COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Logic	

Annotation
This course is an introduction to first-order symbolic logic, specifically, categorical (or syllogistic) logic, propositional logic, and predicate logic. The main goal of the course will be to gain facility with these logical systems. This involves symbolizing English sentences in the languages of the logical systems, learning how to distinguish valid from invalid arguments, and constructing valid arguments by applying rules of inference and equivalence. The ultimate goal of the course is to learn how to reason with greater clarity and rigor, by applying the principles of logic to arguments expressed in ordinary language.

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: dr. Mindaugas Gilaitis **Other(s):** dr. Jonas Dagys	Department of History of Philosophy and Analytic Philosophy

Study cycle	Type of the course unit (module)
First (Bachelor)	General university studies

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	Spring semester	English

Prerequisites
None

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	130	48	82

Purpose of the course unit (module)		
The course aims at introducing students to theoretical basics of logic, the principal methods of logical analysis and their application, to develop students' skills of critical and analytical thinking, to enhance their ability of structured and consistent thought, to train the ability to recognize types of arguments and critically reflect the arguments of the opponents.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
Students will master the principal rules of logic. They will become familiar with the basic levels and methods of logical analysis.	Interactive lectures, study of literature.	Participation in seminars, midterm test, final test (exam).
Students will be able to understand the toolkit of logical analysis and will be able to recognize the logical structure of expressions of natural language.	Interactive lectures, reading of texts, exercises of application of logical grammar and formalization of logical structure of natural language.	
Students will be able to evaluate logical validity of arguments and proofs of various levels of complexity. They will also be able to recognize formal and informal fallacies within arguments and proofs. They will be able to	Interactive lectures, reading of texts, exercises of logical analysis.	

evaluate consistency and prove inconsistency of systems of propositions (descriptions, sets of premises of arguments or proofs).		

Course content: breakdown of the topics	Contact hours			Individual work: time and assignments		
	Lectures	Seminars	Total contact hours	Individual work	Assignments (No. in the reading list)	
					Reading	Exercises
1. The object of logic. Arguments and their logical structure. Enthymeme. Proofs and arguments. Types of arguments: deductive and inductive. Logical truth, logical equivalence and logical consistency. Validity and soundness.	2		**2**	**4**	**1:** pp. 1-18. **2:** pp. 1-75. **3:** pp. 1-61.	**1:** pp. 18-20. **2:** ex. 1.1-1.6. **3:** ex. 1.1-1.4.
2. Formal logic. The notion of logical form. Logical operator. Method of formalization. Fundamental logical relations. Theory of sets. Set-theoretic relationships. Types of definitions and basic rules of a definition.	2	1	**3**	**4**	**2:** pp. 76-116. **3:** pp. 109-139.	**2:** ex. 2.1-2.5. **3:** ex. 3.1-3.3.
3. Categorical statements. Types of categorical statements, their structure, distribution of terms. Square of opposition. Immediate inferences from categorical statements: obversion, conversion, contraposition.	2	1	**3**	**5**	**1:** pp. 225-245. **2:** pp. 199-252. **3:** pp. 197-216	**1:** pp.245-249. **2:** ex. 4.1-4.7. **3:** ex. 5.1-5.3.
4. Simple categorical syllogisms, their structure (moods and figures). Rules of categorical syllogism. Venn diagrams for testing validity of categorical syllogisms.	2	1	**3**	**5**	**1:** pp. 393-397. **2:** pp. 253-300. **3:** pp. 223-273.	**1:** pp. 397. **2:** ex. 5.1-5.7. **3:** ex. 6.1-6.5.
5. Propositional logic: simple and compound propositions. Truth-functional propositional connectives: negation, conjunction, disjunction, material conditional and biconditional. Types of truth-functional compounds.	2	1	**3**	**5**	**1:** pp. 21-49. **2:** pp. 301-363. **3:** pp. 277-308.	**1:** p. 31, 49. **2:** ex. 6.1-6.6. **3:** ex. 7.1-7.2.
6. Formalizing sentences of natural language in propositional logic.	2	1	**3**	**5**	**1:** pp. 51-69.	**1:** pp. 69-73.
7. Truth table method for proving (in)validity of the argument and (in)consistency of its premises. Short truth table method for proving invalidity.	2	1	**3**	**4**	**1:** pp. 33-49. **3:** pp. 308-340.	**1:** pp. 49-50. **2:** ex. 6.6. **3:** ex. 7.3-7.5.
8. Basic laws of natural deduction. Inference rules. Validity proofs by derivation.	2	1	**3**	**5**	**1:** pp. 113-138. **2:** pp. 364-370. **3:** pp. 345-361.	**1:** pp. 139-146. **2:** ex. 7.1-7.2. **3:** ex. 8.1.
9. Replacement rules. Validity proofs by natural deduction using inference rules and replacement rules.	2	2	**4**	**5**	**1:** pp. 147-168. **2:** pp. 374-380, 395-400. **3:** pp. 375-377, 385.	**1:** pp. 168-174. **2:** ex. 7.3-7.4. **3:** ex. 8.2.
10. Conditional proof and indirect proof for validity.	4	2	**6**	**6**	**1:** pp. 175-195. **2:** pp. 405-407, 410-414 **3:** pp. 392-398, 401-407.	**1:** pp. 195-199. **2:** ex. 7.5-7.6. **3:** ex. 8.5-8.6.
12. Predicate logic. Propositional function, universal and existential quantification. Rules for quantifier negation.	2	1	**3**	**5**	**2:** pp. 420-428. **3:** pp. 419-445.	**2:** ex. 8.1-8.3. **3:** ex. 9.1.

11. Formalizing sentences of natural language in predicate logic.	2	1	**3**	**5**	**1:** pp. 201-267.	**1:** pp. 269-272.
13. Quantifiers and finite universe. Proving invalidity in predicate logic. Validity proofs in predicate logic: natural deduction, conditional proof and indirect proof.	2	2	**4**	**6**	**1:** pp. 273-311. **2:** pp. 445-458. **3:** pp. 435-469.	**1:** pp. 311-312. **2:** ex. 8.4-8.5. **3:** ex. 9.2-9.4.
14. Informal criteria of rational argumentation and reasoning. Main types of informal fallacies.	4	1	**5**	**2**	**2:** pp. 118-198. **3:** pp. 147-188.	**3:** ex. 4.1-4.3.
15. Preparation for the mid-term and the final test.				**16**		
Total	**32**	**16**	**48**	**82**		

Assessment strategy	Weight,%	Deadline	Assessment criteria
Participation in the seminars	10%	During the semester	10 % – participates actively, does practice exercises, raises questions. 0 % – participates passively or is absent from more than two seminars without a legitimate excuse.
Mid-term test	30%	Eighth week of the semester	Midterm test consists of one multiple choice question and four problems of logical analysis. Correct solution of all 5 tasks earns 30 %, 4 tasks – 20 %, 3 tasks – 15 %, 2 tasks – 10 %, less than 2 tasks – 0 %.
Final test (exam)	60%	During the exam session	Final test consists of one multiple choice question and six problems of logical analysis. Correct solution of all 7 tasks earns 60 %, 6 tasks – 50 %, 5 tasks – 40 %, 4 tasks – 30 %, 3 tasks – 20 %, 2 tasks – 10 %, less than 2 tasks – 0 %.

No.	Author	Publishing year	Title	Issue No or volume	Publishing house or Internet site
	Required reading				
1.	Klenk, V.	2011	Understanding Symbolic Logic		New Jersey: Prentice Hall
2.	Hurley, P.	2000	A Concise Introduction to Logic (7th Ed.)		Boston: Cengage Learning
3.	Howard-Snyder F., Howard-Snyder D., Wasserman R.	2009	The Power of Logic (4th Ed.)		New York: McGraw-Hill Education
	Optional reading				
4.	Copi, I.M., Cohen, C., McMahon, K.	2019	Introduction to Logic		New Jersey: Prentice Hall
5.	Simpson, R.L.	2008	Essentials of Symbolic Logic		Peterborough: Broadview Press
6.	Cannon, D.	2003	Deductive Logic in Natural Language		Peterborough: Broadview Press