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Logic has been traditionally defined as the study of principles (laws), forms, methods and rules of thought, primarily reasoning. It should, however, be understood that even though principles (laws), forms, methods and rules of thought studied by logic can be traced to earlier practices of human thinking, their expounded versions have, in fact, been invented by logicians themselves in an attempt to develop and perfect a universal tool of theoretical thought. Logic is, therefore, better described and understood as an artificial language specially devised for and adapted to needs of theoretical discourse, including that of science.

Scientific disciplines that lay at the core of university-level education can hardly be adequately comprehended without mastering this language. However, by the 19th century the language of traditional logic created and conceptualised by Aristotle more than two millennia earlier and sophisticated by generations of scholars throughout Antiquity, Middle Ages and Modern Times exhausted its potential and seized to fully meet the needs of sciences. A new language was required, more complex and more powerful, and that requirement has been met by mathematical (symbolic) logic.

Nevertheless, since most classical scientific writings read at higher schools and universities date from the times that preceded symbolic logic, traditional formal logic suffices for their understanding as well as the understanding of their contemporary expositions. Mastery of the language of traditional logic likewise suffices for analysis of everyday public discourse, including political discourse, the bulk of theoretical political discourse being no exception, for the simple reason that the majority of the discourses have never studied and, hence, do not use the language of symbolic logic. In the meantime, such analysis is an essential part of political scientists' routine work and the respective analytical skills are indispensable elements of their professional competence.

The language of traditional formal logic was originally developed on the basis of ordinary ("natural") languages and is, therefore, relatively easy to learn and use. However, due to its artificial nature and, particularly, its deliberate orientation to theoretical thought, it is unrealistic to expect that it can be learned spontaneously, least so properly, in the course of everyday mental work. Even the kind of logical intuition inadvertently developed in mathematical classes proves insufficient in the field of humanities the study of which constitutes the basis of MGIMO education. Hence the language of logic with its specific semantics, syntax, and pragmatics must be taught as a special discipline to all those whose vocations make thinking skills of theoretical level pertinent.

Part 1. The Subject, Functions, Laws and Parts of Logic

(1 lecture, 1 seminar).

Traditional formal logic was conceptualised at the outset as the study (the term *science* had not yet been coined) of principles (rules, or *laws*, to use a later expression) and forms (as different from contents) of thought. Three principles (laws) of thought were initially formulated, viz. (1) the law of identity, (2) the law of contradiction (often referred to as the law of non-contradiction), and (3) the law of excluded middle (also known as the law of excluded third), and three forms of thought were initially identified, viz. (1) concepts, (2) propositions, (3) inferences. It is important to understand that even though the above three principles (laws) can be traced to common sense practices of everyday communications and, at least, the first

two of the above three forms of thought closely resemble such lexical units of ordinary languages as words and sentences with their parts and word order, logic requires far greater accuracy and far greater rigour than those exhibited by “natural” languages, and this is precisely what makes it functional as the language of science.

Unlike imprecise, often metaphorical and ambiguous words of “natural” languages, concepts that figure in logical discourse must be defined explicitly and understood unequivocally – this is precisely what the principle (law) of identity is about, Unlike sentences of ordinary languages, propositions must adhere to strict uniform patterns that allow for clear and unmistakable understanding of logical relations between both concepts that appear in propositions and propositions themselves. Failure to meet these requirements deprives inferences of due rigorousness and destroys their demonstrative and convincing power.

Lecture 1. The Subject, Functions, Laws and Parts of Logic.

The essence and subject of logic. Functions of logic in theoretical discourse. Logic as an artificial language of theoretical discourse. The principles (laws) of thought: the principle of identity; the law of contradiction (non-contradiction), the law of excluded middle (excluded third), the principle of sufficient reason. The forms of thought in traditional logic: concepts, propositions, inferences. Traditional parts of logic.

Seminar 1. The Subject, Functions, Laws and Parts of Logic.

Why do we need logic? Can we do without logic? What are the functions of logic in scientific discourse? Is logic a specific branch or a universal tool of theoretical, more specifically scientific, knowledge? Is logic a theory or a language? Can science do without logic? Are laws of thought also laws of reality or just rules of proper thinking about reality? What are the results of violating laws (rules) of logic? What is equivocation? Are the three forms of thought ordered properly? How do they relate to each other and to forms of ordinary speech and thinking? Is illogical thinking simply incorrect or is it to be seen as an alternative mode of thinking? Are other forms of thought possible and thinkable? Is there just one universal logic or are there many different logics?

Required reading:

- Assadian B. Formal Logic in Philosophy // *Introduction to Philosophy: Logic* / Ed. by B. Martin. – Ch. 3. – Rebus Community, 2020. – P. 23–33; <https://press.rebus.community/intro-to-phil-logic/chapter/chapter-3-formal-logic-in-philosophy/>.
- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 1. The Subject and Laws of Logic: PowerPoint presentation of lecture; https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bf101_the_subject_and_laws_of_logic.pptx.
- Knachel M. What is Logic? // *Introduction to Philosophy: Logic* / Ed. by B. Martin. – Ch. 1. – Rebus Community, 2020. – P. 3–11; <https://press.rebus.community/intro-to-phil-logic/chapter/chapter-1/>.

Further reading:

- Code A. Aristotle's Logic and Metaphysics // *Routledge History of Philosophy*. – Vol. II: From Aristotle to Augustine / Ed. by David Furley. – Ch. 2. – London & New York: Routledge, 1999. – P. 40-71.
- Copleston F. *A History of Philosophy*. – Vol. 1: Greece and Rome. From the Pre-Socratics to Plotinus. – Ch. XXVIII. Logic of Aristotle. – New York et al.: Doubleday, 1993. – P. 277-286.
- Russell B. *A History of Western Philosophy*. – Book I. – Ch. XXII. Aristotle's Logic; <http://archive.org/stream/westernphilosoph035502mbp#page/n225/mode/2up>.

Advanced reading:

- Bobzien S. Ancient Logic // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition); <https://plato.stanford.edu/entries/logic-ancient/>.
- Gottlieb P. Aristotle on Non-contradiction // *The Stanford Encyclopedia of Philosophy* (Spring 2019 Edition); <https://plato.stanford.edu/entries/aristotle-noncontradiction/>.
- Hofweber T. Logic and Ontology // *The Stanford Encyclopedia of Philosophy* (Spring 2021 Edition); <https://plato.stanford.edu/entries/logic-ontology/>.
- Shapiro S. and Kissel T. K. Classical Logic // *The Stanford Encyclopedia of Philosophy* (Spring 2021 Edition); <https://plato.stanford.edu/entries/logic-classical/>.

Part 2. Concept as a Form of Thought

(2 lectures, 2 seminars).

Traditional logic analyses concepts in terms of intensions and extensions and their interrelations. Intensions and extensions both “consist of” (refer to sets of) other concepts which are either predicated of the concept in question (the concept's intension) or of which the concept in question is predicated (the concept's extension).

Elementary logical operations of generalisation and specialisation, as well as the principal methods of explicating concepts, such as definitions and classifications, are aimed at ascertaining exact and unequivocal logical relations between concepts for their subsequent use in propositions. Logical relations between concepts depend on the way their extensions interrelate, i.e. on the presence or absence of common elements in their extensions. Varieties of relations thus identified are conceptualised as different kinds of concepts.

Lecture 2. Concept as a Form of Thought.

The concept of concept: a form of thought that grasps the universal essence of a species or a genus. Intensions and extensions of concepts. The interrelation of intension and extension. Logical operations on concepts: generalisation (broadening extensions by narrowing intensions) and specialisation (augmenting intensions by narrowing extensions). Logical relations between concepts: compatible and incompatible concepts. Kinds of compatibility: equivalence, alternation, intersection. Incompatible cosubalternate concepts: contradictory and contrary concepts.

Seminar 2. Concept as a Form of Thought.

What is the logical rationale of distinguishing between two taxonomical levels of generality: species and genera? How do generality (universality), necessity and essentiality depend on each

other? Why is theoretical thought so keen on identifying the general (universal), the necessary, and the essential in whatever is the matter of its concern? How can a concept consist of concepts and be applicable to concepts? Why does generalisation (broadening the extent of a concept's applicability) imply narrowing that concept's intension? Why does specialisation (augmentation of intension) result in narrowing the extension? Why do logical relations between concepts depend on the way their extensions, rather than their intensions, interrelate? What is the difference between the three kinds of compatible concepts: equivalent, alternate and intersecting concepts? What is the principal difference between the two kinds of opposite (incompatible cosubalternate) concepts: contradictory and contrary concepts? Why is this difference logically important?

Required reading:

- Biryukov N. I. *The Basics of Formal Logic: A Multimedia Manual*. – Topic 2. Concept as a Form of Thought: PowerPoint presentation of lecture; https://nibiryukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl02_concept_as_a_form_of_thought.pptx.

Further reading:

- Dowden B. H. *Logical Reasoning*. – Ch. 12. Aristotelian Logic and Venn-Euler Diagrams. – Sacramento, CA: California State University Sacramento 2020. – P. 402–431; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Fodor J. *The Language of Thought*. – Cambridge, MA: Harvard University Press, 1975.

Advanced reading:

- Baker M. *The Atoms of Language: The Mind's Hidden Rules of Grammar*. – New York: Basic Books, 2001.
- Horn L. R. and Wansing H. Negation. – Contrariety and contradiction // *The Stanford Encyclopedia of Philosophy* (Spring 2020 Edition); <https://plato.stanford.edu/entries/negation/#ConCon>.
- Margolis E. and Laurence S. Concepts // *The Stanford Encyclopedia of Philosophy* (Spring 2021 Edition); <https://plato.stanford.edu/entries/concepts/>.
- Orilia F. and Paolini Paoletti M. Properties // *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition); <https://plato.stanford.edu/entries/properties/>.

Lecture 3. The Kinds of Concepts and Logical Operations on Concepts.

The kinds of concepts: empty and non-empty concepts; universal and singular concepts; registering and non-registering concepts; collective concepts; concrete and abstract concepts; absolute and relational concepts. Explicating concepts: definitions and classifications. The concept and procedure of logical definition. The rules of logical definition: the rule of congruity, the rule of the differentia, the rule of the nearest genus, the rule of sufficiency, the rule of essentiality, the rule of non-circularity, the rule of non-contradiction, the rule of positivity, the rule of non-obscurity. The concept and procedure of logical division (classification). The rules of classification: the rule of one principle, the rule of congruity, the rule of incompatibility, the rule of continuity.

Seminar 3. Kinds of Concepts and Logical Operations on Concepts.

If concepts do, indeed, refer to universal essences of species and genera, how are singular and empty concepts possible? What is the difference between and logical functions of universal and collective concepts? If all concepts are the products of abstract thought, what is the rationale of distinguishing between abstract and concrete concepts and what does the term *concrete concept* mean? Why do we need definitions? Why are there different types of definitions and why are definitions in terms of the nearest genus (*genus proximum*) and specific differences (*differentia specifica*) so special? What are the functions of logical definitions? If definitions are to reveal intensions of concepts, why do most rules of definition refer to concepts' extensions? What is the fallacy of incongruity? What is the fallacy of circularity? What is the fallacy of mutual exclusivity? What is the fallacy of obscurity? Why do so many definitions from common language dictionaries violate the rules of definition and why must we abide by these rules? What is the theoretical value of classifications and why must we abide by the rules of classification even though they seem impossible to implement?

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 2. Concept as a Form of Thought: PowerPoint presentation of lecture;
https://nibiryukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl02_concept_as_a_form_of_thought.pptx.

Further reading:

- Dowden B. H. *Logical Reasoning*. – Ch. 3. Writing with the Appropriate Precision. – Sacramento, CA: California State University Sacramento 2020. – P. 91–142;
<https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.

Advanced reading:

- Belnap N. On Rigorous Definitions // *Philosophical Studies*. – Vol. 72 (1993). – P. 115–146.
- Bobzien S. Ancient Logic. – Aristotle: Syntax and Semantics of Sentences // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition);
<https://plato.stanford.edu/entries/logic-ancient/#SynSemSen>.
- Buroker J. Port Royal Logic. – Semantics of Terms // *The Stanford Encyclopedia of Philosophy* (Spring 2017 Edition); <https://plato.stanford.edu/entries/port-royal-logic/#SemTer>.
- Gupta A. Definitions // *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition);
<https://plato.stanford.edu/entries/definitions/>.
- Gupta A. Remarks on Definitions and the Concept of Truth // *Proceedings of the Aristotelian Society*. – Vol. 89 (1988/89). – P. 227–246.
- Smith R. Aristotle's Logic. – Definitions // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/aristotle-logic/#Def>.

Part 3. Proposition as a Form of Thought

(1 lecture, 1 seminar).

Traditional logic sees proposition as the only form of thought that can be meaningfully characterised as either true, or false. (Expressions such as *false concepts* or *false inferences* occur in ordinary discourse, but they are, at best, confusing, so logicians find them inappropriate). Truth and falsity as such (“in the long run”) depend on extra-logical factors and are conventionally defined as correspondence (or the lack of correspondence) of propositions to objective reality. However, analysis of inferences, the ultimate of logic, focuses on conditions, procedures and rules of deriving new true propositions from other true propositions, suggesting that logical truth depends on the truth of premises and the validity of inferential procedures rather than directly on objective determinants of truth, thus validating logic itself as a powerful means of obtaining new knowledge.

Lecture 4. Proposition as a Form of Thought.

The concept and definition of proposition. The structure of categorical propositions: subjects, predicates, copulas, and quantifiers. Classification of categorical propositions by “quality”: affirmative and negative propositions. Classification of categorical propositions by “quantity”: universal and particular propositions. Joint classification of categorical propositions by “quality” and “quantity”. The principal classes of categorical propositions and logical relations between concepts. Logical relations between propositions: equivalence, contradiction, contrariety, subcontrariety, subalternation. The square of opposition (logical square). The concept of modality. Alethic modality. Classification of propositions by modality: apodeictic, assertoric, and problematic propositions. The hexagon of opposition (logical hexagon). Classification of propositions by “relation”: categorical, hypothetical, and disjunctive propositions.

Seminar 4. Proposition as a Form of Thought.

Why are there no false concepts and false inferences? Why does traditional formal logic treat singular propositions as a subclass of universal propositions? Is this treatment appropriate? What are lexical variants of quantifiers *all* and *some*? Why is the quantifier *some* ambiguous? What is the default reading of *some*? How do logical relations between concepts relate to the principal classes of categorical propositions? Why do bivalent logics, including the traditional formal logic, discern only five kinds of logical relations between propositions? What is the square of opposition and why is it not fully representative of the logical relations between propositions? Why would it be more appropriate to view hypothetical and disjunctive propositions as compound, rather than simple, propositions? What is the logical relation between antecedents and consequents of conditional propositions? What is the difference between necessary and sufficient conditions? What is the difference between conditional and biconditional propositions? What is the logical relation between antecedents and consequents of biconditional propositions? What is the difference between exclusive and inclusive disjunctive propositions?

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 3. Proposition as a Form of Thought: PowerPoint presentation of lecture;
https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl03_proposition_as_a_form_of_thought.pptx.
- Shaffer M. Necessary and Sufficient Conditions // *Introduction to Philosophy: Logic* / Ed. by B. Martin. – Ch. 5. – Rebus Community, 2020. – P. 43–52;

<https://press.rebus.community/intro-to-phil-logic/chapter/chapter-5-necessary-and-sufficient-conditions/>.

Further reading:

- Dowden B. H. *Logical Reasoning*. – Ch. 11. Logical Form and Sentential Logic. – Sacramento, CA: California State University Sacramento 2020. – P. 355–401; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Knachel M. *Fundamental Methods of Logic*. – Ch. 3. Deductive Logic I: Aristotelian Logic. – I. Deductive Logics; II. Classes and Categorical Propositions; III. The Square of Opposition; V. Problems with the Square of Opposition. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 68–84, 96–101; <https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

Advanced reading:

- Brennan A. Necessary and Sufficient Conditions // *The Stanford Encyclopedia of Philosophy* (Summer 2017 Edition); <https://plato.stanford.edu/entries/necessary-sufficient/>.
- Buroker J. Port Royal Logic. – The theory of judgment // *The Stanford Encyclopedia of Philosophy* (Spring 2017 Edition); <https://plato.stanford.edu/entries/port-royal-logic/#TheJud>.
- Fitch G. and Nelson M. Singular Propositions // *The Stanford Encyclopedia of Philosophy* (Spring 2018 Edition); <https://plato.stanford.edu/entries/propositions-singular/>.
- Gómez-Torrente M. Logical Truth. – The Nature of Logical Truth // *The Stanford Encyclopedia of Philosophy* (Spring 2019 Edition); <https://plato.stanford.edu/entries/logical-truth/#NatLogTru>.
- Horn L. R. Contradiction // *The Stanford Encyclopedia of Philosophy* (Winter 2018 Edition); <https://plato.stanford.edu/entries/contradiction/>.
- Iacona A. Are There Propositions? // *Erkenntnis*. – Vol. 58 (2003). – P. 325–351.
- Mallozzi A., Vaidya A., and Wallner M. The Epistemology of Modality // *The Stanford Encyclopedia of Philosophy* (Fall 2021 Edition); <https://plato.stanford.edu/entries/modality-epistemology/>.
- McGrath M. and Frank D. Propositions // *The Stanford Encyclopedia of Philosophy* (Winter 2020 Edition); <https://plato.stanford.edu/entries/propositions/>.
- Parsons T. The Traditional Square of Opposition // *The Stanford Encyclopedia of Philosophy* (Summer 2017 Edition); <https://plato.stanford.edu/entries/square/>.
- Smith R. Aristotle's Logic. – Premises: The Structures of Assertions // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/aristotle-logic/#PreStrAss>.
- Smith R. Aristotle's Logic. – Time and Necessity: The Sea-Battle // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/aristotle-logic/#TimNecSeaBat>.

Part 4. Inference as a Form of Thought

(4 lectures, 4 seminars).

The part of logic that deals with inference as a form of thought is the consummation and, indeed, *raison d'être* of the discipline, analyses of concepts and propositions playing largely propaedeutic roles. The eminence of logic and the place it holds in the system of scientific knowledge rest essentially on the heuristic, explanatory, and prognostic potential of inferences. Inferences are formally divided into (1) deductive that proceed from universal to particular and (2) inductive that proceed from particular to universal. This distinction is vital for understanding the means and ways of science that departs from individual and particular facts but aims at theoretical models of presumably universal significance.

Deductive inferences are further divided into (1.1) immediate inferences made from single premises and (1.2) syllogisms made from two or more premises. Immediate inferences are in their turn divided into (1.1.1) judgements about propositions' truth values based on logical relations between propositions and (1.1.2) transformations of propositions explicating logical relations between propositions' terms. Syllogisms are divided into (1.2.1) categorical, (1.2.2) hypothetical, and (1.2.3) disjunctive, plus various combinations of these.

The theory of categorical syllogism, i.e. inference about logical relation between two concepts established on the basis of their relations to some third concept, has been customarily appraised as the most important or, at least, the most elaborated branch of traditional syllogistic. However, such inferences are, in fact, so plain that they hardly ever appear in scientific (least so, ordinary) discourse in their full forms and usually figure as truncated or sequential or truncated sequential versions of categorical syllogisms (known, respectively, as enthymemes, polysyllogisms, and sorites). Nevertheless, conceptualisation of these semi-intuitive deductive arguments, apart from being a must of systematic thinking, is of practical use inasmuch as it helps identify and explicate or, for that matter, avoid logical blunders frequent enough under the circumstances.

Hypothetical and disjunctive syllogisms differ from categorical syllogisms in having propositions, rather than terms, as their units and have been among the most effective tools of theorising about conditions and alternatives.

Lecture 5. Immediate Inferences.

The concept of inference. Kinds of inferences: deductive and inductive inferences. Kinds of deductive inferences: immediate inferences and syllogisms. Two principal types of immediate inferences: inferences based on logical relations between propositions and inferences based on transformations of categorical propositions. Five kinds of inferences based on logical relations between propositions: inferences of equivalence, subalternation, contradiction, contrariety, and subcontrariety. Alethic immediate inferences. Negations of modal inferences. Five kinds of inferences based on transformations of categorical propositions: obversion, conversion, contraposition to predicate, contraposition to subject, and obverted contraposition. The polysemy of contraposition The concept and rule of distribution.

Seminar 5. Immediate Inferences.

What are the differences between deductive and inductive inferences? What roles do deduction and induction play in scientific discourse and scientific development? What are the differences between immediate inferences and syllogisms? What types of immediate inferences are analysed in traditional formal logic? Why is it sometimes possible to infer the truth value of a proposition from the truth value of another proposition? Why are such inferences not always valid? Why are inferences from truths of subalterns to either truths or falsities of their

superalterns or from falsities of superalterns to truths or falsities of subalterns not valid? Why are inferences from falsities of propositions to either truths or falsities of their contraries or from truths of propositions to either truths or falsities of their subcontraries not valid? What does the term *distribution* mean in syllogistic? Why is this parameter of critical importance? How is one to decide if the term is distributed or undistributed in the proposition in question? Why is it not possible for terms undistributed in premises to be distributed in conclusions? Why is simple conversion valid only for convertends of which terms are either both distributed or both undistributed? Why are universal affirmatives converted only with limitation? Why are conversions of particular negatives not valid? Why do particular affirmatives not contrapose to predicates and particular negatives to subjects? Why is converted contraposition, unlike obverted contraposition, of little logical value?

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 4. Immediate Inferences: PowerPoint presentation of lecture; https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl04_immediate_inferences.pptx.
- Smith N. Evaluating Arguments // *Introduction to Philosophy: Logic* / Ed. by B. Martin. – Ch. 2. – Rebus Community, 2020. – P. 12–22; <https://press.rebus.community/intro-to-phil-logic/chapter/chapter-2-evaluating-arguments/>.

Further reading:

- Dowden B. H. *Logical Reasoning*. – Ch. 10. Deductive Reasoning. – Sacramento, CA: California State University Sacramento 2020. – P. 333–354; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Dowden B. H. *Logical Reasoning*. – Ch. 13. Inductive Reasoning. – Sacramento, CA: California State University Sacramento 2020. – P. 432–487; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Knachel M. *Fundamental Methods of Logic*. – Ch. 1. The Basics of Logical Analysis. – IV. Deductive and Inductive Arguments. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 10–18; <https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.
- Knachel M. *Fundamental Methods of Logic*. – Ch. 3. Deductive Logic I: Aristotelian Logic. – IV. Operations on Categorical Sentences. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 84–96; <https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

Advanced reading:

- Beall J., Restall G., and Sagi G. Logical Consequence. – Deductive and Inductive Consequence // *The Stanford Encyclopedia of Philosophy* (Spring 2019 Edition); <https://plato.stanford.edu/entries/logical-consequence/#DeduInduCons>.
- Buroker J. Port Royal Logic. – The theory of distribution and truth conditions of categorical propositions // *The Stanford Encyclopedia of Philosophy* (Spring 2017 Edition); <https://plato.stanford.edu/entries/port-royal-logic/#TheDisTruConCatPro>.
- Henderson L. The Problem of Induction // *The Stanford Encyclopedia of Philosophy* (Spring 2020 Edition); <https://plato.stanford.edu/entries/induction-problem/>.

- Horn L. R. and Wansing H. Negation. – Double negation // *The Stanford Encyclopedia of Philosophy* (Spring 2020 Edition); <https://plato.stanford.edu/entries/negation/#DouNeg>.
- Parsons T. The Traditional Square of Opposition. – The Principles of Contraposition and Obversion // *The Stanford Encyclopedia of Philosophy* (Summer 2017 Edition); <https://plato.stanford.edu/entries/square/#PriConObv>.

Lecture 6. Categorical Syllogisms.

The idea of categorical syllogism. The structure of categorical syllogism: the premises (the major premise and the minor premise) and the conclusion. The terms of categorical syllogism: the middle term and the extremes (the major term and the minor term). The axiom of categorical syllogism. Rules of categorical syllogism. Rules of the terms: the rule of three terms, the rule of the middle term, the rule of the extremes. Rules of the premises: the rule of an affirmative premise, the rule of two affirmative premises, the rule of a negative premise, the rule of a universal premise, the rule of a particular premise.

Seminar 6. Categorical Syllogisms.

What is the fallacy of four terms? What is the usual source of this fallacy? What is the fallacy of the undistributed middle? How does this fallacy relate to the fallacy of four terms? What is the fallacy of illicit major? What is the fallacy of illicit minor? What is the fallacy of exclusive premises? What is the fallacy of illicit negative? What is the fallacy of illicit affirmative? Why can no inference be made from two particular premises? What is the difference between the figures of categorical syllogism? Why are there precisely four figures? What is the difference between moods of categorical syllogism? Why are only a few of the numerous possible combinations of propositions valid? How many combinations of propositions are possible and how many of them are valid? Why is not every possible combination valid? What are *weakened moods*?

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 6. Categorical Syllogisms: PowerPoint presentation of lecture; https://nibiryukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl06_categorical_syllogisms.pptx.

Further reading:

- Knachel M. *Fundamental Methods of Logic*. – Ch. 3. Deductive Logic I: Aristotelian Logic. – VI. Categorical Syllogisms. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 102–116; <https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

Advanced reading:

- Beall J., Restall G., and Sagi G. Logical Consequence. – Premises and Conclusions // *The Stanford Encyclopedia of Philosophy* (Spring 2019 Edition); <https://plato.stanford.edu/entries/logical-consequence/#PremConc>.

- Bobzien S. Ancient Logic. – Aristotle: Non-modal Syllogistic // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition); <https://plato.stanford.edu/entries/logic-ancient/#NonModSyl>.
- Lagerlund H. Medieval Theories of the Syllogism // *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition); <https://plato.stanford.edu/entries/medieval-syllogism/>
- Smith R. Aristotle's Logic. – The Syllogistic // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/aristotle-logic/#Syl>.

Lecture 7. Figures and Moods of Categorical Syllogism.

The first figure (the “ideal syllogism”): bringing individual cases under general rules. The rules of the first figure: affirmative minor premises and universal major premises. The moods of the first figure. The second figure: refuting application of certain general rules to certain cases. The rules of the second figure: a negative premise (hence, negative conclusions) and universal major premises. The moods of the second figure. The third figure: demonstrating invalidity of certain generalisations. The rule of the third figure: affirmative minor premises (hence particular conclusions). The moods of the third figure. The fourth figure: substantiating teleological arguments. The rules of the fourth figure: universal minor premises in cases of affirmative major premises and universal major premises in cases of one of the premises being negative. The moods of the fourth figure.

Seminar 7. Figures and Moods of Categorical Syllogism.

Why must minor premises of the first figure be affirmative? Why must major premises of the first figure be universal? What makes the first figure an ideal example of inference (an “ideal syllogism”)? What makes the first figure functional in bringing individual cases under general rules? Why must one of the premises of the second figure be negative? Why must major premises of the second figure be universal? Why must conclusions of the second figure be negative? What makes the second figure functional in demonstrating that certain general rules do not apply to certain cases? Why must minor premises of the third figure be affirmative? Why must conclusions of the third figure be particular? What makes the third figure functional in demonstrating invalidity of certain generalisations? Why must minor premises of the fourth figure be universal if major premises are affirmative? Why must major premises of the fourth figure be universal if one of the premises is negative? What makes the fourth figure functional in substantiating teleological arguments?

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 6. Categorical Syllogisms: PowerPoint presentation of lecture; https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl06_categorical_syllogisms.pptx.
- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Supplement to Topic 6. Paralogs in Categorical Syllogistic: A seminar multimedia aide; [https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bflsem07_paralogs_in\(categorical_syllogistic.pptx](https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bflsem07_paralogs_in(categorical_syllogistic.pptx).

Further reading:

- Knachel M. *Fundamental Methods of Logic*. – Ch. 3. Deductive Logic I: Aristotelian Logic. – VI. Categorical Syllogisms. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 102–116;
<https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

Advanced reading:

- Lagerlund H. Medieval Theories of the Syllogism // *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition); <https://plato.stanford.edu/entries/medieval-syllogism/>.
- Smith R. Aristotle's Logic. – The Syllogistic // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/aristotle-logic/#Syl>.

Lecture 8. Hypothetical and Disjunctive Syllogisms. Enthymemes and Polysyllogisms.

Hypothetical syllogisms. Pure (wholly) hypothetical syllogisms. The axiom of hypothetical syllogism. Mixed hypothetical syllogisms. Proof by contrapositive. *Modus ponens* and *modus tollens*. Denying the antecedent, or the fallacy of the inverse. Affirming the consequent, or the fallacy of the converse. The logical biconditional. Biconditional introduction. Biconditional elimination. Disjunctive syllogisms. Pure disjunctive syllogisms. Inclusive and exclusive disjunctions. *Modus tollendo ponens* and *modus ponendo tollens*. Rules of disjunctive syllogisms. Disjunctive hypotheticals: dilemmas, trilemmas, tetralemmas. Simple and complex dilemmas. Constructive and destructive dilemmas. The horns of the dilemma. Truncated syllogisms, or enthymemes. Polysyllogisms. Progressive and regressive polysyllogisms. Sorites. Aristotelian and Goclenian sorites. Epicheiremata.

Seminar 8. Hypothetical and Disjunctive Syllogisms. Enthymemes and Polysyllogisms.

What is the logical relation between antecedents and consequents of major premises of mixed hypothetical syllogisms? What is the function of minor premises of *modus ponens*? What is the function of minor premises of *modus tollens*? What is the fallacy of the inverse? What is the fallacy of the converse? What is the logical relation between antecedents and consequents of major premises of logical biconditionals? How do rules differ for *modus tollendo ponens* and *modus ponendo tollens*? What is the difference between such disjunctive hypotheticals as dilemmas, trilemmas, and tetralemmas? What is the difference between simple and complex dilemmas and between constructive and destructive dilemmas? What makes truncated syllogisms viable and what makes them unviable? What is the difference between progressive and regressive polysyllogisms? What is the difference between Aristotelian and Goclenian sorites?

Required reading:

- Biryukov N. I. *The Basics of Formal Logic: A Multimedia Manual*. – Topic 8. Hypothetical and Disjunctive Syllogisms: PowerPoint presentation of lecture; https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl08_hypothetical_and_disjunctive_syllogisms.pptx.
- Biryukov N. I. *The Basics of Formal Logic: A Multimedia Manual*. – Topic 9. Enthymemes and Polysyllogisms: PowerPoint presentation of lecture; https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl09_enthymemes_and_polysyllogisms.pptx.

Further reading:

- Dowden B. H. *Logical Reasoning*. – Ch. 11. Logical Form and Sentential Logic. – Sacramento, CA: California State University Sacramento 2020. – P. 355–401; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Dowden B. H. *Logical Reasoning*. – Ch. 14. Reasoning about Causes and Their Effects. – Sacramento, CA: California State University Sacramento 2020. – P. 488–531; <https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Knachel M. *Fundamental Methods of Logic*. – Ch. 4. Deductive Logic II: Sentential Logic. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 117–151; <https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

Advanced reading:

- Bobzien S. Ancient Logic. – The Early Peripatetics: Forerunners of *Modus Ponens* and *Modus Tollens* // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition); <https://plato.stanford.edu/entries/logic-ancient/#ForModPonModTol>.
- Bobzien S. Ancient Logic. – The Early Peripatetics: Wholly Hypothetical Syllogisms // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition); <https://plato.stanford.edu/entries/logic-ancient/#WhoHypSyl>.
- Bobzien S. The Development of *Modus Ponens* in Antiquity: From Aristotle to the 2nd Century AD // *Phronesis: A Journal for Ancient Philosophy*. – Vol. 47. – No. 4 (2002). – P. 359–395; https://www.academia.edu/271548/The_Development_of_Modus_Ponens_In_Antiquity_From_Aristotle_to_the_2nd_Century_AD.
- Bobzien S. Wholly Hypothetical Syllogisms // *Phronesis: A Journal for Ancient Philosophy*. – Vol. 45. – No. 2 (May, 2000). – P. 87–137; https://www.academia.edu/275205/Wholly_Hypothetical_Syllogisms.
- Edgington D. Indicative Conditionals // *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition); <https://plato.stanford.edu/entries/conditionals/>.
- Morreau M. The Hypothetical Syllogism // *Journal of Philosophical Logic*. – Vol. 38:4 (2009). – P. 447–464.

Part 5. Logical Methods in Science and Their Practical Applications

(1 seminar).

From the standpoint of form such important scientific procedures as explanations, proofs, and forecasts are *inferences*. Such forms of scientific knowledge as theories and hypotheses are *logical constructs*. Neither of these can be properly understood and assessed with respect to both their validity and their limits without logic. Such scientific practices as writing treatises and holding debates entail *reasoning* and hence come under the auspices of logic, too. The same holds true for political science whether we refer to political theories (mostly ideological rather than scientific, in fact) or to political analysis, including that of political discourse and, especially, deconstruction of its manipulative techniques and practices.

Seminar 9. Proofs and Refutations.

The practice and analysis of argumentation. The structure of argumentation: theses, arguments, demonstration. What is required of the thesis? What is required of the arguments? What is “the burden of proof”? What is the difference between direct and indirect proofs? What is *consequentia mirabilis*? What are formal fallacies in argumentation: *error fundamentalis*, *petitio principii* (begging the question), *non sequitur* (the deductive fallacy), *a dicto secundum quid ad dictum simpliciter* (the fallacy of converse accident), *qui nimium probat nihil probat* (the fallacy of proving too much), *circulus in probando* (circular reasoning)? What are informal fallacies in argumentation: *argumentum ad verecundiam* (argument from authority), *argumentum ad ignorantiam* (argument from ignorance), *argumentum ad populum* (argument from popular opinion), hasty generalisation? What are intentional fallacies in argumentation: *ignoratio elenchi* (irrelevant conclusion, or missing the point), *argumentum ad hominem* (argument directed to the person), *argumentum ad baculum* (appeal to power), the Straw Man fallacy (reducing to a caricature), *argumentum ad misericordiam* (appeal to pity), equivocation. Valid and fallacious *ad hominem* arguments.

Required reading:

- Biryukov N. I. The Basics of Formal Logic: A Multimedia Manual. – Topic 10. Proofs and Refutations: PowerPoint presentation of lecture;
https://nibirukov.mgimo.ru/nb_english/nbe_teaching/nbe_teach_ppp/nbe_ppp_the_basics_of_formal_logic/nbe_bfl08_proofs_and_refutations.pptx.
- Rodrigues C. T. Informal Fallacies // *Introduction to Philosophy: Logic* / Ed. by B. Martin. – Ch. 4. – Rebus Community, 2020. – P. 34–42;
<https://press.rebus.community/intro-to-phil-logic/chapter/chapter-4-informal-fallacies/>.

Further reading:

- Damer T. E. *Attacking Faulty Reasoning: A Practical Guide to Fallacy-Free Arguments*. – 7th ed. – Boston MA, Wadsworth Cengage Learning, 2013; same: 6th ed. – Boston MA, Wadsworth Cengage Learning, 2009 (first published Belmont, CA: Wadsworth Publishing Co., 1980); <https://studylib.net/doc/8314250/attacking-faulty-reasoning--a-practical-guide-to-fallacy>; <https://studylib.net/doc/8420077/attacking-faulty-reasoning>.
- Dowden B. H. *Logical Reasoning*. – Ch. 2. Claims, Issues, and Arguments. – Sacramento, CA: California State University Sacramento 2020. – P. 24–90;
<https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Dowden B. H. *Logical Reasoning*. – Ch. 8. Detecting Fallacies. – Sacramento, CA: California State University Sacramento 2020. – P. 269–298;
<https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Dowden B. H. *Logical Reasoning*. – Ch. 15. Scientific Reasoning. – Sacramento, CA: California State University Sacramento 2020. – P. 532–587;
<https://open.umn.edu/opentextbooks/textbooks/logical-reasoning>.
- Johnson J. L. *Inferring and Explaining*. – Ch. 4. Arguments. – Portland: Portland State University Library, 2019. – P. 25–35;
<https://content.library.pdx.edu/files/PDXScholar/Inferring/36/>.
- Knachel M. *Fundamental Methods of Logic*. – Ch. 2. Informal Logical Fallacies. – Milwaukee, WI: University of Wisconsin Milwaukee, 2017. – P. 29–67;
<https://open.umn.edu/opentextbooks/textbooks/fundamental-methods-of-logic>.

- Van Cleave M. *Introduction to Logic and Critical Thinking*. – Ch. 4. Informal Fallacies. – Lansing, MI: Matthew J. Van Cleave, 2016. – P. 185–206; <https://open.umn.edu/opentextbooks/formats/644>.

Advanced reading:

- Hansen H. Fallacies // *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition); <https://plato.stanford.edu/entries/fallacies/>.

Post-Course Review Reading

- Hintikka J. J. Philosophy of logic; <https://www.britannica.com/topic/philosophy-of-logic>.
- Putnam H. *Philosophy of Logic*. – New York: Harper & Row, 1971.
- Quine W. V. O. *Philosophy of Logic*. – 2nd ed. – Cambridge, MA: Harvard University Press., 1986; *same*: Englewood Cliffs, N.J. : Prentice-Hall, 1970.
- Sher G. *The Bounds of Logic*. – Cambridge, MA: MIT Press, 1991.