PHILOSOPHY 211: INTRODUCTION TO LOGIC
AMERICAN UNIVERSITY OF BEIRUT
FALL 2014
SEC. 1, 11:00 -11:50 & SEC 2, 12:00-12:50 MWF NICELY 320

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Course Description: This is an introduction to the formal methods of rational argument. It also provides some historical context for the development of foundational studies in mathematics and computation. After an introduction to the general idea of Logic, we will focus on the basics of *sentential* logic—symbolization, syntax, derivation, and semantics. Midway through the course we will turn to the same basics, except focusing on *predicate* logic. The main goal of the course is to instill in the student the habit of rational thinking: thinking clearly, consistently, and with "logical consequence." We will also show how logic is closely related to everyday reasoning.

This course fulfills the FAS General Education "quantitative thought" requirement and is required for philosophy majors. To do well in this course you will have to practice logic *every week*. This is definitely not a course where you can sit back, relax, take the exams and pass. Also, while some of you will catch on very quickly, depending on your prior experience, some of you will need more time and practice to catch on. If you don't get it right away—stick with it and keep trying. The operative phrase in this course is *persistent practice*.

Program Learning Outcomes—by the end of this course you will be able to:

- Understand the difference between validity, invalidity, truth, and soundness.
- Determine the logical validity of everyday arguments, by symbolizing English sentences and submitting them to "truth-tables" and derivations (proofs).
- Understand the role of the "quest for certainty" in the development of computational logic.
- Understand the power of deductive reasoning to ward off the evils of fallacy and contradiction!
- Admire the elegant beauty of demonstrative proof!

Essential: **Read this syllabus carefully.** By taking this class, you agree to understand and comply with this syllabus. By 'syllabus' I mean any document appearing directly under the SYLLABUS section of Moodle. If I make any changes to the syllabus, I will inform you. If you have a question about any policy, I am happy to talk about it. But if it is in the syllabus, you can never say that you did not know.

Required Texts: See course schedule below for schedule of assigned readings.

- *The Logic Book*, Sixth Edition, by Bergmann, Moor and Nelson. Available at AUB Bookstore.
- *Logicomix: An Epic Search for Truth,* by Doxiadis and Papadimitriou. Available at AUB bookstore.

Graded Requirements, weighted percentages:

- Homeworks, 5%
- Graded Exercises (weekly) 85% of course grade
- In-class midterm 10%
- Optional Final exam: To be figured
- Bonus points: If you are not doing as well as you would like, you can do a Mid-term Bonus problem and a Final Bonus problem. See below for details.

Homeworks (HW): will be due every Wednesday. Submit in class on *stapled* paper with full name (as it appears on Moodle). While they will not be graded, they are very important to do, since they prepare you for the weekly exercises on Friday. Before turning them in, you can check (most of) your answers in the Student Solutions manual. Any answers not in the Manual will be posted on Moodle *after* you hand in your homework. So, you have to be self-motivated. If you simply copy the answers and do not check them, you will very likely fail the Graded Exercises. To get full credit (100), homeworks must be handed in *complete*. If you did not complete all problems, you get 90 points, or 80, or less, depending on how complete. For an example of how to calculate this portion of your grade, see "Calculating and Estimating Your Grades" on Moodle under the syllabus section.

Graded Exercises (GE). Exercises will be done each Friday and usually take up 30-40 minutes of class time. They will consist of exercises very much like the homework exercises assigned from the textbook (*The Logic Book*), and reading questions about *Logicomix.* Exercises may *not* be made up. If you miss a Graded Exercise, it counts as a zero. However, your two lowest scores will be dropped from the sum of your GE scores. Cheating on the exercises will result in a zero for that exercise. Cheating means looking at someone else's work or talking (whispering) during the exercise, or using your cell phone. Scores of 0 received for cheating *will not* be

removed from your sum in any case. When your GE is returned to you graded, be sure to check the answers and explanations I have posted on Moodle.
NEW! YOU CANNOT DROP YOUR TWO LOWEST SCORES IF YOU DO NOT TAKE THE LAST GRADED EXERCISE. This rule is designed to discourage people from skipping the last two Graded Exercises, and to insure that you have knowledge of all course material. If you do not take the last Graded Exercise, you will get a zero for it and you will not be able to exclude it or any other score from your total GE score.

In-class mid-term: like the weekly exercises, but an hour long. The midterm is cumulative.

Optional Final Exam: You may want to take the Final Exam, if you have not performed as well as you would have liked on the weekly Graded Exercises, and you think you can improve your score. The Final is comprehensive, covering truth tables, translation, and predicate derivations (including inconsistencies and theorems). Here is how to decide whether you should take it: First, calculate your Course Grade according to the Grade Calculation instructions (making sure to leave your lowest two GE scores out of the calculation). Then calculate what score you would need on the Final to get a better Course Grade. To do that, you need to decide what percentage you want your Final to count against your Graded Exercise grade.

For example, suppose you currently have average of 80 on the Homeworks, 65 on the Midterm, and 68 for the GEs. Calculating the weighted percentages, you have: 4 + 6.5 + 58 = Course Grade of 68.5. If you take the Final, it will count as a certain portion of your GE grade. Suppose you give it the full 85%. Then you will need to score higher than 68. If you score 70, that will result in a Course Grade of 70 (70 x .85, etc.). If your Final score is 80, that will result in a Course Grade of 78. You may choose to have the Final count for *less* than 85%, in which case the GE will count for that much less. So, if you want the Final to count for 55%, then the GE will count for 30%. Note that on the evening *before* you take the Final, *you must tell me* the percentage weight you want to give it. In sum, by taking the final, you take somewhat of a gamble, because if your Final score results in a Course Grade that is worse had you not taken it, your Final score results will stand.

Bonus Point project: One point for Sentential, one point for Predicate. For each of the following projects, you can get one point added to your final grade. **For sentential:** Find an argument in a news article or in a casual conversation. Determine the premises and conclusion (no less than three premises, no more than five.) If you need to add a premise to make the argument valid, do so and indicate this. Then give the argument a symbolization key; put it in "standard form" and derive the conclusion. Submit your work with a copy of the original source one week after you receive your midterm grade. **For Predicate:** Find a *symbolized*, predicate-quantifier argument in our textbook. Here are three restrictions:

a. You may use only a symbolized argument that is starred, that has not been assigned, and the answer has not already been posted on Moodle.
b. You cannot use an argument that has an English version.
c. The argument must have at least two premises.

Translate the argument into plain English. Make clear all of the assignment values (F = what, a = who or what, and what the UD is). Derive the conclusion. Then explain what you have done and its significance. Submit no later than the day the Final Exam is scheduled. ALL PROJECTS must be done neatly, preferably on computer.

Attendance: will be taken but not graded. However, it is in your best interest to attend every class, to be attentive, and to participate in the discussions. Learning logic is a cumulative process and to learn it well requires repeated practice. Also, if you are absent more than eight times, you will either be dropped from the course and will receive a "W", or you will receive a failing grade of 50. If you are having problems attending class, you must tell me right away. Do not start showing up at the end of the semester expecting to make up the work and pass. You will have missed too much.

Participation and class conduct: Participation is strongly encouraged. In order to participate well, you must do the homeworks *before* class so we can go over them in class. Ask questions, make comments, and respond (respectfully) to other students. No question or comment is too silly or off-base. Everyone has questions, and surely others have the same questions as you. However, please do not monopolize the discussion. Give others a chance to speak. *Be respectful of me and others by listening to what is going on, rather than talking among yourselves.*
NOTE: Repeat offenders of the following behaviors will be ejected from class and will have **points removed from their final grade**. (1) Talking while someone else is talking. (2) Using cell phones in class. All electronic devices must be turned off and put away completely out of sight. If you must take notes with a computer, the internet connection must be turned off. (3) Leaving the room to make or answer phone calls; playing games or reading non-class material during class. (4) Repeated lateness; leaving early. Also, as a courtesy to me, *please do not make preparations to leave class until I say class is over.* If I seem unaware that class time has expired, kindly alert me, thank you.

Grade Calculation: I want you to understand how your grades are assigned and calculated, so that you can exercise more control over your progress. See "Calculating and Estimating Your Course Grades" on Moodle." This will show you completely explicitly how all calculations are made, so that you can do them yourself. Here is a brief explanation: All grades are recorded on Moodle's "Grades" (as well as on the assignments themselves), so you can view them as soon as I have put them up (Moodle→Administration→Grades). To estimate your grade at any point in the semester, simply figure your average and multiply it by the "weighted" amount; then sum the weighted amounts (see "Calculating and Estimating. . ."). Be sure to drop your two lowest Graded Exercise scores.

NOTE: Never ask me to give you a certain grade that you need, want, or "must have." Such requests are completely unethical. If made, I will *reduce* your course grade by *at least* 2 points. Your grades are based solely on *your performance, in accord with the syllabus requirements*. The best way to get the grade you need is to do the required work as best you can. If you need extra help, I am here to work with you. Feel free to come to office hours or to make an appointment. And if I have made a grading *mistake*, please let me know! But never ask me to give you a grade higher than you earned or to give you credit for an assignment not done.

Moodle: Here you will find course material such as the syllabus, answers to textbook exercises, and the occasional fun thing. Class notices and announcements will be sent to you by e-mail (via the "News Forum" on Moodle) so, **check your AUB e-mail** regularly.

E-mail: **So that we may better communicate, you must use your AUB e-mail and "authenticate" it so that I can see your name and know who you are.**

Course Schedule: This schedule is subject to change, although any changes will be announced well in advance. *Always* bring the assigned material to class. Monday lists the topic for the week and the required readings, which you should read before class. Wednesday: Assigned Homework (HW) is due, and we will go over any questions you may have. You should also have read the assigned chapter in *Logicomix.* Friday: Additional questions will be answered (briefly), and then we will have a Graded Exercise (GE) taking up most of class time. The GE will be based on the week's readings and homework, plus brief questions on *Logicomix.* Answers to the GEs will be posted by late afternoon on Friday. I then suggest that over the weekend you check and understand your answers on the GE; then prepare for Monday's assignments. Be sure to read any new Moodle postings.

Week	Monday	Wednesday	Friday
1. Sept.	**1** NO class	**3** Intro to syllabus, logic Chapter 1, 1.1-2. Assign HW	**5** HW practice: All unstarred exercises in 1.2E
2	**8** Ch. 2: Syntax & Symbolization (sentential logic) Sec. 2.1, 2.2	**10** HW1: 2.1E, parts 1 & 2, all exercises; part 3, unstarred.	**12** HW2: 2.2E: parts 1 & 2, unstarred.
3	**15** Ch. 2: More complex symbolization, Sec. 2.3	**17** HW3: 2.3E, 1. unstarred. 2. unstarred. 3. a, c, e. 4. c, i. 5. unstarred. 6. a, e.	**19** Graded Exercise 1 Logicomix: "Overture"
4	**22** Ch. 3: Sentential Logic: Semantics Sec. 3.1, 3.2, 3.3, 3.5	**24** HW4 3.1E: 1. a, c. 3.2E: 1. a, c, e. 3. a, b. 3.3E: 1. a, c, e. 3. a. 3.4E: 1. a, e. 3.5E: 1. a, e. 4. a, c. (full TTs only)	**26** GE2 Logicomix 1. "Pembroke Lodge."
5 Oct.	**29** Ch. 5 Sentential Logic: Derivations. Sec. 5.1 & 5.1.1	**01** HW5: 5.1.1: unstarred	**03** GE3 Logicomix 2: "The Sorcerer's Apprentice."
6	**06 Al-Adha NO CLASS**	**08** Ch. 5 Sentential Logic: Derivations. Sec. 5.1.2, Subderivation Rules Sec. 5.1.3, Concluding comments	**10** HW6 5.1.2E: 1 and 2 unstarred 5.1.3E: unstarred Logicomix 3: "Wanderjahre."
7	**13** Ch. 5 Sentential Logic: 5.2. Basic concepts of SD 5.3 Strategies	**15** HW7 5.3E: 1. a, c, g. 2. a, g, i. 3. a, c, e. 4. a, c. 5. e, g. 6. c, e. 7. a, g, m 10. a, c, e. **11. a, c, e** (don't skip!)	**17** GE4
8	**20** More work on 5.3	**22** More work on 5.3	**24 Midterm**, through 5.3
9	**27** Ch. 7 Predicate Logic: Syntax & Symbolization Syntax, Sec. 7.1. 7.2	**29** HW8 7.1E all. 7.2E 1. all a-m. 2. a-m unstarred. 3. all unstarred.	**31** HW9: 7.3E: 1. all. 2. all a-d 3. all a-d, h. 4. all a-d, h. Logicomix 4: "Paradoxes"
10 Nov	**03 Ashoura NO CLASS**	**05** 7.4 Symbolization fine-tuned. HW10: The book has no exercises for 7.4. HW10 will be done in class.	**07** GE5 on 7.1-4 Logicomix 4: "Paradoxes" Logicomix: "Entract."
11	**10** Ch. 10 Predicate Logic: Derivations Sec. 10.1	**12** HW11: 10.1E 1. a, b, c, d, e, g. 2. a, b, c, d, e, f.	**14** GE6 Logicomix 5: "Logico-Philosophical Wars."
12	**17** Ch. 10 Predicate Logic: Derivations, Sec. 10.2	**19** HW12: 10.2E 1. a, b, c, e, g, i, k. (validity) 2. a, b. (theorems)	**21** GE7
13	**24** Ch. 10 Predicate Logic: Derivations, Sec. 10.2	**26** HW13: 10.2E 2. c, d, e. (theorems) 3. a, b, c. (equivalence) 4. a, b, c. (inconsistency) 5. a, b. 6. a, b, c. (validity)	**28** GE8 Logicomix 6: "Incompleteness."
14 Dec	**01** Ch. 10 Predicate Logic: Derivations, Sec. 10.2??	**03** HW14 10.2E 6. d, g, h. (validity) 7. a, c, e, g, j. (theorems) 8. a, b, c. (equivalence) 9. b, e, i, k. (inconsistency)	**05** Review 10.2 for last class GE Logicomix 7: "Finale."
15	**08 Last class** GE9 on 10.2	**10** *Reading period*	**12** *Reading period*
16	**15.**	**17 Final exam, 2 pm Fisk 139.**	19

End of semester Dec 22