Symbolic Logic

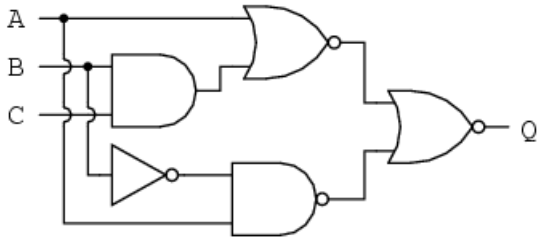
Fall 2018
University of Central Arkansas
Instructor: Dr. Sharon Mason

PHIL 3310, CRN #22591
MWF, 2-2:50pm, Irby 102

Course Description

One of the great intellectual achievements of the late 19th and early 20th centuries was the development of *symbolic logic* (sometimes called *formal* or *deductive* logic). Symbolic logic is the result of a philosophical effort to, as George Boole puts it "investigate the fundamental laws of those operations of the mind by which reasoning is performed; to give expression to them in the symbolical language of a Calculus." Logicians such as Gottlob Frege, Bertrand Russell, and Alfred North Whitehead developed a rigorous logical language for analyzing the logical structures and relations of arguments. This kind of reasoning is valuable in philosophical inquiry, and symbolic logic is still widely used in argumentation and analysis in contemporary analytic philosophy. However, by far the most significant consequence of the development of symbolic logic is its importance to computer science. The language of symbolic logic separates the semantic (meaning or content of sentences) from the syntactic (formal structure of the logical relations of those sentences), and allows one to manipulate purely syntactic structures. That distinction, along with ways of mapping logic onto physical structures such as Boolean circuits and Turing machines, laid the foundation for modern-day computer science.

In this class, students will learn standard systems of first-order symbolic logic. This includes the notation of formal logical systems: five logical connectives and two quantifiers. We will practice translating sentences from English into formal logic, and students will learn how to test sentences and arguments for important logical properties, including consistency, inconsistency, logical equivalence (for sentences), and validity (for arguments). Students will also learn how to construct truth tables, truth trees, and natural deduction proofs for proving validity in both propositional and predicate logic. If time, we may also discuss basic set theory and introduce modal logic.



Contact Information:

Office Location: Irby 118c

Office Hours: Schedule an appointment by viewing my calendar at **smason-uca. youcanbook.me**

Email: smason@uca.edu

Office Phone: 501-450-5590

This class fulfills the logic requirement for philosophy majors OR one 3-credit hour elective in the Epistemology and Metaphysics distribution area (not both). It also fulfills one Upper Division "I" (Critical Inquiry) designation for the UCA Core.

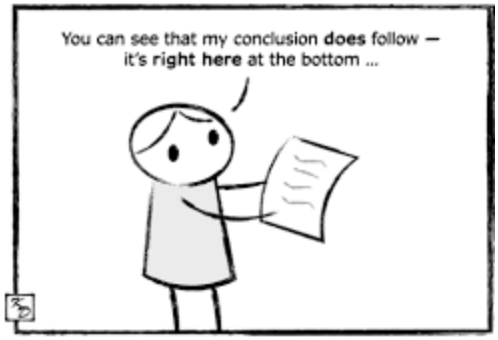
It is recommended for philosophy majors, computer science majors, linguistics majors, political science majors, and anyone with a general interest in learning logical reasoning systems.

NOTE: While this course does not have any prerequisites, it is a fast-paced class. Some familiarity with philosophical reasoning methods, computer science, and/or mathematics is highly recommended.

Course Objectives

Upon satisfactory completion of this course, a student should be able to:

- Understand and use the five basic Boolean connectives: *and, or, not, if/then, and equivalence*
- Translate sentences from English into their logical form in both propositional and predicate logic
- Construct truth tables to test for properties such as consistency, inconsistency, logical equivalence, and validity
- Use the rules of inference and replacement to construct natural deduction proofs in propositional logic
- Use quantifier rules to construct proofs in predicate logic to prove validity



Course Text

- Klenk, Virginia. (2007). *Understanding Symbolic Logic*. Fifth edition. Pearson Prentice Hall.
- Any additional materials will be handed out in class or made available online through the course website.

Grading Scheme

Attendance/Participation	10%
Homework Assignments	40%
Exams	50%

Phone and Laptop Policy

The course policies are designed to help you get the most you can out of this class. Being on your cell phone during class interferes with your education. **Therefore, you are not allowed to use cell phones during class.**

Attendance/Participation (100 points)

Much of what you learn in this course will come from your time in the classroom. Unsurprisingly, students who do not attend class regularly will not benefit from the course as much as those who attend regularly. Attendance and active participation in the class are, therefore, required.

Attendance: Each student may take up to 3 excused absences for any reason. Absences in excess of 2 will result in a deduction of 10% from your attendance/participation grade per absence, *with no upper bound*. In cases of an emergency, sickness, death in the family, or other unforeseen event, I may grant additional excused absences provided that the student notifies me right away and provides appropriate documentation.

Participation: Participation is refers to your active involvement in the class through being prepared for class, working problems on the board, and engaging in classroom discussion. Visits to my office hours will also count toward your participation grade.

Homework Assignments (400 points)

Learning logic well requires practice. Even students who can easily master theoretical knowledge will need to practice, as logic involves mastering not only theoretical, but also procedural knowledge. Homework assignments are essential as they provide the practice you need to master this material.

Expect to spend several hours a week on the readings and homework assignments, and homework will be due in almost every class period. Homework will be collected and graded, and it is essential in preparing you to do well on the exams. You should also work practice problems on your own and bring any questions you have to class.

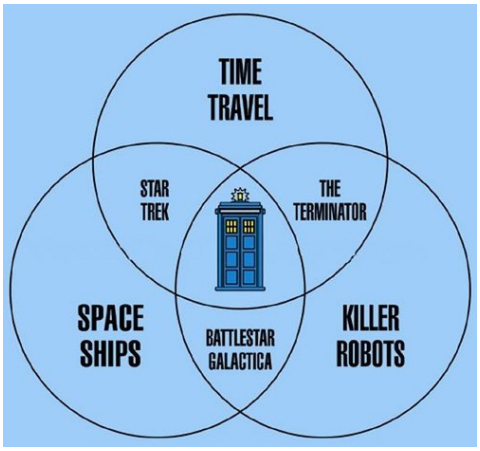
Homework will be due at the beginning of class. Because we will usually begin class by reviewing the homework, no late work will be accepted without arranging an extension with the instructor *in advance* of the class period in which the homework is due. There are no exceptions to this rule, so take note!

"Thinking is skilled work. It is not true that we are naturally endowed with the ability to think clearly and logically - without learning how, or without practicing."

— Alfred Mander —

Exams (500 points)

There will be three exams, roughly one every 5 weeks. The first two exams are worth 15% of your grade each. The final exam is worth 20% of your grade and is cumulative.



How do I make an A in this class?

There are three sufficient conditions for getting an A in this class:

1) Earn at least 900 points out of 1000 for the class. All grades of 90% and above will be assigned an A for the course.

2) Earn at least 800 out of 850 points in the class before the final exam (i.e. have a 94% or above in the class before the final exam.) Any student with 800 points or higher in this category will be exempt from the final exam and will receive an A in the course.

3) Make a 95% or higher on the final exam (190/200 points or higher) AND have no missing assignments. Any student who fulfills both of these criteria will be given an A in the class, regardless of the student's total number of points earned over the course of the semester. Note that missing even one assignment will disqualify a student from this option.

Course Schedule

	Readings:	**Assignments:**
Week 1	Chapter 1: Introduction to Logic Chapter 2: The Structure of Sentential Logic	Homework (HW)
Week 2	Chapter 3: Computing Truth Values Chapter 4: Symbolizing English Sentences	HW
Week 3	Chapter 5: Truth Tables for Testing Validity	HW
Week 4	Chapter 6: Further Applications of the Truth Table Method	HW
Week 5	Chapter 7: The Proof Method: Eight Basic Inference Rules	**Exam #1** HW
Week 6	Chapter 8: Replacement Rules	HW
Week 7	Chapter 9: Conditional Proof and Indirect Proof	HW
Week 8	Chapter 10: Singular Sentences Chapter 11: Quantifiers	HW
Week 9	Chapter 12: Categorical Propositions	HW
Week 10	Chapter 13: Complex Subjects and Predicates	**Exam #2** HW
Week 11	Chapter 14: Quantifier Form and Truth-functional Compounds of Quantifier Statements	HW
Week 12	Chapter 15: Proofs in Predicate Logic Chapter 16: Invalidity in Quantifier Logic	HW
Week 13	Chapter 17: Symbolization in Relational Predicate Logic	HW
Week 14	Chapter 18: Proofs and invalidity for relational predicate logic	HW
Week 15	Chapter 19: Identity and Definite Descriptions Chapter 20: Proofs Involving Identity	HW
Final Exam Week	**Final Exam: Friday, Dec. 14, 10am-12pm**	

Important Notices required by UCA Administration

◊ **Academic Integrity Statement:**

The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by the Board of Trustees as Board Policy No. 709 on February 10, 2010, and published in the Student Handbook. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

◊ **Americans with Disabilities Act:**

The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the UCA Disability Resource Center, 450-3613.

◊ **Building Emergency Plan:**

An Emergency Procedures Summary (EPS) for the building in which this class is held will be discussed during the first week of this course. EPS documents for most buildings on campus are available at http://uca.edu/mysafety/bep/. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

◊ **Title IX Disclosure:**

If a student discloses an act of sexual harassment, discrimination, assault, or other sexual misconduct to a faculty member (as it relates to "student-on-student" or "employee-on-student"), the faculty member cannot maintain complete confidentiality and is required to report the act and may be required to reveal the names of the parties involved. Any allegations made by a student may or may not trigger an investigation. Each situation differs, and the obligation to conduct an investigation will depend on the specific set of circumstances. The determination to conduct an investigation will be made by the Title IX Coordinator. For further information, please visit: https://uca.edu/titleix.
*Disclosure of sexual misconduct by a third party who is not a student and/or employee is also required if the misconduct occurs when the third party is a participant in a university-sponsored program, event, or activity.

◊ **Student Handbook:**

Students are strongly encouraged to familiarize themselves with all policies in the Student Handbook, especially the Academic Policies and the Sexual Harassment Policy.