FORMAL LOGIC

Course code	*FUN133*
Compulsory in the programmes	*Economics and Politics, Finance*
Level of studies	*Undergraduate*
ECTS	*3: 24 contact hours, 2 hours for final exam, 2 consultation hours, 53 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 (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. In addition to that 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)	Degree level learning objectives (Number of LO)	Study methods	Evaluation methods
CLO1. To understand theoretical basics of logic and main methods of logical analysis	ELO 1.1., ELO 1.2.,	Lecture, discussion, self-studies	Homework, final exam
CLO2. Be able to recognize formal and informal fallacies of reasoning and proofs	ELO 1.1., ELO 1.2., ELO, 2.1.	Lecture, discussion, self-studies	Homework, final exam
CLO3. Be able to determine if the statements (assumptions of an inference and premises of a proof) are consistent	ELO 1.1., ELO 1.2., ELO, 2.1.	Lecture, discussion, self-studies	Homework, final exam
CLO4. Be able to think in a structured and consistent way	ELO 1.1., ELO 1.2., ELO, 2.1.	Lecture, discussion, self-studies	Homework, final exam
CLO5. To perceive importance of the logical inference, be able to correct informal fallacies in argumentation	ELO 1.1., ELO 1.2., ELO, 2.1.	Lecture, discussion, self-studies	Homework, final exam

Quality issues

Lectures and seminars are interactive. The lecturer assures a variety of teaching methods that develop critical and analytical thinking. Consultations before assessments and feedback afterwards are compulsory. 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.

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. Logical truth, logical equivalence and logical consistency. Formal logic. The notion of logical form. Logical operator. Theory of sets. Set-theoretic relationships. Types of definitions and basic rules of a definition.	2	2	**1:** 1-25. **2:** 1-62.
2.	Categorical statements. Types of categorical statements, their structure, distribution of terms. Square of opposition. Immediate inferences from categorical statements: obversion, conversion, contraposition. Simple categorical syllogisms, their structure (moods and figures). Rules of categorical syllogism.	2	2	**1:** 206-274. **2:** 197-222, 223-228, 269-274.
3.	Venn diagrams for testing validity of categorical syllogisms. Propositional (sentential) logic: simple and compound propositions. Truth-functional propositional connectives: negation, conjunction, disjunction, material conditional and biconditional. Types of truth-functional compounds.	2	2	**1:** 274-327, 327-352. **2:** 229-268, 277-309.
4.	Propositional logic. 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:** 352-381. **2:** 277-295, 310-343.
5.	Basic laws of natural deduction. Rules of inference. Simple validity proofs by derivation. Rules of replacement. More complex validity proofs by natural deduction using inference rules and replacement rules.	2	2	**1:** 403-470. **2:** 345-391.
6.	Proving inconsistency of statements by natural deduction. Further methods of validity proofs: conditional proof and indirect proof. Informal criteria of rational argumentation and reasoning. Main types of informal fallacies.	2	2	**1:** 175-200. **2:** 392-418, 147-196.
	Total:	**12**	**12**	

Individual work and assessment

Type	Total hours	Evaluation weight, %
Homework I	3	8
Homework II	3	8
Homework III	3	8
Homework IV	3	8
Homework V	3	8
Final exam	42	60
Total:	**57**	**100**

Assessments

1. Homework. Specific homework tasks are based on the lecture materials and are to be provided during the lectures. Homework is to be collected and discussed each week during the seminars. Late submissions are accepted no later than before the final exam.

2. Final exam. It is held during the exam session and covers the material of the entire course, its duration is 90 min. Exam consists of three (3) multiple-choice theory questions and twelve (12) practical tasks. Students are allowed to use the set of formulas (prepared and provided by the lecturer).

3. Retake. In case of a failing final grade (less than 5) student can be allowed to have a retake. Retake lasts 90 min. and covers all the material of the course. Students are allowed to use the set of formulas (prepared and provided by the lecturer). All previous marks, except of homework, are annulled; the weight of the retake is 60%. Additional homework will not be accepted.

Precision of composite evaluations is left intact (up to 2 decimal places) until the end of semester and only the final evaluation will be subject to rounding.

Main textbooks:

1. Hurley, P., Watson, L. (2021). *A Concise Introduction to Logic* (13th 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.

ANNEX

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the <u>Bachelor of Business Management</u>
Programmes:
International Business and Communication,
Business Management and Marketing, Finance,
Industrial Technology Management

Learning Goals	Learning Objectives
Students will be critical thinkers	BLO1.1. Students will be able to understand core concepts and methods in the business disciplines
	BLO1.2. Students will be able to conduct a contextual analysis to identify a problem associated with their discipline, to generate managerial options and propose viable solutions
Students will be socially responsible in their related discipline	BLO2.1. Students will be knowledgeable about ethics and social responsibility
Students will be technology agile	BLO3.1. Students will demonstrate proficiency in common business software packages
	BLO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	BLO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	BLO4.2. Students will be able to convey their ideas effectively through an oral presentation
	BLO4.3. Students will be able to convey their ideas effectively in a written paper

Learning objectives for the <u>Bachelor of Social Science</u>
Programmes:
Economics and Data Analytics,
Economics and Politics

Learning Goals	Learning Objectives
Students will be critical thinkers	ELO1.1. Students will be able to understand core concepts and methods in the key economics disciplines
	ELO1.2. Students will be able to identify underlying assumptions and logical consistency of causal statements
Students will have skills to employ economic thought for the common good	ELO2.1. Students will have a keen sense of ethical criteria for practical problem-solving
Students will be technology agile	ELO3.1. Students will demonstrate proficiency in common business software packages
	ELO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	ELO4.1.Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	ELO4.2.Students will be able to convey their ideas effectively through an oral presentation
	ELO4.3. Students will be able to convey their ideas effectively in a written paper