University of Gdańsk

Subject card

Subject name and code	Logics, PG_00179254						
Field of study	Informatics						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	Master's studies		Subject group	Obligatory subject group in the field of study Optional subject group			
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	6.0			
Learning profile	academic		Assessment form	exam			
Conducting unit							
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	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		0.0	40
Subject objectives	Making students familiar with 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. Student will become familiar with terminology in English.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFMU2_U04] Defines formal languages using grammars and automata; distinguishes between decidable and undecidable problems.	is able to use a formalized language of logic to express properties and model real word is able to apply selected tools for modeling, describing, and verifying the properties of simple information systems is able to prove a theorem in classical or intuitionistic logic, is able to prove that the theorem of classical logic is not a theorem of intuitionistic logic is able to express the meaningful property of an information system in temporal logic, LTL, CTL, CTL*, distinguishes these logics is able to prepare a model of a simple information system using tools such as SPIN and/or Alloy	[SU4] test/exam - oral or written [SU5] implementation of a problem task
[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	knows some basic logical calculi, their syntax and semantics, deductive systems, and the most important (meta)properties sees the relationship between the logics learned and computer science problems knows how to define a logic using rules of natural deduction, knows classical and intuitionistic logic, can conduct proofs of logical formulas, knows the semantics of these logics (Boolean algebra, Kripke structures) knows temporal logics, LTL, CTL, CTL* knows tools supporting modeling, expressing properties and verifying those properties: SPIN, Alloy, PIPE2	[SW4] test/exam - oral or written [SW5] implementation of a problem task

Subject contents

- Classical propositional calculus: syntax, semantics, basic properties, natural deduction method
- Boolean satisfiability problem (SAT)
- First-order predicate logic: syntax, semantics, basic properties, natural deduction method
- Applications of predicate logic to specification and modeling of systems
- Intuitionistic logic: constructive interpretation of connectives, semantics based on Kripke structures
- Temporal logics: LTL, CTL, CTL*
- Model checking of temporal properties

Prerequisites and co-requisites

Assessment methods and criteria

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

Recommended reading

Basic literature	Andrzej Borzyszkowski, materials for the lecture available on the website
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 it holds (A->B) \/ (B->C) Construct a model M such that M |=/ G F p and M |= AG EF p What is undecidability? Provide an example and justify it.
Work placement	Not applicable

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