

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | | | | | | |
|--|---------------------------|---|------------------------------|------------------------------------|---|-------------|
| Predmet: | | Teorija izračunljivosti | | | | |
| Course title: | | Computability theory | | | | |
| 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: | | | | M2602 | | |
| Predavanja Lectures | Seminar Seminar | Vaje Tutorial | Klinične vaje work | Druge oblike študija | Samost. delo Individ. work | ECTS |
| 45 | | 30 | | | 105 | 6 |
| Nosilec predmeta / Lecturer: | | prof. Andrej Bauer, prof. Marko Petkovšek | | | | |
| 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: | | |
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| Vsebina: | | | | Content (Syllabus outline): | | |
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| <p>Turingovi stroji in izračunljive funkcije. Univerzalni stroj. Neodločljivi problemi in neizračunljive funkcije.</p> <p>Osnovni izreki in pojmi: Izrek s-m-n, izrek u-t-m, izrek o rekurziji, izračunljive in izračunljivo preštevne množice, njihove lastnosti, neseparabilne množice, Riceov izrek, Rice-Shapiro izrek.</p> <p>Računanje z oraklji, Turingove redukcije in stopnje.</p> <p>Dodatna vsebina: izračunljivi funkcionali, zveznost funkcionalov, izrek KLS, izračunljiva realna števila, osnovni rezultati izračunljive realne analize.</p> | <p>Turing machines and computable functions. Universal machine. Undecidable problems and non-computable functions.</p> <p>Basic theorems and notions: s-m-n and u-t-m theorems, recursion theorem, computable and computably enumerable sets and their properties, non-separable sets, Rice's theorem, Rice-Shapiro theorem.</p> <p>Oracle computations, Turing reducibility and degrees.</p> <p>If time permits: computable functionals, continuity of functionals, KLS theorem, computable real numbers, basic results in computable analysis.</p> |
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Temeljni literatura in viri / Readings:

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| <p>J. E. Hopcroft, J. D. Ullman: Uvod v teorijo avtomatov, jezikov in izračunov, FER, Ljubljana, 1990. P. Odifreddi: Classical Recursion Theory, North-Holland, 1989.</p> |
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Cilji in kompetence:

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| <p>Znanje osnovnih pojmov in rezultatov v teoriji izračunljivosti.</p> |
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Objectives and competences:

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| <p>Knowledge of basic notions and results in computability theory.</p> |
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Predvideni študijski rezultati:

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| <p>Znanje in razumevanje: Razumevanje povezav med računskimi pojmi, kot so Turingovi stroji, in osnovnimi matematičnimi pojmi, kot so množice števil. Uporaba: Snov predstavlja teoretično matematično podlago za računalništvo v splošnem smislu.</p> |
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Intended learning outcomes:

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| <p>Knowledge and understanding: Understanding of the connections between computability notions, such as Turing machines, and basic mathematical notions, such as sets of numbers.</p> <p>Application:</p> |
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| <p>Refleksija:</p> <p>Vpliv pojma izračunljivosti na osnove matematike.</p> <p>Prenosljive spretnosti – niso vezane le na en predmet:</p> <p>Analitično in abstraktno razmišljanje o teoretičnih mejah računalništva.</p> | <p>The subject matter provides a general theoretical foundation for computer science.</p> <p>Reflection:</p> <p>The influence of the notion of computability on foundations of mathematics.</p> <p>Transferable skills:</p> <p>Analytic and abstract thinking about the theoretical frontiers of computer science.</p> |
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Metode poučevanja in učenja:

predavanja, vaje, domače naloge, konzultacije

Learning and teaching methods:

Lectures, exercises, homeworks, consultations

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):
izpit iz vaj (2 kolokvija ali pisni izpit)

ustni izpit

Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)

Delež (v %) /

Weight (in %)

Assessment:

Type (examination, oral, coursework, project):
2 midterm exams instead of written exam, written exam

oral exam

Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

50%
50%

Reference nosilca / Lecturer's references:

Andrej Bauer:
– BAUER, Andrej. A relationship between equilogical spaces and Type Two Effectivity. Mathematical logic quarterly, ISSN 0942-5616, 2002, vol. 48, suppl. 1, str. 1-15 [COBISS.SI-ID 12033369]

– 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. First steps in synthetic computability theory. V: Proceedings of the 21st Annual Conference on Mathematical Foundations of Programming Semantics (MFPS XXI), (Electronic notes in theoretical computer science, ISSN 1571-0661, Vol. 155). Amsterdam: Elsevier, 2006, str. 5-31 [COBISS.SI-ID 14631001]

Marko Petkovšek:

– PETKOVŠEK, Marko, WILF, Herbert S., ZEILBERGER, Doron. A=B. Wellesley (Massachusetts): A. K. Peters, cop. 1996. VII, 212 str. ISBN 1-56881-063-6 [COBISS.SI-ID 4085337]

– PETKOVŠEK, Marko. Ambiguous numbers are dense. American mathematical monthly, ISSN 0002-9890, 1990, let. 97, št. 5, str. 408-411 [COBISS.SI-ID 8040537]

– PETKOVŠEK, Marko. Letter graphs and well-quasi-order by induced subgraphs. Discrete Mathematics, ISSN 0012-365X. [Print ed.], 2002, vol. 244, no. 1-3, str. 375-388 [COBISS.SI-ID 11414873]