PHIL0180: INTRODUCTION TO MODERN LOGIC
MIDDLEBURY COLLEGE
Fall 2017
Twilight 201
MWF, 12:30-1:20PM
Discussion:
Section X: Fridays, 9:05-9:55 AM
Section Y: Fridays, 10:10-11:00 AM
Section Z: 11:15AM-12:05PM

Kareem Khalifa, PhD
Email: kkhalifa@middlebury.edu (far more reliable than telephone)
Course Website: http://sites.middlebury.edu/logic
(also: go/logic/; all lecture notes are posted here)
Instructor Website: http://kareemkhalifa.com
(also: go/khalifa/)
Office Hours: Wednesdays, 4:30-5:30PM, Thursdays, 2:00-4:00PM
and by appointment
Graders: Lizzy Giovanniello and Nosagie Asaolu

Course Description: Logic is concerned with good reasoning; as such, it stands at the core of the liberal arts. We will develop our reasoning skills by analyzing arguments found in conversation, newspapers, political debates, academic discourse, and popular culture, as well as by formulating our own. We will then use the formal techniques of modern propositional and predicate logic to codify many of our strategies for reasoning.

Course Objectives: I have two principal objectives:
(1) To cultivate your critical thinking skills. By critical thinking skills, I include the abilities to recognize, analyze, and criticize arguments in the contexts of reading, writing, thinking, and discussion. I expect you to do this not only with others’ positions but, more importantly, with your own positions.
(2) To encourage you to be active learners. By an active learner I mean a person who has the curiosity, confidence, and passion to take the initiative to seek information that will make the recognition, analysis, and criticism of arguments—once again, both others’ and your own—more poignant, penetrating, and insightful.

Evaluation:
We will meet our course objectives through homework, pop quizzes, problem sets, exams, and discussion. Here is the breakdown of their relative weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>35%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>5%</td>
</tr>
<tr>
<td>Problem Sets</td>
<td>5%/each x 2 problem sets = 10% of final grade</td>
</tr>
<tr>
<td>Tests</td>
<td>15%/each x 2 tests = 30% of final grade</td>
</tr>
<tr>
<td>Final Project</td>
<td>10%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
</tbody>
</table>

Alphabetic grades will then be assigned according to the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92.5-100.0</td>
</tr>
<tr>
<td>B</td>
<td>82.5-91.4</td>
</tr>
<tr>
<td>C</td>
<td>72.5-81.4</td>
</tr>
<tr>
<td>D</td>
<td>62.5-71.4</td>
</tr>
<tr>
<td>F</td>
<td>0-61.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>B+</td>
<td>87.5-89.4</td>
</tr>
<tr>
<td>C+</td>
<td>77.5-79.4</td>
</tr>
<tr>
<td>D</td>
<td>59.5-69.4</td>
</tr>
<tr>
<td>E</td>
<td>0-59.4</td>
</tr>
</tbody>
</table>
There is no rounding up or down of final grades. Rounding occurs only for the final grade, i.e., individual assignments, tests, etc. are not rounded.

A. Homework
Expect to be doing up to 30 logic problems per week in this course. Let me be as clear as possible about this: every person who has not submitted his/her homework on a regular basis has received a D or F. Improving your critical thinking skills is a lot like improving your jump shot, golf swing, guitar technique, abs, etc.—it requires practice. Generally, homework assignments are your first opportunity to test your understanding of the readings. They allow you to identify areas of confusion that you should then communicate to me so that I can help you to better understand the material. As a result, struggling through homework is not necessarily a cause for concern. Indeed, homework assignments are evaluated more on your effort at understanding the material than on your ability to arrive at the correct answer (insofar as the two can be distinguished).

1. Criteria of evaluation:
On homework assignments, you will be given a grade of S (satisfactory), S- (less than satisfactory), U ( unacceptable), or 0 (zero). On these assignments, S = 100%, S- = 70%, U = 25%, 0 = 0%.

A satisfactory (S) assignment is one that:
• Is handed in as a hard copy no later than the end of class on which it is due,
• In which an honest effort (as judged by me, though further discussed below) has been shown for all the problems in the assignment; and
• Is organized (as judged by me, though further discussed below).
A less than satisfactory (S-) assignment is an assignment that would be satisfactory, except:
• It was sent to me after the end of class it was due but no later than 11:59PM of the day after it was due. (e.g., it was sent to me by 11:59PM Tuesday if it was due on Monday.)
  o In this case, you must EMAIL me your assignment.
• It was poorly organized, or
• An honest effort has not been shown for one problem, but it was handed in at the appropriate time.
An unacceptable (U) assignment is one that is handed in later than 11:59PM of the day after it was due, or in which an honest effort has not been shown for more than one of the problems in the assignment.

A zero (0) is an assignment that is not handed in at all.

This “honest effort’ requirement may seem obscure, but it amounts to doing two things:
1. Writing down the best ideas you have for solving the problem, even if you’re completely stumped. This helps me figure out where you need help, and keeps you from getting passive; and
2. Correcting any mistakes that you discover, especially if we review the problem in class. In class, we frequently discuss answers to homework problems; where you see an error in your work, write in the correct answer. This shows me that you’re paying attention and making an effort to figure things out.

You will be penalized for an incorrect answer if you do not correct a mistake on a problem that we have reviewed in class. This is especially relevant if you do not attend a class.

Organization will be assessed according to the following:
• Homework assignments must be typed: It is nearly impossible to organize a homework assignment poorly if you type it out. Furthermore, this allows you to submit a homework assignment and continue to reexamine a copy of it whenever you want after we’ve discussed it in class. Finally, we’ll often review homework problems in class. Typing your assignment helps me to see that: (i)
you actually did your homework and didn’t simply copy the solution discussed in class, and (ii) you’re correcting your mistakes.

- **Each homework assignment must be on a separate sheet of paper:** On Fridays, we meet twice: once in discussion section and again for lecture. Often you will have an assignment due for each of our meetings. Please submit these on separate sheets of paper. This makes my graders’ job much easier, and lowers the probability that one of your assignments is not accounted for.

- **Homework assignments must be submitted as hard copies.** This course has a lot of assignments and has a good deal of students. In a typical week, I receive 100 documents from you. Consequently, if many students submit many assignments via email, my inbox gets needlessly cluttered. To avoid this clutter, I will penalize anybody who submits an assignment electronically. Thus, an electronically submitted assignment that would otherwise be an S will become an S-; an S- will become a U; etc. Claiming that the printer you were planning on using malfunctioned is not a legitimate excuse for handing something in electronically. Since the public printers are unreliable, allow yourself enough time in the event that the first printer you try to use does not work.

- **Show enough work to demonstrate that you did not obtain the answer by some arbitrary or illegitimate method.** A major lesson of this course is that one can arrive at correct beliefs through incorrect reasoning. The goal, of course, is to arrive at correct beliefs through correct reasoning. Thus, showing your work (your reasoning) is of the utmost importance.

- **Be neat and precise.** Since a significant aspect of logic is the ability to deploy ideas coherently, acquiring these habits sharpens your critical thinking skills, and lowers the likelihood of making careless mistakes. This involves several requirements:
  - Present your work in a manner that is easy to follow. I am not obligated to decode incoherent work; you are obligated to provide coherent work. This includes, but is not limited to, working vertically as much as possible, e.g., not placing two problems next to each other.
  - Spell all words correctly.
  - Use only grammatically correct sentences.
  - Leave space to make corrections (see Honest Effort Requirement above).

- **Make sure you can be identified as the author of your own work:** Specifically:
  - All homework involving more than one sheet of paper should be stapled. Since this is a large class, the potential for jumbling papers is sizable. No paper clips, folding or tearing of the corners of papers, etc. is acceptable. If you cannot staple your paper before class begins, you have roughly two nanoseconds after class (three if I haven’t had my coffee) to run to Twilight 202 and beg Trish Dougherty, the philosophy department coordinator, for use of her stapler.
  - Put your name on each sheet of paper comprising your homework assignment. If you do not later identify yourself as the author of a homework assignment lacking a name, you will receive 0% on that assignment. Any page of your homework that is unstapled and without a name will not be graded.

---

2. **Timing of reading, lecture, and homework:** There are several concepts in this class where you will be required to work through problems in advance of my lecturing on them. I have done this because I strongly believe in independent learning. I have made a point of restricting this practice to the easier concepts in the class, but have spared you from agonizing over the really tough stuff before I lecture on it. That being said, some of you may nevertheless struggle with material I’ve yet to lecture on. When this happens, don’t get discouraged, and keep in mind the “honest effort requirement” above. You can be completely stumped on a homework assignment and still get an S. (See below about the “safety net” built into this course).

B. **Quizzes**

All quizzes will be pop quizzes and are designed to test:
• Your understanding of material that we’ve already discussed in class. In this case, you will be given a problem very similar to one already discussed in class; and/or
• Whether you’ve actually read the materials due on a particular day of class. In this case, I won’t expect you to have understood how to solve problems we’ve yet to discuss, but I will expect you to be able to define key concepts. In particular, if a word is in boldface, you should be able to define it, regardless of whether we’ve discussed it in class or not.
• All quizzes are graded on a scale of 0-100. If you simply put your name on a pop quiz, you get a 50. If you make an honest effort, showing some evidence that you’ve read the text, you get a 70. All other points are based on the correctness of your answer and the quality of your work.

C. Problem Sets
You will have two problem sets. These are generally designed to test your ability to apply the concepts in the course to the kinds of passages that you might find in other philosophy courses. They must satisfy all of the following requirements:
• All criteria of organization for a satisfactory (S) homework assignment also apply to problem sets. Failure to be organized will result in a lower grade.
• Correctness of answers is the ultimate criterion of evaluation, i.e., evidence of an honest effort is not sufficient to get a good grade on a problem set.
• Interpretations of a passage will be graded as much on their parsimony and elegance as on their detail and fidelity to the original. A crucial aspect of critical thinking is being able to extract the most relevant aspects of a passage, so throwing in the kitchen sink may show an incredible amount of effort, but a noticeable lack of insight. Grades will reflect this.
• Additional criteria may vary with respect to different problem sets.
• All problem sets should be handed in no later than the end of the class on which they are due.
• You will lose 10% of your grade on a problem set if you submit it after this time but before 11:59PM on the day it is due; each 24-hour period thereafter results in an additional 3-percentage-point penalty.

Note on Collaboration:
Working together on homework and problem sets is strongly encouraged. However, you should collaborate only after each collaborator has worked individually through the assignment. The collaboration process should consist of comparing answers and discussing differences in the reasoning informing those answers. At no point should you be copying another student’s work. On problem sets, be aware of the following policy: if you make the same weird mistake as someone else, I will not only deduct points for getting it wrong, but additional points for collaborating poorly. Specifically, if \( n \) people make the same weird mistake, then the penalty will be multiplied by \( n \). This is to encourage collaboration that will decrease the number of weird mistakes, and to discourage collaboration that propagates weird mistakes. When we get to the first problem set, remind me to tell you what counts as a “weird mistake.”

Additionally, remember that homework assignments serve as a helpful diagnostic tool for me. Thus, if your homework indicates that you understand the material, but only because you collaborated with someone else, you remove my most effective way of pinpointing potential trouble spots for you. It becomes increasingly incumbent upon you to approach me in these cases.

Feel free to ask for clarifications about this policy.

D. Tests
There will be two tests. By its nature, logic is cumulative, so the second test will require that you understand the material covered in the first test. A general word of caution: I view tests as the primary means of distinguishing A students from the rest. As a result, about 10% of a test’s points
will be very difficult for many of you to earn. However, I am also exceedingly generous with partial credit, so it is never a good strategy to leave an answer blank.

E. Final Project
Your final project will force you to apply the lessons of this course to a debate of your choice. The only requirement is the final project, due during finals week. However, throughout the semester, I will use my own example to show how the week’s lessons apply to a real-life debate, and you will see suggested exercises for working on your final project that follow my lead. You are not required to do any of these suggested exercises, but they will make the final project easier to do and are interesting in their own right. If you would like to discuss these suggested exercises, please swing by office hours.

F. Participation
This is a general evaluation of the amount of effort and astuteness you have demonstrated to me in the course. Considerations that are relevant include promptness, attendance, quantity and quality of both contributions and questions in class sessions, responsiveness to other people’s comments in class, discussions outside of class, and appropriate class behavior. This grade reflects your performance in all of those areas of the course other than the graded, written assignments.

Despite the large size of this class, participation is still significant. If you simply attend all of the required courses, you will receive a 75 (C) on your participation grade. Here are some ways of improving that grade:

- **Asking questions about the material.** Generally, unless prompted, you should not ask questions like “What is the answer to problem 6 on page 235?” in lecture sections. (This is fair game in discussion sections and office hours). Rather, ask something more interesting, e.g., “Can you clarify the difference between the object language and meta-language?”
- **Asking questions that go beyond the material.** There are both practical and philosophical issues that are not discussed in our texts. Truth be told, they’re a lot more interesting than what is discussed in our texts, e.g., “How do these funny symbols relate to the concrete practices of arguing for a position?” “How might I use these ideas in reading and writing?” “What is truth?” “Do properties exist independently of the individual objects of which they are predicated?” or “Does material implication really correspond to ‘if-then’ statements in English?” I REALLY want you to ask these questions, but with one caveat: let me summarize and field questions about the material first; then we can go beyond. Time constraints may limit our discussions of these issues, but I’m happy to talk shop during discussion sections and especially during office hours. Also, if you are a total logic nerd like me, ask me about teaching an Advanced Logic course.
- **Answering your peers’ questions.** Some of you will find this material easier than others. For those of you who find this easy, don’t be passive, don’t get bored, etc. Rather, share your knowledge, especially when you have an answer to someone else’s questions.
- **Don’t be shy during discussion sections and office hours.** Some of you feel more comfortable in large lecture sections than others. For those who would rather not speak in front of your peers, feel free to swing by office hours or to use discussion section to be more open with your thoughts and concerns.

*General expectations of student behavior:* 
Participation also includes behaving like an adult. This includes exhibiting the virtues of civility, accountability, responsibility—particularly as these virtues apply to your education. For most of you, this is second nature. However, for the few of you who have not yet shed your adolescent tendencies, please note that failure to behave like an adult will be reflected in your participation grade. This includes taking the required initiative and responsibility of your workload in the event that you need a Dean’s Excuse (see below).
Email etiquette/decorum:
Different professors have different expectations about how they are addressed, and especially how they are addressed in email correspondences. If you are not clear what a professor’s expectations are, use the template described here:

https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087

I consider my norms to be “semiformal,” i.e. I expect some form of salutation with some acknowledgment that I’m a professor, but within those constraints, you can be fairly colloquial. For instance, the following are all perfectly good ways to start an email: “Dear Professor Khalifa,” “Hey Prof,” “Hi Dr. K,” “Howdy Most Esteemed Educator,” etc. What’s not acceptable is an email either lacking a salutation or failing to acknowledge the fact that I’m a professor. This reads as if I’m a waiter taking your order, which is not a good professor-student dynamic. Examples of bad email introductions include diving into your email without addressing me at all, “Hi,” “Hey,” “Hello,” “Hello Kareem,” “Khalifa,” “Hey Khalifa,” etc. Just so you know, I don’t reply to emails if they don’t follow these very basic rules of decorum. Similar rules apply in face-to-face interactions.

Also, a general rule: most professors (including myself) don’t like to answer emails about logistical issues (how something will be graded, how to access a file, when something is due, etc.) in which the student could have read the syllabus, searched the internet, or asked a classmate in roughly the same amount of time it would take them to write and wait for a reply to an email. This is not a good use of your time (since you often could get the answer to your question more quickly with a little more effort) and it’s definitely not a good use of my time. Here’s my rule: if you send me one of these emails, I will send you a YouTube video of an 80’s pop song. You have two choices at this point: (1) you can go search for the lyrics to this song, and email them back to me. After that, I will answer your original query. (2) Alternatively, you can spend the same amount of time searching for the answer to your original query.

All in all, I prefer face-to-face interactions, where we’re talking about the content of the course. So, wherever possible, you should try to meet under these conditions.

Dean’s Excuses:
There are exceptions to certain deadlines (e.g., illness, family emergency). However, they require a Dean’s Excuse. The Dean’s Excuse serves the following functions in my course:

• As official documentation to me that your reasons for handing in a tardy assignment are legitimate;
• A mandate for you to initiate a conversation with me about how you will make up any assignments that you’ve missed.
• A mandate for you to initiate this conversation as soon as possible.
  ○ In general, I prefer that you speak with me prior to my receiving a Dean’s excuse.
  ○ “As soon as possible” should be read “within a week in which I receive the Dean’s Excuse,” circumstances permitting. If you can attend class, then your circumstances permit you to speak with me about any work you need to make up.

A Dean’s Excuse does NOT serve the following functions in my course:

• A permission slip for you to hand in your assignment at your earliest convenience.
• A mandate for me to seek you out in order to initiate a conversation with you about how you will make up any assignments that you’ve missed.
• Failure to respect these guidelines will result in a reduction of your participation grade AND the relevant assignments.

_Travel:_
I realize that, in many cases, you can save a lot of money by leaving for the holidays a few days early. In these cases, if you give me at least _two weeks_’ notice, I will try my best to accommodate you; though the earlier you notify me of this, the better. Otherwise, it’s your problem, not mine.

_A Brief Comment on Logical Aptitude and the “Safety-Net” in the Grading System:_
Some people struggle in this course. I want to ease your anxieties, so please note the following: if your test average is a 60% but you ace everything else, you can still earn a B+ for the course. While you have a fair amount of control over how well you do on a test (practice, practice, practice!), you have even more control over how well you do on everything else. So, as long as you put in the effort, you’ll almost always do okay. I know that there’s something unrewarding about working hard and not getting an A, but logic is a very results-oriented enterprise, and it’s an important life lesson that hard work doesn’t guarantee first-rate results. (For example, I work harder than many celebrities, but I don’t have as much money as they do.)

_Objections to grades:_
If you object to a grade you receive, send me an email with the parts of your assignment where you think I was being unfair. Provide reasons why my assessment was not fair. The email should also include times when you can meet over a one-week period. I will not discuss grades without reading an email first. This process should not be adversarial; rather, it is an extended application of your critical thinking skills. These policies are intended to facilitate clarity and communication, as well as to guarantee that I respond as thoughtfully as I can to your queries and concerns.

_ADA Statement:_
Middlebury College seeks to provide reasonable accommodations for qualified individuals with documented disabilities. Students who have Letters of Accommodation in this class are encouraged to contact me as early in the semester as possible to ensure that such accommodations are implemented in a timely fashion. For those without Letters of Accommodation, assistance is available to eligible students through Student Accessibility Services. Please contact Jodi Litchfield or Courtney Cioffredi, the ADA Coordinators, for more information: Courtney Cioffredi can be reached at cioffredi@middlebury.edu or 802-443-2169 and Jodi Litchfield can be reached at litchfie@middlebury.edu or 802-443-5936. All discussions will remain confidential.

_Family Educational Rights and Privacy Act (FERPA):_ FERPA requires that confidential documents, in either paper or electronic form, are not left unattended. This includes your homework, which causes a potential snag. Since we have a high volume of homework that needs to be returned, strict compliance with FERPA would greatly slow down the rate at which I could return your homework, and could drastically cut into the time I could devote to teaching the course content. My policy for many years is to make any assignment graded S, S-, U, 0 (i.e. homework) available even when I am not present. Quizzes, problem sets, and tests are always returned to you in compliance with FERPA. Since students in the past have found this policy of returning assignments to be optimal, I treat this as the default. However, you may opt not to waive this right, in which case, you should let me know. In this case, you will have to make special arrangements with me to pick up your homework. Consequently, there is a tradeoff: you can have privacy or you can have expediency, but you can’t have both.

_Honor code:_
You are expected to abide by all the rules of Middlebury College’s honor code. Failure to do so will lead to reporting you to the proper university authorities.

**Texts:**


All required selections from these books are available at:  
[http://sites.middlebury.edu/logic/readings/](http://sites.middlebury.edu/logic/readings/)
This is password protected. The password is: logic-phil180

<table>
<thead>
<tr>
<th>Date</th>
<th>Readings and assignments to be discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Informal reasoning</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A. Basic concepts</strong></td>
<td></td>
</tr>
<tr>
<td>9/13</td>
<td>Propositions &amp; arguments: read pp. 4-9; do pp. 9-12 #3, 5, 9, 14, 15</td>
</tr>
</tbody>
</table>
Suggested: Find a controversial topic that interests you, with two brief passages: one for each opposing side of the debate. You may want to ask one of your other professors for some topics that will be coming up later in the semester. |
| 9/18 | Validity & counterexamples: read Nolt, pp. 6-12; do Nolt, pp. 12-13 #1, 2, 3, 6, 7, 10, 12, 14 |
| 9/22D | *In-Class Exercise*: Recognizing and analyzing Owens’ and Patton’s arguments.  
Suggested: Try recognizing and analyzing the arguments in the two passages you selected from last week. |
| **II. Semiformal reasoning** | |
| **A. Basic notation** | |
| 9/22L | Symbolic language & basic operators: read pp. 315-327 |
| 9/25 | do pp. 327-328 (part A) #2, 8, 14, 21, 24; p. 329 (part C) # 4, 11, 24; pp. 329-331 (part D) #2, 8, 22 |
| 9/27 | Conditional statements & material implication: read pp. 331-339 |
| 9/29D | *In-Class Exercise*: Formalizing Owens’ and Patton’s arguments.  
Suggested: Try formalizing the arguments in your two passages. |
| 9/29L | do p. 339 (part A) #2, 9, 19, 24; p. 340 (part C) #2, 4, 8, 21, 22, 24 |
| **B. Truth tables** | |
| 10/2 | Validity & common argument forms: read pp. 346-355 |
| 10/4 | Statement forms & material equivalence: read pp. 357-361; do pp. 355-356 (part B) #3, 4, 9; pp. 356-357 #2, 4, 8, 9 |
| 10/6D | *In-Class Exercise*: Formalizing Owens’ and Patton’s arguments (continued).  
Suggested: Try formalizing the arguments in your two passages. |
### III. Formal proofs in propositional logic

<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/6L</td>
<td>Simple inference rules: read Nolt, pp. 82-89</td>
</tr>
<tr>
<td>10/9</td>
<td>do Nolt, 4.2, #1, 5, 11, 15, 19</td>
</tr>
<tr>
<td>10/11</td>
<td>Hypothetical derivations: read Nolt, pp. 89-101</td>
</tr>
</tbody>
</table>
| 10/13D | *In-Class Exercise:* Proving Owens and Patton’s arguments.  
          *Suggested:* Try proving the arguments in your two passages. |
| 10/13L | Do Nolt, 4.3, #1, 6, 9, 15, 20 |
| 10/16 | PROBLEM SET #1 DUE, Theorems & shortcuts: read Nolt, pp. 102-106 |
| 10/18 | Use the ten basic rules (Nolt p.102) and the derived rules (Nolt p.105-106) to prove the arguments in Copi & Cohen, p. 419, #17; pp. 420-421, #1-5 |
| 10/20D | *In-Class Exercise:* Proving Owens’ and Patton’s arguments (continued).  
          *Suggested:* Try proving the arguments in your two passages. |
| 10/20L | Proof of invalidity: read Copi & Cohen, pp. 421-423; do Copi & Cohen, pp. 423-424 #2, 7, 9 |
| 10/23 | No Class—Midterm Recess |

Check website for future classes.