University of Gdańsk

Subject card

Subject name and code	Logics in Computer Science, PG_00203625		
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	part-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	dr Andrzej Borzyszkowski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	0.0	0.0	40
	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	40	0.0	85.0	125

Subject objectives

To familiarize students with

- the role and applications of logical systems in computer science;
- examples of logics that are important from the perspective of computer science;
- various methods for modeling and verifying the properties of computer systems;
- selected tools that support the modeling, proof, and verification of properties

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFMU2_U01] is able to formulate, analyze and solve complex problems related to computer science by selecting and applying appropriate mathematical methods and tools	can develop a model of a simple computer system using tools such as SPIN and/or Alloy can prove a theorem in classical and intuitionistic logic; can prove that a theorem in classical logic is not a theorem in intuitionistic logic can express a meaningful property of a computer system in temporal logic, LTL, CTL, CTL*, can distinguish between these logics	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[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	is familiar with tools that support modeling, expressing properties, and verifying those properties, including SPIN and/or Alloy knows how to define logic using the rules of natural deduction, is familiar with classical and intuitionistic logic, and understands the semantics of these logics (Boolean algebra, Kripke structures) is familiar with temporal logics, LTL, CTL, and CTL	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[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, to lead a debate	is able to formulate precise questions designed to deepen their own understanding of a given topic or to identify gaps in their reasoning	[SU2] presentation/project/paper/ report

Subject contents

- Classical propositional calculus: syntax, semantics, basic (meta)properties, proof by natural deduction
- The Boolean satisfiability problem (SAT)
- Intuitionistic logic: constructive interpretation of connectives, semantics based on Kripke structures
- First-order predicate logic: syntax, semantics, key (meta)properties, proof by natural deduction
- Applications of first-order predicate logic to system specification and modeling
- Temporal logics: LTL, CTL, CTL*
- Model verification of temporal properties

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	51.0%	60.0%
exam	51.0%	40.0%

Recommended reading

Basic literature	Andrzej Borzyszkowski; lecture materials available at www page
Supplementary literature	• Michael Huth, Mark Ryan, Logic in Computer Science, Modelling and Reasoning about Systems, Cambridge University Press, 2004. • Gerard J. Holzmann, The Spin Model Checker, Primer and Reference Manual, Addison-Wesley, 2004. • Daniel Jackson. Software Abstractions: Logic, Language, and Analysis, The MIT Press, 2006
eResources addresses	

Example issues/ example questions/ tasks being completed

- Using the method of natural deduction, prove that in classical propositional logic, (A→B) \/ (B→C) holds.
- Construct a model M such that M |=/ G F p and M |= AG EF p.
- What is undecidability? Give an example and explain your answer.

Work placement

Not applicable

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