Summary Course C.6-11: Elements of Logic (1992-1993).

General

The course Elements of Logic provides a propaedeutic and general-education introduction to logic, deeply rooted in the intellectual heritage of Ancient Greece and Christianity. With Aristotle and Plato as classical teachers, the subject analyses the three fundamental building blocks of human reasoning: concepts, judgments and reasoning. The course explains how concepts are composed of comprehension and extension, how judgments rest on identity relations, the use of models and subjective interpretation, and how various forms of reasoning—from deduction, reduction and induction to axiomatics, analogy, idiography and proof by contradiction - are employed to understand reality and provide a rational justification for it.

1: Context, Introduction and the Classical Tradition

The concept of 'element' (*stoicheion*, *archè* or *logos*) is central to the course and means that which makes something intelligible, comprehensible and justifiable. The course is conceived as propaedeutic (introductory) and general-educational in nature, in accordance with the so-called *Harvard principle*: it aims to protect students against one-sided specialisation ('professional narrow-mindedness') by equipping them with a reasoned method of thinking and historical insight.

Our Western way of thinking and academic disciplines—such as mathematics, physics, medicine, social studies and rhetoric—have their roots in the ancient Greeks, whose intellectual tradition was adopted and disseminated by Christianity. Historically, according to I.M. Bochenski, the history of logic has witnessed three major periods of flourishing: classical ancient logic (4th–3rd centuries BC), medieval scholasticism (12th–13th centuries) and formalised/mathematised logic since approximately 1850. Aristotle's work, collected in the *Organon* (instrument of thought), constitutes the classical core. In it, Aristotle distinguishes the three fundamental components of thought: concepts, judgments and reasoning.

2: Concept Theory (The First Element)

A concept is a mental representation in which reality (that which 'is') is reflected in our intellect. A logical analysis of concepts breaks down two necessary parameters (*stoicheia*):

- *Conceptual content* (*comprehensio*): what our understanding knows and thinks about a given object (its characteristics).

- *Conceptual extension* or scope (*extensio*): the collection or system of all instances to which that content applies.

There is an inverse relationship between content and extension: the richer and more detailed the conceptual content, the narrower and smaller the extension (for example, the concept "beautiful girl" contains more characteristics but refers to fewer people than the concept "girl"). As Immanuel Kant observed, concepts without extension/examples are empty, and examples without an organising concept are blind. The linguistic expression of a concept is called a term.

3: Theory of Judgment: Structure, Identity, Models and Interpretation

Whereas a concept intuitively grasps an idea, a judgment expresses relations between concepts in an explanatory (*discursive*) linguistic statement; the linguistic representation of a judgment is the proposition or sentence. A sentence consists of a subject (*onoma*, the reality being named) and a predicate (*rhèma*, the explanatory information).

Judgments are classified according to:

- Quantity: the scope of the subject (transcendental, singular/unique, particular/type-specific, universal/general).
- Quality: the relationship to the predicate (affirmative/assertive, negative/denying, restrictive/limiting).

The deeper foundation of every judgment is identity. This may be total identity (as in definitions) or partial identity/analogy. Partial identity operates according to set theory (metaphorically, as in "Jan is a pupil") or systemically (metonymically, as in "Leuven is arriving" when the inhabitants of Leuven are meant).

Judging also involves the use of models: speaking about the unknown in terms of the known. This takes place through applicative models (examples for illustration) or regulative models (general rules), which may be iconic (resemblance, such as a city map) or deictic (connection, such as a walking route through the city).

According to hermeneutics (the theory of interpretation), every judgment is also an interpretation in which the thinking subject can be recognized. The psychiatric ABC model (A = reality/stimulus, B = presuppositions/personality,

C = judgment/reaction) illustrates how a judgment is partly determined by the inner structure of the person making it.

4: Theory of Reasoning I: Basic Forms, Syllogisms, Deduction and Reduction

Reasoning derives a conclusion (*apodosis*) logically from one or more premises (*protasis* or premises). This rests on the principle of a necessary and/or sufficient reason.

Since Plato, two fundamental directions of reasoning have been distinguished:

- *Deduction* (*sunthesis* or forward reasoning): proceeds from a general rule or presupposition to a specific conclusion ("If A, then B. Now A; therefore B"). Strictly speaking, deduction does not produce new factual information, but highlights aspects already implicit in the premises.

- *Reduction* (*analusis* or backward reasoning): reasons backwards from an established effect or consequence to an explanatory hypothesis or cause ("If A, then B. Now B; therefore A"). Reduction expands knowledge but is inherently restrictive (subject to further verification).

A syllogism constitutes the classical core, in which two premises lead to a conclusion. In addition to standard forms, there are irregular syllogisms - such as the enthymeme (an abbreviated argument), the polysyllogism (chained arguments), the sorites, the dilemma and the epicheirema (with embedded proofs) - as well as invalid arguments (paralogisms and sophisms).

5: Theory of Reasoning II: Induction, Statistics and Idiography

Induction starts from samples (partial observations) in order to infer a general rule for an entire collection or system. The course distinguishes:
- *Summative* (Aristotelian) *induction*: summarizing what has been established for each individual member.

- *Causal* (Baconian) *induction*: inferring a general law of nature from observed cause-and-effect relationships.

- *Socratic* (dialogical) *induction*: seeking universal ethical definitions through conversation and sampling human behavior.

- *Analogical induction*: concluding that objects which resemble one another in certain respects are probably similar in other respects as well.

When induction is not based on 100% of cases, but operates between 0% and 100%, it is called statistical induction. This requires both sufficiently large quantitative samples and qualitative impartiality (randomisation).

Idiographic reasoning applies to the study of the unique and singular (such as historical figures or geographical areas). The Jesuit School of Coimbra defined the singular through a systematic sum of characteristics (*forma, figura, locus, stirps, nomen, patria, tempus*).

6: Theory of Reasoning III: Arguments from Authority, Lemmata, Absurdity and Ad Hominem

- *Argument from authority* (*argumentum ex auctoritate*): relies on the prestige or expertise of a person or institution61. An epistemologically valid argument from authority applies only within the authority's specific field of expertise and is inductively limited in its premise.

- *Lemmatic reasoning*: works with a provisional model or assumption (a *lemma* or working hypothesis). In science, this forms the crucial bridge from a nominal (verbal) definition to a substantive (real) definition.

- *Proof by contradiction* (*reductio ad absurdum* or apagogical reasoning): proves that a proposition is true by showing that the counter-hypothesis) leads to an impossible contradiction (such as the Pythagorean proof of the irrationality of.

- *Ad hominem argumentation*: addresses the person directly by confronting an opponent's claims with their own statements or actions, in order to demonstrate an internal self-contradiction or historical inconsistency.

7: Theory of Reasoning IV: Dialectics, Axiomatics and the Principle of Sufficient Reason

- *Hegelian deduction*: places individual elements within the dynamic, changing whole (*the process*) of total reality in order to interpret their meaning and specific place.

- *Axiomatics*: the deliberate selection of a set of unproven presuppositions (*axioms* or postulates) from which one proceeds through strict deduction. Charles S. Peirce distinguishes four approaches to thought in this context: the tenacious, the authoritative, the a priori or preference-based, and the scientific (reflective) method.

- *Deductive philosophy*: illustrated through the work of L. Hoyack, it shows that philosophical systems are often deductions arising from a deeper, pre-rational 'disposition' or mystical foundational experience.

Ultimately, all logic culminates in the study of foundations: the principle of sufficient reason or ground (*foundationalism*). Every rational claim or action seeks to justify itself ("in the name of") by pointing to the necessary and sufficient conditions that warrant it.