

Subject card

Subject name and code	Logics in Computer Science, PG_00167660						
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 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			7.0	
Learning profile	academic		Assessment form				
Conducting unit	Institute of Informatics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Wiesław Pawłowski				
	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		115.0	175
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_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
	[INFMU2_K04] understands and appreciates the importance of intellectual honesty in his own and others' actions; acts ethically	understands and appreciates the importance of intellectual integrity in their own and others' actions; acts ethically	[SK5] 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 tools supporting modeling, expressing properties and checking these properties, the SPIN system, optionally the Alloy system knows how to define logic using the rules of a natural deduction, knows a classical and an intuitionistic logic, knows the semantics of these logics (Boolean algebra, Kripke structures) knows temporal logics, LTL, CTL, CTL*	[SW4] test/exam - oral or written
	[INFMU2_U01] can apply mathematical knowledge to 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_K01] knows the limits of his own knowledge and understands the need for further learning	knows the limitations of his knowledge and understands the need to deepen knowledge	[SK4] test/exam - oral or written
Subject contents	[INFMU2_W06] is well acquainted with the principles of health and safety in the IT profession	knows well the principles of health and safety in the profession of an IT specialist	[SW5] implementation of a problem task
	- 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		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	40.0%
	test	51.0%	60.0%
Recommended reading	Basic literature	- 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	
	Supplementary literature	Gerard J. Holzmann, The Spin Model Checker, Primer and Reference Manual, Addison-Wesley, 2004.	
	eResources addresses		

Example issues/ example questions/ tasks being completed	Using the method of natural deduction, prove that in classical propositional calculus $(A \rightarrow B) \vee (B \rightarrow C)$ Construct a model M such that $M \models G F p$ and $M \models AG EF p$ What is undecidability? Give an example and justify.
Work placement	Not applicable

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