Logic: Principles of Reasoning
Johns Hopkins Center for Talented Youth

About this Course

Logic: Principles of Reasoning is the equivalent of a traditional, introductory-level college logic course, and covering both informal and formal patterns of reasoning. Informal logic includes general critical reasoning, informal fallacies, and non-symbolic evaluations of validity. Formal logic includes the syntax and semantics of propositional logic, including the use of truth tables for evaluating validity and natural deduction proofs. Throughout the course, students apply logic to natural language arguments, whether through debates, analysis of arguments in editorials, speeches, blogs, etc., or analysis of arguments in philosophical works.

Course Objectives

By the completion of this course, students will:
1. learn how to symbolize English sentences in the language of propositional logic.
2. know how to use truth tables to determine a number of logical properties a sentence or argument might have.
3. be able to construct derivations in a proof system for propositional logic.
4. learn how to succinctly argue for a position and defend the relevant premises.
5. learn how to critically discuss one another's arguments in a friendly and charitable way.
6. strengthen their writing skills by learning how to write argumentatively.

Required Text

Introduction to Logic, 3rd Edition, by Harry Gensler
ISBN: 978-1138910591
Week 1

Day 1 – Course Introduction

Morning
Ice breakers and Meet
- Who are you?
- Alliterative Animal Association
- Classroom Bingo (not from HK, Hobby Sports, Hobby Books, Trilingual, -need 24 total source from class) Sourcing led by TA
- Personal presentations: Name, hobbies, hopes for CTY experience

Principles of Classroom Citizenship
- Small groups independently – propose terms, discuss
- Large group make comprehensive list
- Signatories!

Afternoon
- What is philosophy? – brain storm, definitions, taxonomy (epistemology, axiology metaphysics, logic) Small groups – generate 3 questions from each field
- Pre-assessment

Evening
- Read Ch 1 – pg. 1-15, Exercises 2.2a, 2.2b, 2.2c, 2.3a #1-#5 – discuss 2.3 1-5 if time (e.g., soundness)
- Journals

Day 2 – Syllogistic Logic

Morning
- Review, Debrief Day 1 (deductive, valid, sound)
- 2.4 Harder Translations - permissible operators – no, non-, some, all
  #1-10 pg. 17 – Jigsaw – Groups 5 groups do 2 each, present
- 2.5 Deriving Conclusions – Create and exchange arguments which are valid, sound, invalid and unsound (use pg. 20 as a model)

Afternoon
- 2.6 Venn Diagrams Lecture/Demonstration – (shading and Xs) 2,3 circles small group challenge
- 2.7 Idiomatic Arguments - #1-6 on pg. 27

Evening
- 2.6 Venn Diagram Exercises 1-12 on pg. 25-26, Cooperatively create exotic cases (fun)
- Journal
Day 3 – Definitions, Meaning, and Rhetoric

Morning
- Review – formal structure vs semantic content
- Declarative, Interrogative, Imperative, Exclamatory
- Positive negative neutral valence
- Pathos, Ethos, Logos
- Definitions: Lexical vs stipulative meaning -3.2 Exercises #1-15

Afternoon
- Logical Positivism – 3.4
- Pragmatism
- Making Distinctions – 3.5a
- Analytic, Synthetic, 3.6a
- *a priori, a posteriori* - make analytic/synthetic/a priori/ a posteriori squares. Provide some examples and where they fall

Evening
- Jeopardy – TA assemble examples of all of the above – Students identify all of the different types
  - Categories: Sentence Types, Connotative valence, Pathos/ethos/logos, analytic/synthetic/a priori/ a posteriori squares, LP/PR and Lexical/Stipulative
- Journals

Day 4 – Argumentation continued, Formal and Informal Fallacies

Morning
- Modus Tollens, Modus Ponens, Fallacies: Affirming the consequent, Denying the antecedent – Create three valid but not sound, 3 sound of MT and MP, create 3 intuitively deceptive and three obviously invalid of AC and DA
  - Swap, small group identification, share (do it in a way so your peers don’t know which is which)
- Inconsistency - 4.3 Explicit and Implicit Contradictions, no Contradiction
  - It is wrong to tell people what to do, you should never tell people what to do
- Use argument construction to make sound/valid arguments 4.4, #2, #5, #6, #13, #14
- Silent Work – Gettier Reading and Argument Reconstruction (printed handouts)

Afternoon
- Informal Fallacy Power Point
- Informal Fallacy Skits

Evening
- Informal Fallacy worksheet 4.2 #1-30
- Discuss – which informal fallacies are most common, what contexts, why are they persuasive?
- Journal

**Day 5 – Introduction to Inductive Reasoning and Applied Logic**

**Morning**
- Statistical Syllogism – Incogent (or Reliable/unreliable), Weak/Strong
- Identify deductive vs inductive, Strong/weak/cogent, valid/sound. pg 75-80
- Create three strong but not reliable inductive arguments, three reliable arguments, and three weak/unreliable arguments

**Afternoon**
- Debate – Stages: 1) Form Groups, 2) Create formal arguments, 3) Present formal arguments with elaborations, 4) Separate group evaluation period, 5) Each group responds to initial argument, 6) Separate Group Development of final statements, rejoinders 7) Final statements
- Collect Journals

**Week 2**

**Day 6 _Skeptical Doubts about Induction**

**Morning**
- Review week 1 –
- Assessment 1 –
- Inductive Reasoning Continued –5.4 Reasoning from a Sample Exercises #1-5, Analogical Reasoning, 5.5 p90 Exercises #1-10
- Analogy and Other Minds (5.6) – Read, Discuss

**Afternoon**
- Hume – Problem of Induction
  o Lecture/power point -
  o Handout – Silent Reading
  o Discussion - Present Flow Chart
  o Draw coins out of box. What can we infer? On what basis? How many coins do we need to extract to be confident that our inference is reliable?

**Evening**
- Coin Flip Lab – In pairs flip a coin 100 times and track each iteration. Identify probabilities: overall ratio, recurring patterns (5x consecutive h/t),
- Journals

**Day 7 _Skeptical Solutions and Reliable (if uncertain) methods for inductive inference**
Morning
- Review Hume’s Skeptical Doubts
- Read Hume’s Skeptical Solution
- Discussion – What does this mean for the inductive method (science?!)
- Discussion continued - 5.3 Philosophical Questions

Afternoon
- Mill’s Method, Science and Abduction

Evening
- Discussion – Avoiding skepticism

**Day 8 – Introduction to Propositional Logic**

Morning
- Basic Operators and Translations 6.2a #1-15
- Basic Truth Tables 6.3a #1-15
- 6.5 #1-9

Afternoon
- Truth Assignment Test 6.7 #1-15
- Harder Translations 6.8

Evening
- Propositional Jeopardy

**Day 9 – Rules of Deductive inference and Proofs**

Morning
- S-Rules – AND, NOT-BOTH, NOR, NIF
- I-Rules – NOT-BOTH, OR, IF-THEN (MP/MT)
- Hybrid Applications

Afternoon
- Propositional Proofs
  - 7.1 - #1-10

Evening
- Natural Translation Proofs
  - Jigsaw- create, collaborate and translate

**Day 10 – Harder Proofs and Advanced Rules**

Morning
- Multiple Assumption Proofs 7.3
- Advanced Refutations 7.4

Afternoon
- Debate
- Collect Journals

Week 3

Day 11 - Quantificational Logic

Morning
- Review Week 2
- Translations 8.1a #1-25
- Round Robin

Afternoon
- Simple Proofs
  o 8.2 # 1-7

Evening
- Discussion – Why logic?

Day 12 Modal Logic and Belief Logic

Morning
- Marvel Multiverse Intro
- Modal Logic
  o Translations 10.1a
- Intro to Modal Proofs
  o 10.2 #1-7

Afternoon
- Belief Logic
  o 13.2 #1-10

Evening
- A Formalized Ethical Theory (Ch. 14)

Day 13 – Logic Applications and Projects

Morning
– Group Research (Computer Lab)
  o Deliverables – initial topic, direct quotes/excerpts, counter position, direct quotes/excerpts
**Afternoon**
- Presentation Development
  - Deliverables: Translations, Abductive/Inductive, Deductive, (strong/reliable?, valid/sound?), Truth-table test, truth-assignment test

**Evening** – Post-Assessment

**Day 14 - Logic applications and Presentations**

**Morning** – Presentation Development
- Poster Board, Each Group Member Speaking Role, Dispersed Rehearsals

**Afternoon** – Presentations

**Day 15 – The End**

**Morning** – Closing activities