ISM UNIVERSITY OF MANAGEMENT
AND ECONOMICS

FORMAL LOGIC

Course code	*FUN133*
Course title	*Logic*
Type of course	*Compulsory*
Stage of study	*Undergraduate*
Year of study	*First*
Semester	*Fall*
ECTS	*3: 12 hours of lectures, 12 hours of practices, 57 hrs. of self-study*
Coordinating lecturer	*Dr. Mindaugas Gilaitis*
Studies form	*Full-time*
Prerequisites	*–*
Language of instruction	*English*

Annotation

This introductory logic course is focused on the basic issues in logic, such as the distinction between factual and logical truths, the conditions of the formal analysis of thought, elementary logical relations (tautology, contradiction and entailment), the issues of validity of inferential knowledge, formal and informal requirements for arguments and proofs, and the most widely used methods of formal proofs. The student will become familiar with the theory of categorical syllogism and propositional calculus. Classroom exercises are devoted to the practice of formalization – translating the expressions of natural language into the formal language, formal analysis of validity of arguments and consistency of propositions. The main methods applied during the course are as follows: Venn diagrams, truth tables, and natural deduction proof methods (including conditional and indirect proofs).

Aims of the course

This course aims to introduce students to the theoretical basics of logic, main methods of logical analysis and their applications.

Course learning outcomes (CLO)	Study methods	Evaluation methods
CLO1. To understand theoretical basics of logic and main methods of logical analysis	Lecture, discussion, self-studies	Midterm test, final exam
CLO2. Be able to recognize formal and informal fallacies of reasoning and proofs	Lecture, discussion, self-studies	Midterm test, final exam
CLO3. Be able to determine if the statements (assumptions of an inference and premises of a proof) are consistent	Lecture, discussion, self-studies	Midterm test, final exam
CLO4. Be able to think in a structured and consistent way	Lecture, discussion, self-studies	Midterm test, final exam
CLO5. To perceive importance of the logical inference, be able to correct informal fallacies in argumentation	Lecture, discussion, self-studies	Midterm test, final exam

Quality issues

Lectures and seminars are interactive. The lecturer assures a variety of teaching methods that develop critical and analytical thinking. Feedback from students will always be highly valued and appreciated.

Cheating issues

The teaching and testing methods are chosen taking into account the purpose of the minimization of cheating opportunities. The ISM regulations on academic ethics are fully applied in the course.

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Topics

NO.	TOPIC	CONTACT HOURS		Readings (No. according to the list below):
		Lectures	Seminars	
1.	The object of logic. Arguments and their logical structure. Enthymeme. Proofs and arguments. Types of arguments: deductive and non-deductive. Factual and logical truths. Formal logic. The notion of logical form. Logical operator. Fundamental logical relations. Theory of sets. Set-theoretic relationships.	2	2	**1:** 1-62. **2:** 1-62.
2.	Categorical propositions. Types of categorical propositions, their structure, distribution of terms. Square of opposition. Immediate inferences from categorical statements: obversion, conversion, contraposition.	2	2	**1:** 175-230. **2:** 197-239.
3.	Simple categorical syllogisms, their structure (moods and figures). Rules of categorical syllogism. Venn diagrams for testing validity of categorical syllogisms.	2	2	**1:** 231-261. **2:** 239-275.
4.	Propositional (sentential) logic. Simple and compound propositions. Truth-functional propositional connectives: negation, conjunction, disjunction, material conditional and biconditional. Formalizing sentences of natural language in propositional logic. Properties and types of deductive argument. Validity and soundness. Analysing deductive arguments in propositional logic. Truth table method for determining the logical relations between propositions and testing the validity of arguments. Short truth table method for proving invalidity.	2	2	**1:** 275-308. **2:** 277-342.
5.	Basic laws of natural deduction. Rules of implication (inference). Simple validity proofs by derivation. Rules of replacement (equivalence). More complex validity proofs by natural deduction using implication rules and replacement rules.	2	2	**1:** 336-375. **2:** 345-391.
6.	Proving inconsistency of statements by natural deduction. Further methods of validity proofs: conditional proof and indirect proof (reduction ad absurdum). Informal criteria of rational argumentation and reasoning. Main types of informal fallacies.	2	2	**1:** 377-386, 107-174. **2:** 392-418, 147-196.
	Total:	12	12	

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Individual work and assessment

Type	Total hours	Evaluation weight, %
Midterm test	22	40
Final exam	35	60
Total:	**57**	**100**

Assessments

1. Midterm test. It is held during the midterm session and covers the material of topics 1 – 3. Exam consists of one (1) multiple-choice theory question and four (4) practical tasks. The test evaluation is given on a 10-point performance rating scale, based on the number of correctly completed tasks; all tasks have the same weight.

2. Final exam. It is held during the exam session and covers the material of topics 4 – 6. Exam consists of one (1) multiple-choice theory question and five (5) practical tasks. Students are allowed to use the set of formulas (prepared and provided by the lecturer). The test evaluation is given on a 10-point performance rating scale, based on the number of correctly completed tasks; all tasks have the same weight.

3. Retake. In case of a failing final grade (less than 5) student can be allowed to have a retake. Retake covers **all the material of the course (evaluation weight – 100%)**. Students are allowed to use the set of formulas (prepared and provided by the lecturer).

Assessment requirements, procedures, and other important regulations may be communicated verbally during lectures. Failure to attend a lecture where such information is provided does not exempt the student from the responsibility of complying with these requirements.

Main textbooks:

1. Hurley, P., Watson, L. (2024). *A Concise Introduction to Logic* (14th Edition). Cengage Learning.

2. Howard-Snyder, F., Howard-Snyder, D., Wasserman, R. (2012) *The Power of Logic* (5th Edition*)*. McGraw-Hill.

Additional readings:

3. Virginia Klenk (2008) *Understanding* Symbolic Logic (5th Edition). Pearson, Prentice Hall.

4. Copi, I.M., Cohen, C., McMahon, K. (2016) *Introduction to Logic* (16th Edition). New Jersey: Prentice Hall.

5. Warburton N. (2000). *Thinking from A to Z*. Routledge.

6. Toulmin S, Rieke R., Janik A. (1997). *An Introduction to Reasoning*. Prentice Hall.

7. Bowell T.& Kemp G. (2005). *Critical Thinking*. Routledge.