Print ed.], 2011, vol. 311, iss. 14, str. 1310-1322 [COBISS.SI-ID 15884121]
- PETKOVŠEK, Marko, ZAKRAJŠEK, Helena. Solving linear recurrence equations with polynomial coefficients. *Preprint series*, ISSN 2232-2094, 2013, vol. 51, no. 1185, str. 1-26 [COBISS.SI-ID 16571737]

Matija Pretnar:

- PLOTKIN, Gordon, PRETNAR, Matija. Handling algebraic effects. *Logical methods in computer science*, ISSN 1860-5974, 2013, vol. 9, iss. 4, paper 23 (str. 1-36) [COBISS.SI-ID 16816729]
- PRETNAR, Matija. Inferring algebraic effects. *Logical methods in computer science*, ISSN 1860-5974, 2014, vol. 10, iss. 3, paper 21 (str. 1-43) [COBISS.SI-ID 17190745]
- BAUER, Andrej, PRETNAR, Matija. An effect system for algebraic effects and handlers. *Logical methods in computer science*, ISSN 1860-5974, 2014, vol. 10, iss. 4, paper 9 (str. 1-29). <http://arxiv.org/pdf/1306.6316> [COBISS.SI-ID 17191001]

Alexander Keith Simpson:

- AWODEY, Steve, BUTZ, Carsten, SIMPSON, Alex, STREICHER, Thomas. Relating first-order set theories and elementary toposes. *Bulletin of symbolic logic*, ISSN 1079-8986, 2007, vol. 13, no. 3,

str. 340-358 [COBISS.SI-ID 17096537]

– SIMPSON, Alex. Computational adequacy for recursive types in models of intuitionistic set theory. *Annals of pure and applied Logic*, ISSN 0168-0072. [Print ed.], 2004, vol. 130, iss. 1-3, str. 207-275 [COBISS.SI-ID 17117017]

– SIMPSON, Alex. A characterization of the least-fixed-point operator by dinaturality. *Theoretical computer science*, ISSN 0304-3975, 1993, vol. 118, iss. 2, str. 301-314 [COBISS.SI-ID 17181017]