University of Gdańsk

Subject card

Subject name and code	Logics in Computer Science, PG_00143949		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	postgraduate studies	Subject group	Obligatory subject group 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	Instytut Informatyki -> Faculty of Mathematics, Physics and Informatics -> Rektor		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Wiesław Pawłowski	
	Teachers	mgr Łukasz Mielewczyk dr hab. Wiesław Pawłowski	

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	10.0	105.0	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	[SU1] oral statement/conversation/ discussion [SU8] observation of student's independent or team work
[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	[SK8] observation of student's independent or team work
[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_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 [SW1] oral statement/ conversation/discussion [SW5] 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	[SK8] observation of student's independent or team work
[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	[SW1] oral statement/ conversation/discussion

Subject contents

- Classical propositional calculus: syntax, semantics, basic (meta)properties, natural deduction proof system
- Satisfiability Problem (SAT)
- 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
- Intuitionist logic: constructive interpretation of conjunctions, sematics based on Kripke structures
- 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	50.0%	55.0%
general activity	0.0%	5.0%
oral exam	50.0%	40.0%

Recommended reading

Basic 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
Supplementary literature	none
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	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.
Work placement	Not applicable

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