

# Phil 2430 MODERN LOGIC AND PHILOSOPHY OF LOGIC

## COURSE DESCRIPTION

*Professor:* Ken Warmbrød

*Main Topic:* Symbolic logic and related topics in philosophy of logic.

*Method of Instruction:* A self-paced system under which each student works through the material of the course at his/her own pace. Lectures are replaced entirely by one-to-one tutorials and the textbook.

*Method of Evaluation:* Quizzes plus optional essay. Quizzes are marked on a scale 0-3. In most cases, students are allowed multiple attempts to achieve a given mark. A mark of 3 normally requires answering all questions correctly.

*Textbook:* Warmbrød, *Logic and Philosophy of Logic*. Available in the bookstore.

*Other readings:* Selected essays on topics in philosophy of logic by Quine, Grice, Strawson, and Russell. Available in the library.

## OUTLINE OF TOPICS

### Part I: Mostly Formal

#### Unit 1 Objectives and Basic Concepts

A Logician's Concept of Argument  
The Logician as Language *Analyst*: Deduction vs. Induction  
The Place of Deductive Logic in Science  
Truth, Validity and Soundness  
The Formal Approach to Validity  
The Logician as Language *Designer*

#### Unit 2 Sentential Logic: Language

Sentence Letters, Variables and Connectives  
Sentences and their Forms  
The Problem of the Logical Structure of English  
A Solution: the Revised Language SL  
Non-Truth-Functional Connectives

#### Unit 3 Sentential Logic: Truth, Tautologies and Validity

Truth-Table Analysis: Tautologies and Equivalence  
Validity and Consistency  
Sentences and Truth-Value Bearers

#### Unit 4 Sentential Logic: Truth Trees

Using Truth-Trees to Prove Consistency  
Truth-Tree Rules and Tautologies  
Proving Validity and Invalidity

#### Unit 5 Sentential Logic: Inference Rules

Implicational Rules  
Replacement Rules  
The Axiom of Non-Contradiction

#### Unit 6 Sentential Logic: Conditional and Indirect Proof

Conditional Proof  
Indirect Proof  
Strategies for Using CP and IP

#### Unit 7 Advanced Proofs and Strategy

Basic Points of Strategy  
Working Backwards  
The Hypothetical Syllogism Strategy  
The Distribution Strategy

#### Unit 8 Quantificational Logic: Language I

Grammar, Form and Validity  
Singular Terms and Quantifiers  
Restriction of Quantifiers to a Standard Context  
Reduction to two Quantifiers  
Variables  
A Grammar for QL  
Translation Between English and QL

#### Unit 9 Quantificational Logic: Language II

Predicates  
Abbreviated QL  
Domain of Discourse  
All, Every and Any  
Multiple and Overlapping Quantifiers  
Only  
Modularizing Translation Problems

## **Unit 10 Quantificational Logic: Truth and Validity**

Interpretations and Truth  
Truth Formally Defined  
Validity, Consistency, Logical Truth and Equivalence  
Proving Invalidity  
Interpretations and the Problem of Abstract Entities

## **Unit 11 Quantificational Logic: Truth Trees**

The Truth-Tree Rules  
Strategy in Constructing Trees  
Limitations of Truth-Trees

## **Unit 12 Quantificational Logic: Inference Rules**

Use of Sentential Rules  
Universal Instantiation and Existential Generalization  
Existential Instantiation and Universal Generalization  
Quantifier Negation  
Proof Strategy

## **Unit 13 Identity and Definite Descriptions**

The Problem of Definite Descriptions  
At Least, At Most, Exactly  
Russell's Theory of Definite Descriptions  
Modularizing Translation Problems

## **Unit 14 Identity, Logical Truths, and Advanced Proofs**

Proving Logical Truths  
Rules for Identity  
Comparison of Truth-Trees and Inference Rules

## **Part II: Mostly Philosophical**

### **Unit A Necessary Truth**

Necessary vs. Contingent  
Implications of Quine's Criticisms  
Notes on the Readings  
The Positive Side of Quine's Position

### **Unit B Problems with Conditionals**

Counterfactual Conditionals  
Notes on Chisholm  
Notes on Goodman  
Notes on Quine

### **Unit C Descriptions, Existence and Language**

Descriptions and Existence  
Language Design and Clarity  
The Elimination of Definite Descriptions  
Strawson's Objection

### **Unit D Logic and Ontology**

Ontology and Observation  
Alternatives and Objections

### **Unit E Modal Logic**

The Theory T  
The Theory S4  
The Theory S5  
Truth Conditions of Modal Statements  
Can the Controversies be Resolved?

### **Unit F Conditional Logic**

Strict Conditionals  
The Theory C  
Alternatives to Theory C  
Truth Conditions of Conditional Statements  
Objections to Theory C