COURSE CODE
LECTURER

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CONTENTS

These lecture notes were collated by me from a mixture of sources , the two main sources being the lecture notes provided by the lecturer and the content presented in-lecture. All other referenced material (if used) can be found in the *Bibliography* and *References* sections.

The primary goal of these notes is to function as a succinct but comprehensive revision aid, hence if you came by them via a search engine , please note that they're not intended to be a reflection of the quality of the materials referenced or the content lectured.

Lastly, with regards to formatting, the pdf doc was typeset in LaTeX, using a modified version of Stefano Maggiolo's [class](#)

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1 Propositional Logic

1.1 definition. Propositional Logic the logic of compound statements built from simpler statements using Boolean connectives

1.2 definition. Propostion declarative sentence which is either true or false

To do (1)

To do (2) **To do** (3) **To do** (4)

2

3

4

5 Proofs

5.1 *Rules of Inference*

5.1 definition. Valid Argument the truth of the premises logically guarantees the truth of the conclusion , *i.e.* $(p \wedge q \wedge r \wedge \dots) \to q$ is a tautology

Memorising not required

Modus Ponens

$$\frac{p \quad (p \to q)}{q}$$

p	q	(	p	$\wedge$	(	p	$\to$	q	))	$\to$	q
1	1		1	1		1	1	1		**1**	1
1	0		1	0		1	0	0		**1**	0
0	1		0	0		0	1	1		**1**	1
0	0		0	0		0	1	0		**1**	0

Modus Tolens

$$\frac{\neg q \quad (p \to q)}{\neg q}$$

p	q	(	$\neg$	q	$\wedge$	(	p	$\to$	q	))	$\to$	$\neg$	p
1	1		0	1	0		1	1	1		**1**	0	1
1	0		1	0	0		1	0	0		**1**	0	1
0	1		0	1	0		0	1	1		**1**	1	0
0	0		1	0	1		0	1	0		**1**	1	0

To do (5)

Hypothetical Syllogism

$$\frac{(p \to q) \quad (q \to r)}{p \to r}$$

Disjunctive Syllogism

$$\frac{p \vee q \quad \neg p}{q}$$

Resolution

$$\frac{p \vee q \quad \neg p \vee r}{q \vee r}$$

Addition

$$\frac{p}{p \vee q}$$

Simplification

$$\frac{p \wedge q}{p}$$

Conjunction

$$\frac{p \quad q}{p \wedge q}$$

To do (6)

5.2 *Constructing a Proof Tree*

Continuing with the example above, we can construct a *proof tree*, where each *leaf* is composed of axioms - the premises, and theconclusion sits at the *root*

To do (7)

To do (8)

To do...

☐   1 (p. 2): See slide annotations

☐   2 (p. 2): Truth table for all connectives , use the succinct style, where for large statements the result is written under the connective

☐   3 (p. 2): Write a remark explaining the use of the succinct form of the tables for large compound propositions (e.g. (p ¿ q) & (p v q) one would not make a separate column for the conjunction, but instead just write the result under the &)

☐   4 (p. 2): Write a remark explaining that for any n propositions, rows = 2^n, since for every p 1,0

☐   5 (p. 2): Tautology truth tables

☐   6 (p. 3): Example slides 26,27

☐   7 (p. 3): slide 33

☐   8 (p. 4): add bib: Truth Tables : Michael Rieppel "mrieppel " @https://github.com/mrieppel/TruthTableGenerator