University of Gdańsk

Subject card

Subject name and code	Automata, Languages and Computational Complexity, PG_00198008		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Andrzej Szepietowski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	0.0	65.0	125

Subject objectives

The aim of the course is to introduce the basics of automata theory and formal languages, develop skills in manipulating regular expressions, and using context-free grammars.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFOL3_U02] is able to use his/her knowledge of higher mathematics to model and solve complex problems	Apply formal mathematical apparatus to model languages and computation — construct regular expressions and context-free grammars, determinize NFAs, and prove language properties using the pumping lemma.	[SU4] test/exam - oral or written
[INFOL3_U06] is able to select and apply appropriate IT methods and tools to solve complex problems, is able to use acquired knowledge by appropriately selecting sources and information derived from them, and perform evaluation, critical analysis, and synthesis of this information	Select and apply an appropriate computational model (finite automaton, pushdown automaton, Turing machine) to analyse a problem, construct a parser for a CFG, and critically analyse decidability and time complexity.	[SU4] test/exam - oral or written
[INFOL3_W03] knows and understands advanced concepts in the field of algorithms and data structures, formal languages, automata theory and computational complexity, and artificial intelligence	Is familiar with the basics of formal languages. Knows the definitions and examples of regular expressions, finite automata, context-free grammars, pushdown automata, and Turing machines. Understands the definition of time complexity for Turing machines.	[SW4] test/exam - oral or written

Subject contents	1. Finite automata, regular expressions, nondeterministic automata, determinization theorem, equivalence theorem between finite automata and regular expressions, pumping lemma; 2. Chomsky grammars, context-free grammars, pushdown automata, parse trees. Parsers. Pumping lemma for context-free languages, context-sensitive grammars, linear-bounded automata; 3. Turing machines, recursively enumerable and recursively enumerable languages, decidability and undecidability problems, halting problem.	
Prerequisites and co-requisites		
Assessment methods and criteria	Subject passing criteria / Passing threshold / Percentage of the final grade	
	exam / 51.0% / 90.0%	
	tests / 51.0% / 10.0%	
Recommended reading	Basic literature	1. J. Hopcroft, J. Ullman - Wprowadzenie do teorii automatów, języków i obliczeń, PWN 1994; 2. J. Jędrzejowicz, A. Szepietowski Języki, automaty, złożoność obliczeniowa Wyd. UG 2008;
	Supplementary literature	not aplicable
	eResources addresses	
Example issues/ example questions/ tasks being completed	not aplicable	
Work placement	Not applicable	

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