<table>
<tr><td>NAZIV PREDMETA</td><td colspan="7">Computability</td></tr>
<tr><td>Code</td><td>PMM129</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Milica Klaričić Bakula</td><td>Credits (ECTS)</td><td colspan="5">5,0</td></tr>
<tr><td rowspan="2">Teaching assoc.</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>P</td><td>S</td><td>V</td><td>T</td></tr>
<tr><td>30</td><td></td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Compulsory</td><td>Percentage of application of e-learning</td><td colspan="5">20</td></tr>
<tr><td colspan="8">OPIS PREDMETA</td></tr>
<tr><td>Course objectives</td><td colspan="7">The aim of this course is to introduce basic concepts and results in computability and complexity theories. What makes a problem computationally complex and some other problem simple? We can’t give an answer to this question but students should be able to classify computational problems according to their complexity. Closely related to the notion of complexity is the notion of decidability: students will learn to differentiate solvable problems from unsolvable ones. At the end of this course students should be able to understand the meaning of the tenth Hilbert’s problem and the idea of the proof of Gödel’s incompleteness theorems.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Students should be comfortable with using the following concepts: sets and relations; functions; finite automata; regular expressions; regular grammars; context-free grammars; derivations and languages; mathematical proofs (in particular induction proofs). Basics of JFLAP.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Upon successful completion of this course students will be able to:
- find Turing machine that accepts/decides a language or compute a function
- differentiate decidable from undecidable problems
- prove undecidability by reduction
- prove that a function is recursive or primitive recursive
- define and explain the time complexity of Turing machines, the complexity classes P and NP, and NP-completeness
- prove NP-completeness by reduction</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="7">- Turing machine: motivation, informal and formal definition, TM languages (4)
- Variants of Turing machines and their equivalence (4)
- Informal and formal definition of algorithm (2)
- Recursively enumerable languages, recursive languages (4)
- Unrestricted grammars, context-sensitive grammars(2)
- Decision problems (2)
- Decidability in logic (2)
- Primitive recursive functions, recursive functions
- Computable functions vs recursive functions (4)
- Complexity classes P i NP (2)
- NP complete problems (2)</td></tr>
<tr><td>Format of instruction</td><td colspan="7">Lectures and exercises.</td></tr>
<tr><td>Student responsibilities</td><td colspan="7">Attending classes, doing homework assignments.</td></tr>
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Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Attending classes, doing homework assignments: 2 ECTS. Final exam: 3 ECTS.
Grading and evaluating student work in class and at the final exam	Homework assignments, midterm / final exams.
Required literature (available in the library and via other media)	1. J. Martin, Introduction to Languages and the Theory of Computation, McGraw Hill, 2010. 2. M. Sipser, Introduction to the Theory of Computation, PWS Publishing Company, 1996.
Optional literature (at the time of submission of the study programme proposal)	1. G. Boolos, J. Borgess, R. Jeffrey, Computability and Logic, Cambrige University Press, 2007. 2. J. R. Shoenfiled, Recursion Theory, Springer-Verlag, 1993. 3. R. Smullyan - Gödel's Incompleteness Theorems, Oxford University Press, 1992. 4. E. Mendelson, Introduction to Mathematical Logic, D. Van Nostrand Company, 1997.
Quality assurance methods that ensure the acquisition of the exit competences	Summary feedback for the whole class after the exam. Anonymous student survey.
Other (as the proposer wishes to add)	