

Logic

HUMA 1720 – Fall 2020

The Hong Kong University of Science and Technology (HKUST)

Lecturer: Dr. T.Y. William Wong
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Office Hours: Weds 2-4pm (by appointment)
Lecture Location: Online via Zoom (Link on Canvas)
Schedule: T, Th 12:00pm to 1:20pm (see lecture outline for public holiday exceptions)

HKUST Catalog Course Description

This course is designed to provide students with a basic knowledge of logic, so that they can apply logical techniques to analyze various problems of reasoning in ordinary language and to examine the fallacies of thinking in daily life. The course includes topics such as the basic concepts of logic, logic and language, fallacies and definitions, sentential logic, and syllogism.

Further Description

Logic is the systematic study of arguments for internal cogency. Colloquially, one is most likely to have encountered philosophical logic through everyday concepts such as premises, conclusions, validity, fallacies, and inferential rules.

This Fall 2020 course is an introduction to formal philosophical logic and can be divided into *three* parts. In the first part, we will systematically consider basic concepts in logic, such as validity, soundness, and inferential rules, as well as learn how to recognise logical structure in natural language (i.e. English). In the second part, we will learn the syntax and semantics of sentential logic (*aka* propositional logic), in order to be able to identify and understand the logical structure of sentences written in sentential logic. In the third part, we will extend the very same learning objectives to predicate logic. Importantly, students will also be taught how to perform natural derivations for both sentential and predicate logic in parts two and three.

A brief note: students from mathematics, computer science, linguistics, and related areas may appreciate the familiarity of logical thinking and symbol manipulation. However, there is no expectation nor requirement for students to have had any experience in logic, maths, computer science, or linguistics. Rest assured that students from other disciplines will also be able to master this course and perform well, as history has shown.

Course Objectives

There are three key objectives. Students will, first, gain an understanding of key concepts and principles in philosophical logic, including, validity, soundness, inferences, and fallacies. Secondly, students will be able to use these concepts and logic to identify logical structures in natural language and assess their validity. Thirdly, and more technically, students will learn how to manipulate logic symbols, use predicate quantifiers, and perform derivations in both sentential and predicate logic (first-order logic).

<i>HKUST HUMA 1720 Course ILOs</i>	
1	Paraphrase the logical definition of argument.
2	Distinguish valid from invalid arguments and translate sentences of ordinary language into the formal language of logic.
3	Explain in their own words important logical terminology such as valid, invalid, sound, unsound, consistent, inconsistent, contingent, necessary, theorem, tautology.
4	Use logical methods to elaborate correct reasoning, construct proofs in formal systems for sentential logic and syllogism, and use semantic methods (truth tables, counter-models) to test for validity and related properties.
5	Examine some of the sophisticated and interesting problems in philosophy through some paradigm examples.

Course Assessment

Participation (Attendance)	5%
Test 1 (Argument Structure, Inference, Fallacies, and Natural Language Logic)	10%
Test 2 (Test 1 Material + Sentential Logic)	20%
Test 3 (Predicate Logic Only)	20%
Final Exam (All Material Covered)	45%

Participation Policy

Participation points for this course are solely by attendance (Zoom logs attendance time). You can miss up to two mandatory lectures and one tutorial without penalty.

Assignments and Practice Aids (How to Do Well)

It is relatively straight forward to do well in this course. Like almost any other skill, one can simply get better with practice. As such, the practice with problem sets will allow one to get better at identifying logical structures and performing derivations. For each week (but not each lecture), students will be expected to practice, on their own, a number of problem sets provided in the reading. If you do not practice, you will fall behind (I guarantee it).

Students will be able to attend a maximum of two group tutorials – one in the week of the 12th of October, and the other in the week of the 9th of November. (sign up on Google forms, first come first serve). Office hours on an individual basis are also available by appointment.

Associated Course Materials (Readings and Software)

1. *LogicText*. Terence Parson. (made available online by author).
2. *An Introduction to Formal Logic*. Peter Smith. (recently made available online by author).
3. Excerpt from *A Concise Introduction to Logic*. Patrick J Hurley (2014). (will be posted online).
4. Logic2010 (made available for free for HKUST by David Kaplan). I will provide an in-class demonstration on the 6th of October.

Online Proctored Examinations and Academic Honesty

In the spirit of social distancing, examinations and tests will be conducted online via Zoom, and will be appropriately proctored to ensure academic honesty. Accordingly, all students will require a webcam and a quiet place in which to partake tests and examinations.

All tests and examination are open book, and students will be provided a 'cheat sheet' of all logical rules with which to perform derivations.

At the beginning of a test or examination, access to the examination questions will be provided to students attending the Zoom exam. Students are to complete the exam with pen and paper on A4 lined paper, whilst being proctored via webcam. At the end of the examination, students are to take a photograph or scan their exam papers and then upload them to Canvas (further details to be announced) within a period of 10 minutes.

Each page must have a student's name, student number, page number, and student signature at the top.

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Lecture Outline

Date	Lecture # and Topic	Agenda	Reading and Practice Assignments (not graded)
8th September 2020	1. Introduction	<ul style="list-style-type: none"> • What is Logic? • Why study Logic? • Course Overview + Aims • Introduction to Argument Structure • How to Do Well in This Course • Poll (Background and Year) 	
10th September 2020	2. Argument Structure	<ul style="list-style-type: none"> • Deduction vs Induction • Validity • Soundness • Reading Comprehension Exercise • Symbolisation 	Read Provided Excerpt from Peter Smith (2003). An introduction to Logic.
15th September 2020	3. Symbolisation and Basic Rules	<ul style="list-style-type: none"> • Symbolisation • WFFs • Truth Tables • DN, CNJ, DSJ, S, ADD, R • Examples 	Read Provided Excerpt from Peter Smith (2003). An introduction to Logic.
17th September 2020	4. Inferential Rules I	<ul style="list-style-type: none"> • Modus Ponens • Modus Tollens • Truth Tables • Group Exercise • Only If, Biconditional • Modus Tollendo Ponens • Group Exercise 	
22nd September 2020	5. Inferential Rules II and Fallacies	<ul style="list-style-type: none"> • Inferential Rules Review • Introduction to Fallacies • Denying the Antecedent • Affirming the Consequent • Examples I • Informal Fallacies • Examples II 	Read Chapter 3 of Patrick J. Hurley (2014) A Concise Introduction to Logic.
24th September 2020	6. Introduction to Sentential Logic	<ul style="list-style-type: none"> • Symbolisation • Direct Derivations • Why Derivations? • Basic Mechanics of Derivations 	Read LogicText Chapter 1 (sections 1 to 4) <i>before</i> class.

Date	Lecture # and Topic	Agenda	Reading and Practice Assignments (not graded)
29 th September 2020	7. Term Test 1 (On Material from Lecture 2-5)	<ul style="list-style-type: none"> • Proctored Online • Webcam Required • A4 Lined Paper 	
1 st October 2020	Public Holiday (No Class)		
6 th October 2020	8. Derivations in Sentential Logic I	<ul style="list-style-type: none"> • MP/MT Example • Group Exercise • MTP Example • Group Exercise • Rules 'Cheat Sheet' • Logic2010 Demonstration • Informal Anonymous Feedback for Lecturer (Google Forms) 	Read LogicText Chapter 1 (section 5), Chapter 2 (sections 1 to 3) <i>before</i> class. Do Chapter 1 Section 5 Exercises <i>after</i> class.
8 th October 2020	9. Derivations in Sentential Logic II	<ul style="list-style-type: none"> • Other Rules: S, CNJ, DSJ, CB • Conditional Derivations • DeMorgan's Laws • Stupid Mistakes • Logic2010 Demonstration 	Read LogicText Chapter 1 (sections 6), Chapter 2 (sections 4-5) <i>before</i> class. Do Chapter 1 Section 6 Exercises <i>after</i> class.
13 th October 2020	10. Tutorial Group A (Half the Class)	<ul style="list-style-type: none"> • Demonstrations • 'Tricky' Questions • Problem Sets • Questions and Answers 	
15 th October 2020	11. Tutorial Group B (Half the Class)	<ul style="list-style-type: none"> • Demonstrations • 'Tricky' Questions • Problem Sets • Questions and Answers 	
20 th October 2020	12. Derivations in Sentential Logic III	<ul style="list-style-type: none"> • SL Derivations Review • Indirect Derivations • DeMorgan's Laws • Miscellaneous 	Read LogicText Chapter 1 (section 7 to 8) <i>before</i> class. Do LogicText Chapter 1 (Section 9 Exercises) <i>after</i> class.
22 nd October 2020	13. Term Test II	<ul style="list-style-type: none"> • Proctored Online • Webcam Required • A4 Lined Paper 	
27 th October 2020	14. Introduction to Predicate Logic	<ul style="list-style-type: none"> • Syntax • Universal and Existential Quantifiers • Differences between SL and PL • Reading Comprehension • Group Exercises 	Read Logic Text Chapter 3 (section 1 to 5) <i>before</i> class. Do LogicText Chapter 3 (section 5) All Exercises <i>after</i> class.

Date	Lecture # and Topic	Agenda	Reading and Practice Assignments (not graded)
29 th October 2020	15. Derivations in Predicate Logic I	<ul style="list-style-type: none"> • Derivations in PL (MP, MT, MTP) • Universal Derivations • Exercises • PL in Logic 2010 	Read Logic Text Chapter 3 (section 6 to 7) <i>before</i> class. Do LogicText Chapter 3 (section 6) all exercises <i>after</i> class.
3 rd November 2020	16. Derivations in Predicate Logic II	<ul style="list-style-type: none"> • Derivations in PL (DMR) • Exercises • Questions and Answer 	Read Logic Text Chapter 3 (section 8) <i>before</i> class. Do LogicText Chapter 3 (section 7) All exercises <i>after</i> class
5 th November 2020	17. Derivations in Predicate Logic III	<ul style="list-style-type: none"> • Group Exercise • Further Derivations • Questions and Answer 	Do LogicText Chapter 3 (section 8) Exercises 1a, 1b, 1c, 1e, 1f, 2 (T203), 2 T(204) <i>after</i> class.
10 th November 2020	18. Tutorial Group A (Half the Class)	<ul style="list-style-type: none"> • Demonstrations of PL Derivations • ‘Tricky’ Questions • Problem Sets • Questions and Answers 	
12 th November 2020	19. Tutorial Group B (Half the Class)	<ul style="list-style-type: none"> • Demonstrations of PL Derivations • ‘Tricky’ Questions • Problem Sets • Questions and Answers 	
17 th November 2020	20. Test III (Predicate Logic Only)	<ul style="list-style-type: none"> • Proctored Online • Webcam Required • A4 Lined Paper 	
19 th November 2020	21. Argument Structure, Inference Rules, Natural Language Logic Review	<ul style="list-style-type: none"> • Review of concepts and practice 	Do Wong Exercise Set 1 (not graded)
24 th November 2020	22. Sentential Logic Review	<ul style="list-style-type: none"> • Review of concepts and practice 	Do Wong Exercise Set 2 (not graded)
26 th November 2020	23. Predicate Logic Review	<ul style="list-style-type: none"> • Review of concepts and practice 	Do Wong Exercise Set 3 (not graded)
1 st December 2020	24. Predicate Logic Review II	<ul style="list-style-type: none"> • Review of concepts and practice II 	

Date	Lecture # and Topic	Agenda	Reading and Practice Assignments (not graded)
3 rd December 2020	25. Final Exam	<ul style="list-style-type: none">• Proctored Online• Webcam Required• A4 Lined Paper	