



**UNIVERSITY OF CALGARY**  
FACULTY OF ARTS  
Department of Philosophy

# Elementary Formal Logic

Phil 377

July 2–Aug 13 2019

June 20, 2019

**Instructor:** Dr. Gillman Payette

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Email: [ggpayett@ucalgary.ca](mailto:ggpayett@ucalgary.ca)  
Office Hours: Wednesday 10:00–12:00 or by appointment.

**Lecture Time and Place:** Tuesday & Thursday 13:00–15:45 SA 129 (Classroom may change)

**Course Description:** This course, although it is a philosophy course, has more of the feel of a math course. Nonetheless, being in the sciences is not necessary to do well in this logic course. The content of the course will focus on using what is known as First-Order Logic (FOL): a mathematical model that can help us to think about things. This system is your first step into a larger world, and is the basis for understanding how computers work and how we make proofs in mathematics very precise. The goal is to have you understand when and when not to use FOL to model an argument, what the “formal language” of FOL represents, and how to construct proofs for FOL sentences.

The individual classes are 2 hours and 45 min. long. I will structure them into about an hour of lecture-like time about a 10 min. break, another 50 min. of lecture-like time another break, and then 40 min. of group activity.

**Prerequisites:** There are no prerequisites for this course.

**Text:** The textbook is *Forall x–Calgary Remix* It can be found on the course D2L website where you can download a pdf for free, or it can be found on Amazon where you can get a printed copy. There is also a proof checker accessible on the website for the book. Its url will be posted on the course website.

**Contacting the Instructor:** The way to contact me is via email. When you write an email *please include ‘Phil377–your name–’ in the subject line.* If you don’t get an email back from me, check to see if you have included this. **If you email me after 4:30 pm or on the weekend, do not expect me to reply until the next day or Monday, respectively.**

## Requirements and Evaluation

**Two Paths to Go By:** This is a new option that I am playing around with since I realize that some people just don’t want to come to class or can’t. For second year classes I am content with that. But I believe engagement is very important in philosophy and can be helpful for some, so to accommodate that I will use two paths of assessment. You must choose one of the paths by the second week of class, and sign a contract to that effect. The real difference between the two paths is in the weighting of tasks.

Path 1		
Task	Due	%
Assignments (best 2 of 3):	July 12, 26; Aug 9	40
Quizzes:	July 18; Aug 1, 13	20
Final Test:	Aug 15	25
Participation:		15

Task	Due	%
Assignments (best 2 of 3):	July 12, 26; Aug 9	45
Quizzes:	July 18; Aug 1, 13	25
Final Test:	Aug 15	30

**Assignments:** The assignments are to be your own work, but I encourage discussing the

assignments with your peers about them before completing them. Don't put your name on the assignment. If you do, you will get a 0. I want the assignments to be anonymous.

There will be three of these assignments and I will take the best two of them. They are due on Fridays by 13:00 (see the due dates above). The philosophy office is in SS 1256. The physical dropboxes are emptied each day at 4pm and the office closes at 4:30pm. These may be submitted to D2L or you may submit a paper copy via the course's dropbox in the philosophy department. If you submit a paper version, you must write your student number on the back of the assignment. Again, do not write your name on it.

If you would like to submit it directly to D2L, there are a few options:

1. Write it on paper as you normally would. Then take **very** clear photos of each page separately, and upload those to D2L. If the photos are not clear, that is on you.
2. If you are proficient in  $\text{\LaTeX}$ , use it to write the assignments with proper notation and submit the pdf. I will provide some templates for typesetting proofs. (If you do not know what  $\text{\LaTeX}$  is now, you should not use this option.)

**Quizzes:** The quizzes will be done in class on their respective dates in the last 30 minutes of the second third of the class time. The grades for the quizzes will be released after class has ended.

**Final Test:** The test will be a two day take-home test. It will be like a longer assignment and will cover all the material from the term. It will be submitted in paper form to the course's dropbox in the philosophy department (SS1256). It will be due by 4pm when the dropboxes are emptied. The department closes at 4:30pm. You will write your student number on the back of a cover page that I will provide and you will staple to it. Again, no names.

**Participation:** This method of assessment will be used only for the first assessment path. You will be assigned a group, and assess your group mates' contribution. For each class you will give each of your group mates a mark from 0-6 regarding their contribution to the discussion/task from that class. That will be due by 23:59 on the Sunday of that week, and are submitted through D2L. Details for that will be posted on D2L. If you do not submit a peer review for that day, you are not eligible for the points available for that day. How to submit the reviews and specifications for assigning the points will be posted on D2L. An

average of these points from the semester will be your participation mark. The average is an average from each day, and then an average of the day marks, by the number of possible (non-excused absence) assessment days—of which there will be ten. There may be the possibility of bonus points for some of the group tasks.

## Policies

**Late Work and Extensions:** The due dates for submitted work are strict. If the work is not submitted by the due date and time, it will not be marked and receive 0. Extensions and missed assignments will only be granted for medical or other valid reasons. Too much work is not a valid reason. To write the quizzes outside of the allotted time you must have a valid reason, and it must be given to me before the quiz (after the quiz only in the case of emergencies).

**Paths:** Once you sign a contract for a path, being released from that contract will only occur for valid reasons. ‘I don’t like it’ is not a valid reason.

**Absences:** If you choose path one, excused absences will only be granted for valid reasons.

**Part Marks:** The questions on the assignments and final take-home test will be assessed as either right or wrong. There will be no part marks.

**Letter Grades:** The following is how percentages will be transformed into letter grades; marks will not be rounded. The reason that D starts at 55 is because the proof checker makes it possible to get 100% on all of the assignment questions requiring proofs, which is most of them.

	A+	≥	98	>	A	≥	90	>	A-	≥	85	
85	>	B+	≥	82	>	B	≥	78	>	B-	≥	75
75	>	C+	≥	72	>	C	≥	68	>	C-	≥	65
65	>	D+	≥	60	>	D	≥	55	>	F		

## Schedule

This schedule is tentative, but should give you a rough idea what we are doing when or at least the sequence of the subjects. We will be following the textbook closely, and I will try

to stick to timing below as closely as possible. The assignment, quiz and test dates are firm. I have not packed the schedule, but if we find ourselves ahead, we will simply cover more topics that the textbook deals with. The phrasing of the learning objectives is in such a way that it will give you some guide as to what the important skills are so you can judge whether you can do what you need to be able to do.

### **July 2: Introduction and Key Notions of Logic**

Introductory and philosophical remarks: What is logic? The field of logic and its applications. Arguments, intuitive validity and what we are doing. Introduction to Formal Languages.

*Logic:* Learning Objectives: Identifying parts of arguments and relations between natural language sentences.

### **July 4: Truth-Functional Languages**

*Between Natural and Formal Languages* Learning Objectives: Constructing formalizations of natural language sentences using the truth-functional connectives. Recognize the limits to the formalization process.

### **July 9: Truth Tables**

*Semantics of Propositional Logic* Learning objectives: Constructing complete truth-tables for formulas using  $\wedge, \vee, \neg, \rightarrow, \leftrightarrow$ .

### **July 11: More Truth Tables**

Constructing partial truth-tables. Using truth-tables to identify logical connections and properties of propositional formulas. **Assignment 1 due Friday July 12, by 13:00.**

### **July 16: Natural Deduction**

*Proof theory of Boolean Connectives* Learning objectives: Using the formal rules of the connectives  $\vee, \neg, \wedge, \rightarrow$  to construct natural deductions.

### **July 18: More Natural Deduction**

*Proof theory of Boolean Connectives* Learning objectives: Using natural deduction to test whether proof theoretic concepts apply to sets of sentences in propositional logic. **Quiz 1: July 18.**

### **July 23: The Language of Elements**

Learning objectives: Identifying and constructing formulas involving quantifiers: well-formed formulas, free and bound variables. Perform simple formalizations of natural language into FOL with quantifiers.

### **July 25: More of the Language of Elements**

Perform complex formalizations of natural language into FOL with multiple quantifiers, using identity and definite descriptions. **Assignment 2 due July 26, 13:00**

### **July 30: Interpretations of First Order Languages**

*Interpretations* Learning objectives: Constructing interpretations for FOL. Explaining and showing satisfaction of first-order formulas.

### **August 1: Interpretations and Logical Concepts**

*Semantics Concepts* Learning objectives: Using interpretations to identify and test for connections between formulas of first order logic. **Quiz 2 August 1**

### **August 6: Natural Deduction for FOL**

*Formal proofs* Learning objectives: Applying the proof rules for quantifiers  $\forall$  and  $\exists$ . Applying strategies for proofs with quantifiers. Proofs with multiple and mixed quantifiers.

### **August 8: More Natural Deduction for FOL**

*Identity and More* Learning objectives: Applying the proof rules for the identity predicate. Using derived proof rules for FOL **Assignment 3 due August 9, 13:00**

### **August 13: Metatheory, Outlook, Review**

*Basic metatheory* Learning objectives: Explain the aims of meta-theory. Formulate the definition of and prove truth-functional completeness for  $\wedge$ ,  $\vee$ , and  $\neg$ . Also for the truth-functional completeness of “neither ... nor—”. Show that the Boolean connectives can express “neither ... nor—” and “not both... and—”. Explain the significance of soundness and completeness proofs. Sketch a soundness proof.

*Putting it all together* Learning objectives: Explain the “big picture”. Analyze the significance and application of logic. Discuss the limitations of logic: undecidability, incompleteness, richer logics and alternative logics.

### **Quiz 3 August 13**

## IMPORTANT DEPARTMENTAL, FACULTY AND UNIVERSITY INFORMATION

### **Academic Honesty**

Cheating or plagiarism on any assignment or examination is regarded as an extremely serious academic offense, the penalty for which will be an F on the assignment or an F in the course, and possibly a disciplinary sanction such as probation, suspension, or expulsion. See the relevant section K.5 on Academic Misconduct in the current University Calendar <http://www.ucalgary.ca/pubs/calendar/current/k-5.html>.

Intellectual honesty requires that your work include adequate referencing to sources. Plagiarism occurs when you do not acknowledge or correctly reference your sources. If you have questions about correct referencing, consult your instructor.

### **Academic Accommodation**

The student accommodation policy can be found at: [ucalgary.ca/access/accommodations/policy](http://ucalgary.ca/access/accommodations/policy). Students needing an Accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities <http://www.ucalgary.ca/policies/files/policies/student-accommodationpolicy.pdf>.

Students needing an Accommodation based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to their instructor. D2L Help Desire2Learn is UCalgary's online learning management system. Important information and communications about this course may be posted on D2L. Go to <https://ucalgary.service-now.com/itforhelp>.

### **General Academic Concerns and Program Planning**

Have a question but not sure where to start? The Arts Students Centre is your information resource for everything in the Faculty of Arts. Drop in at SS102, call 403- 220-3580, or email [ascarts@ucalgary.ca](mailto:ascarts@ucalgary.ca) . Advisors in the ASC can also provide assistance and advice in planning your program through to graduation. Visit the Faculty of Arts website at <https://arts.ucalgary.ca/advising> for detailed information on common academic concerns

### **Advice on Philosophy Courses**

You may find answers to your more specific questions about a philosophy degree on the Department of Philosophys website <http://phil.ucalgary.ca>, or contact one of Philosophys Undergraduate Advisors. David Dick Undergraduate Program Director ([dgdick@ucalgary.ca](mailto:dgdick@ucalgary.ca)), Megan Delehanty Honors Advisor ([mdelehan@ucalgary.ca](mailto:mdelehan@ucalgary.ca)) or Allen Habib ([anhabib@ucalgary.ca](mailto:anhabib@ucalgary.ca)).

### **Registration and Prerequisite Waivers**

If you have questions regarding registration, or are seeking permission to waive the prerequisites for a course, email the Philosophy Department Undergraduate Program Administrator (UPA), Rebecca Lesser ([rebecca.lesser@ucalgary.ca](mailto:rebecca.lesser@ucalgary.ca)). Include the specific course information and your UCID number in your request.



## **Writing**

All written assignments (including, although to a lesser extent, written exam responses) will be assessed at least partly on writing skills. Writing skills include not only surface correctness (grammar, punctuation, sentence structure, etc.) but also general clarity and organization. Research papers must be properly documented. Students are also encouraged to use Writing Support Services and other Student Success Centre Services, located on the 3rd floor of the Taylor Family Digital Library. Writing Support Services assist with a variety of assignments, from essays to lab reports. Students can book 30-minute one-on-one appointments online, sign up for 15-minute drop-in appointments, and register for a variety of writing workshops. For more information on this and other Student Success Centre services, please visit [www.ucalgary.ca/ssc](http://www.ucalgary.ca/ssc).

## **Protection of Privacy**

The University of Calgary is under the jurisdiction of the provincial Freedom of Information and Protection of Privacy (FOIP) Act. The Department of Philosophy ensures the students right to privacy by requiring all graded assignments be returned to the student directly from the instructor or teaching assistant.

## **Internet and Electronic Communication Devices**

The instructor reserves the right to establish course policies regarding the use of devices such as laptops, tablets, and smartbooks. If allowed, these devices must be used exclusively for instructional purposes and must not cause disruption to the instructor or to fellow students. Cell phones and paging devices should be set to silent mode during lectures. Audio or video recording of lectures is not permitted without the written permission of the instructor. Students violating this policy are subject to discipline under the University of Calgary's Non-Academic Misconduct policy.

## **Emergency Evacuation:**

In case of an emergency evacuation during class, students must gather at the designated assembly point nearest to the classroom. The list of assembly points is found at <http://www.ucalgary.ca/emergencyplan/assemblypoints>. Please check this website and note the nearest assembly point for this course.

## **Other Helpful Contacts**

- Safewalk and Campus Security: 403-220-5333
- Faculty of Arts Student Representatives: 403-220-6552,

arts1@su.ucalgary.ca , arts2@su.ucalgary.ca, arts3@su.ucalgary.ca,  
arts4@su.ucalgary.ca

- Student Union: <https://www.su.ucalgary.ca/>; 403-220-6551
- Student Ombudsman: <http://www.ucalgary.ca/provost/students/ombuds>
- Campus Mental Health Strategy: <https://www.ucalgary.ca/mentalhealth/>