

# Syllabus for CS/PHIL 360

IWU  
Fall 2017

## CONTACT INFO

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**Course Web Site:** <http://criley.org/360>

**Office Hours:** M 9–10:50a; T 4–4:50p; F 11–11:50a & 3–3:50p; + by appt.

## REQUIRED TEXT & SOFTWARE PACKAGE:

- (a) *Language, Proof, and Logic*, 2nd edition. David Barker-Plummer, Jon Barwise and John Etchemendy, CSLI 2011.
- (b) *Introduction to Gödel’s Theorems*, 2nd edition. Peter Smith. Cambridge University Press. 2013.
- (c) *Gödel’s Theorem: An Incomplete Guide to its Use and Abuse*. Torkel Franzén.

I will circulate a digital copy of the LPL package text and software package, and it is already installed on the computers in our classroom. The software works on PCs *and* Macs; install on any computer you like. Students in my 100-level logic class have to buy a new version of this book because they have to have a new registration code they can use to submit homework. You do not *have* to buy a new copy: you will be able to get buy with the digital one I’m circulating, or with a used text if you want a hard copy. You may purchase new one if you wish—doing so will give you access to the on-line “Grade Grinder” with lots of “self-check” exercises that can help you review and fill in any gaps in your understanding of what’s typically covered in an introductory course. To buy and download a digital copy, go to <https://ggweb.gradegrinder.net/store>.

If you have already purchased the text when you took 102 with me, you can continue to use that same registration code. I can give you your registration code again if you lost it. Make sure that you have the most recent version of the software, however.

For the Smith book, please make sure to get the second edition. You can buy a digital version if you prefer.

There are many supplemental texts you might use to aid you in your study; contact me to talk about what extra readings might suit your interests and background. For a non-technical but rigorous introduction to Gödel’s results and some of the ways in which those results have been used—and misused—I have asked you to purchase Torkel Franzén’s excellent book.

## COURSE TOPIC

*Introductory* courses in logic usually develop a system of propositional logic and a system of predicate logic. Students in those courses learn to *use* these systems (translating sentences from English into the formal language and back, using axioms and/or rules of inference to construct formal proofs, etc.).

What comes next? Well, an advanced logic course tends to expand the field of study in two directions:

- First, it moves from formulating sentences and proofs *within* those basic systems to formulating claims and proofs *about* those formal systems.
- Second, it develops different formal systems—either expansions of, or revisions to, the basic systems developed in intro courses. (Then, of course, it turns to claims and proofs *about* those new formal systems.)

That is how we will proceed. We will reacquaint ourselves *very quickly* with the syntax and semantics of the languages of propositional and predicate logics, and then *very quickly* reacquaint ourselves with some of the proof systems associated with them. Then we will prove some results about those systems. Then we will expand our first-order system to include parts of mathematics, including arithmetic and set theory. Eventually we will have a system that is sufficiently expressive to in effect make interesting claims about *itself*. That’s where the real fun begins.

We will study the monumental “incompleteness” results established by perhaps the greatest logician who ever lived, Kurt Gödel. His 1931 paper (translated under the title “On Formally Undecidable Propositions of *Principia Mathematica* and Related Systems”) established a pair of astounding theorems about the in-principle limitations of formal systems of arithmetic. In order to understand Gödel’s work, we will have to learn some of the basics of the theory of *computable functions*: the branch of mathematics that underpins theoretical computer science.

#### COURSE REQUIREMENTS

##### 1. Attendance, Participation, Occasional In-Class Exercises

You are expected to come to class regularly, to have done the assigned reading, and to be prepared to ask and answer questions about it. If you become convinced that this class is so easy or so hard that coming to class is just a waste of your time, please do not decide just to stop showing up. Please contact me, and we will talk about your situation.

##### 2. Diagnostic Quizzes (10% of your course grade)

From time to time we will have quick, unannounced diagnostic quizzes. These will basically be graded on a pass-fail basis; they will principally be used to give you and me a sense of how well you’re grasping the material as we go. If you’re regularly tanking these, they can begin to bring your grade down and you should expect to come meet with me to discuss your difficulties. If you are consistently doing really well on them, they will boost your grade.

##### 3. Assigned Exercises (15% of your course grade)

Roughly once a week I will give you a homework assignment consisting of a couple of problems. These will typically be due on Tuesdays. Please either typeset the exercises or write them out in incredibly neatly handwriting.

##### 4. Exams (15% for the first exam; 30% for the second exam)

There will be two exams in this course, both closed-book and closed-note. The first exam will be during our regularly scheduled meeting on Tuesday, October 10. The second will be during our regularly scheduled final exam slot, at 1:15 on Thursday, December 14.

##### 5. Project (30% of your course grade)

You will develop a substantial project related to advanced topics in logic. Typically, but not necessarily, your project will be related to the listing under which you are taking the

course: philosophy students often write a paper discussing the philosophical significance of some of the results we will study; CS students often write a “literate program” or actual, executable, well-commented code that implements some interesting algorithm or function related to the course topics. Other possibilities (for either listing) would include constructing and explaining some especially challenging and ambitious proof not covered in class.

This should represent roughly the level of work involved in writing a ten-page paper or a fairly substantial programming project, i.e., roughly 30 hours of effort.

You must propose a topic to me and get my approval. You may submit your proposal as early in the semester as you like, and you may change your topic and write another proposal if you like. But I must have a proposal for your project topic no later than Thursday, November 2. You can submit your project itself as early in the semester as you like, but I must have at least a “half draft”<sup>1</sup> by November 16, and the final version must be submitted no later than 5 p.m. on the last day of classes (Friday, December 8).

**Grades.** I will aim to use the following standard grade scheme for this course:

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87–90%: <b>B+</b>	77–80%: <b>C+</b>			
93–100%: <b>A</b>	83–87%: <b>B</b>	73–77%: <b>C</b>	60–70%: <b>D</b>	< 60%: <b>F</b>
90–93%: <b>A-</b>	80–83%: <b>B-</b>	70–73%: <b>C-</b>		

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**Late Policies.** No late or make-up quizzes will be administered under any circumstances. Missing one because you are sick or because you happened to have one of your *rare* absences that day is not a big deal.

Late exercises, projects, or make-up exams will be countenanced only for extreme, documented emergencies.

#### ACCOMMODATIONS

If you have a condition that is covered by §504 of the Rehabilitation Act of 1973 or the Americans with Disabilities Act of 1990, I will do whatever I can to accommodate your specific situation. Please contact Chandra Shipley, Director of Academic Advising, at [cshipley@iwu.edu](mailto:cshipley@iwu.edu) to discuss the details. If you already have a note from her office, please let me know that as soon as possible so that we can make arrangements.

#### ACADEMIC INTEGRITY EXPECTATIONS

**Assigned Exercises.** I *strongly encourage* you to discuss course materials and assigned exercises with other students, both in and out of the classroom. You may share notes, insights, hints, and strategies about particular assigned exercises, correct one another’s mistakes, etc. You may look at one another’s solutions, work through problems together on a whiteboard, etc. However, the actual work of writing up the assigned exercises *must be completely your own*. No joint submissions are allowed, and you are forbidden to copy/paste others’ work or files, or to work together on a “shared” solution or write-up.

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<sup>1</sup>A half draft is a submission that represents at least 50% of the work on the final project (i.e., around 15 hours of solid work). It can be a sloppy draft of the whole project, a polished first half of the project, or something in between.

When you get help or hints on assigned exercises from a source other than me or one of the required books for the class (e.g., from a fellow student, an online resource, or another book), make sure that you credit that source by adding a note to your submitted exercise, describing the help you received. Indicating that you got such help or hints will *not* lower your grade.

**Exams/Quizzes.** Collaboration or sharing information with other students *concerning exams or quizzes* is cheating: an academic integrity violation. So is making use of prohibited resources for closed-book and closed-note exams.

**Project.** Presenting other people's ideas or written work without providing explicit acknowledgment (a) that they originate with someone else and (b) of who that someone else is plagiarism: an academic integrity violation. That means that you must provide appropriate credit and citation for your project as you would for any other academic paper or project.

**Consequences.** *The penalty for an academic integrity violation is failure of the course.* I will also have to file an academic dishonesty report on the incident with the Associate Provost's office.

If you aren't sure whether what you are planning to do is an academic integrity violation, ask me *before* you do it (e.g., before you hand in assigned exercises).