University of Gdańsk

Subject card

Subject name and code	Logics in Computer Science, PG_00203606		
Field of study	Informatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master'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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit	Institute of Informatics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Andrzej Borzyszkowski	
	Teachers		

Lesson types

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

- role and applications of logical calculi in computer science
- examples of logics relevant in computer science
- various methods of modeling and verification of properties of information processing systems
- selected tools to support the modeling, proving and verification of properties

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFMU2_W01] has in-depth knowledge of the branches of mathematics necessary for the study of computer science; has a good understanding of the role and importance of the construction of mathematical reasoning		
[INFMU2_U01] can apply mathematical knowledge to individually formulate, analyze and solve tasks related to computer science	is able to prepare a model of a simple IT system using tools such as SPIN and/or Alloy is able to prove the theorem of a classical and an intuitionist logic, can prove that the theorem of a classical logic is not a theorem of an intuitionistic logic is able to express the some property of an IT system in temporal logic, LTL, CTL, CTL*, distinguishes between these logics	[SU5] implementation of a problem task
[INFMU2_U02] is able to formulate questions with precision, serving to deepen his/her own reasoning on a given topic or to find missing elements of reasoning	is able to precisely formulate questions to deepen their own reasoning on a given topic or to find missing elements of a reasoning	[SU5] implementation of a problem task

<table>
<tr><td>Subject contents</td><td>

- Classical propositional calculus: syntax, semantics, basic (meta)properties, natural deduction proof system
- Satisfiability Problem (SAT)
- Intuitionist logic: constructive interpretation of logical connectives, semantics based on Kripke structures
- Logic of first-order predicates: syntax, semantics, the most important (meta)properties, natural deduction proof system
- Applications of predicate logic to specification and modeling of systems
- Temporal logics: LTL, CTL, CTL*
- Model verification of temporal properties

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<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>test</td><td>51.0%</td><td>60.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>40.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>

- Lecture notes/slides.
- Michael Huth, Mark Ryan, Logic in Computer Science, Modelling and Reasoning about Systems, Cambridge University Press, 2004.
- Daniel Jackson. Software Abstractions: Logic, Language, and Analysis, Revised Edition, The MIT Press, 2012

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<tr><td>Supplementary literature</td><td>

- Gerard J. Holzmann, The Spin Model Checker, Primer and Reference Manual, Addison-Wesley, 2004.

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<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>

Using the method of natural deduction, prove that in classical propositional calculus (A->B) \/ (B-> C)

Construct a model M such that M |=/ G F p and M |= AG EF p

What is undecidability? Give an example and justify.

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<tr><td>Work placement</td><td>Not applicable</td></tr>
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