Philosophy 210: Logic and Critical Thinking (Spring 2015)

Syllabus

This syllabus is subject to change.

Professor: Dr. Rachel Fredericks
I prefer to be called Rachel, but you may call me Professor or Doctor Fredericks if that makes you more comfortable.

Classes: Mondays, Tuesdays, Wednesdays, and Thursdays, 10:00–10:50 a.m. in Colgate 220

Email Address: rachel.fredericks@colby-sawyer.edu
I prefer to be contacted by email rather than telephone. If you send me an email, I will usually be able to respond within 24 hours during the week and 48 hours on the weekend.

Office Hours: M & W 11:00 a.m. - noon, T 1:45-2:45 p.m., & F 3:45-4:45, and by appointment
Office Location: Colgate 234
Office Phone: 603 526 3422

Course Description:

This course is an introduction to critical thinking and to both informal and formal (symbolic) logic. Since everyone uses logic (though not everyone studies it!) in making inferences (that is, in drawing conclusions) about any subject matter whatsoever, this course improves us as thinkers in ways that are relevant to all our other academic and non-academic pursuits.

Throughout the course, we investigate what makes some reasoning better than other reasoning and practice the skills used in good reasoning. Students learn about the nature of arguments, fallacies, induction and deduction, validity and soundness, and both propositional and predicate logic. In coming to grips with these concepts, students develop their ability to identify arguments in everyday contexts, analyze the logical structure of arguments, evaluate arguments, and create strong arguments of their own about any topics they may choose.

This course is intended to serve as the Quantitative Literacy course in the philosophy program; it is a required course for the philosophy major and minor, as well as the legal studies minor. It is also highly recommended for math minors and anyone interested in computer programming or computer science more generally. This course also fulfills the Humanities Exploration Area.

Student Learning Outcomes

Upon successful completion of the course, students will have learned to:

1. Define and use key logical concepts, such as argument, fallacy, validity, soundness, induction, deduction, etc.,
2. Translate ordinary (natural) language statements into proper symbolic notation (both propositional and predicate logic),
3. Analyze arguments and classify them according to their logical structure, and
4. Evaluate arguments, with a primary focus on their structure rather than their content.

REQUIRED Book

Kalish, Donald, Richard Montague, and Gary Mar. *Logic: Techniques of Formal Reasoning.* 2nd ed. New York: Oxford University Press, 1992.

Additional required readings are available via Moodle and are marked on the schedule with a *.

You should have all required readings done before class on the day for which they are scheduled, and you should always bring a copy (paper or electronic) of them with you to class on the day for which they are scheduled!

Recommended Books

Weston, Anthony. *A Rulebook for Arguments*. 4th ed. Indianapolis: Hackett Publishing Company, Inc., 2009.

Shenefelt, Michael and Heidi White. *If A, Then B: How the World Discovered Logic*. New York: Columbia University Press, 2013.

More recommended readings and other resources are available via Moodle; pay attention to which items on Moodle are strictly required and which are merely recommended!

Schedule

All groups of students are different in their interests, needs, and talents, so I reserve the right to make changes to this schedule (although I try to do that as little as possible and give as much warning as possible if and when I do).

Unit A: Critical Thinking and Informal Logic

Tuesday, 1/20: Welcome to Logic and Critical Thinking!

- Required reading: Rachel Fredericks, "Syllabus"*
- Course Policies and Purposes
- Arguments
    - Recommended viewing: Geoff Pynn, "Intro to Critical Thinking"*

Wednesday, 1/21: Informal (Non-Symbolized) Arguments

- Discussion of Examples
    - Recommended viewing: Greg Ganssle, "Argument and Evidence"*

Thursday, 1/22: Arguments in the Media

- Homework A Due
    - Find a news story on a reputable website that contains an argument. It can be about literally anything, and it can be one that you think is good or bad.
    - Print out the article, making sure that the author, title, publisher, date, and URL are included on the hard copy.
    - Put your name on it, put brackets around all the claims in the argument, and write "conclusion" next to the bracketed conclusion.
    - Bring the hard copy to class.
- Homework Presentations & Discussion

Monday 1/26: Fallacies

- Required reading: Ali Almossawi, "An Illustrated Book of Bad Arguments"*
- Why Learning about Bad Reasoning is Good
- Identifying Fallacies
- Calling out Fallacies Without Being a Jerk

Unit 0: Introduction to Formal Systems

Tuesday 1/27: Formal Logic

- Required reading: "Chapter 1," pp. 1-2
- Formal Systems Overview **[Handout 0.1]**
- Validity
- Natural Language, Formal Language, Object Language, and Metalanguage

Unit 1: Translations in Conditional Logic (CL)

Wednesday 1/28: Introduction to CL

- Syntax of CL **[Handout 1.1]**
- Variables and Metavariables
- Grammar of CL **[Handout 1.2]**
- Informal Conventions of CL **[Handout 1.3]**

Thursday 1/29: ACTIVITY TBD

Monday, 2/2: CL to English

- Canonical Translations and Style
- Formal English of CL **[Handout 1.4]**

Tuesday, 2/3: English to CL

- Idiomatic Variants of Informal English for CL
- Embedded Translations

Wednesday, 2/4: Translation Practice

- Translating Real Arguments
- Difficult Translations
- Contraposition and Conversion

Thursday, 2/5: Further Translation Practice

- Homework 1 Due
    - Read Section 1.1 and complete Exercises 1-6.
    - Read Section 1.2 and complete Exercises 7, 8, 9, 11, 12, 14, 15, 16.
- Homework Questions
- Ambiguous Translations
- **Practice Quiz 1**

Unit 2: Derivations in Conditional Logic (CL)

Monday, 2/9: Rules of Inference

- Proof Structure Introduction **[Handout 2.1]**
- Boxing Rules {DD, ID, CD} **[Handout 2.2]**

Tuesday, 2/10: Basic Derivations in CL

- Inference Rules {MP, MT, DN}**[Handout 2.3]**
- **Quiz 1**

Wednesday, 2/11: Basic Derivation Practice

- Simple Proof Practice

Thursday, 2/12: Intermediate Derivation Practice

- Embedded Proofs
- Homework 2 Due
    - Read Section 1.3 and complete Exercises 18, 21, 23, 24, 25.
    - Read Section 1.4 and complete Exercises 29, 34, 35.
    - Read Section 1.6 and complete Exercises 36, 37.
- Homework Questions

Monday, 2/16: WINTER RECESS (No classes!)

Tuesday, 2/17: Difficult Derivation Practice

- Eliminating Rules, Adding Rules
- Arguments in Practice
- **Practice Quiz 2**

Unit 3: Translations in Sentential Logic (SL)

Wednesday, 2/18: Intro to Translations in SL

- Syntax and Grammar of SL **[Handout 3.1]**
- "Stickiness Conventions" of SL **[Handout 3.2]**

Thursday, 2/19: SL to English

- Formal English of SL **[Handout 3.3]**
- Canonical Translations and Style
- **Quiz 2**

Monday, 2/23: English to SL

- Idiomatic Variants of Informal English for SL
- Translation Practice

Tuesday, 2/24: English to SL

- Homework 3 Due
    - Read Section 2.1 and complete Exercises 3, 4, 9.
    - Read Section 2.2 and complete Exercises 13, 14, 17, 21.
    - Read Section 2.3 and complete Exercise 22 (c), (d), (e), (g), (h), (j), (l), (o).
- Homework Questions
- **Practice Quiz 3**

Unit 4: Derivations in Sentential Logic (SL)

Wednesday, 2/25: Inference Rules of SL

- Inference Rules {S, Adj, Add, MTP, BC, CB} **[Handout 4.1]**

Thursday, 2/26: Inference Rules of SL Continued

- Simple Derivation Practice
- **Quiz 3**

Monday, 3/2: Further Derivations in SL

- Nested Derivations of SL
- Intermediate Derivation Practice

Tuesday, 3/3: Practice Derivations in SL

- Difficult Derivations
- Homework 4 Due
    - Read Section 2.4, skim Sections 2.5, 2.6, and complete Exercises 38 & 42.
    - Read Section 2.7 and complete Exercise 44.
    - Prove 4 of the following: T110, T102, T90, T107, T63, T25, T94, T61.
- Homework Questions

Wednesday, 3/4: Practice Derivations in SL

- Difficult Derivations
- Ambiguous Translations
- **Practice Quiz 4**

Unit 5: Models of Sentential Logic (SL)

Thursday, 3/5: Truth Tables

- Sentential Truth Conditions
- Truth of Singular Sentences in SL **[Handout 5.1]**

Monday, 3/9: Truth of Sentences

- Truth of Groups of Sentences in SL
- **Quiz 4**

Tuesday, 3/10: Validity and Arguments

- Validity of Arguments in SL
- Invalidity in SL

Wednesday, 3/11: Truth Table Practice

- Homework 5 Due
    - Read Section 2.8 and complete Exercises 51, 54.
    - Read Section 2.9 and complete Exercises 64, 65, 66, 76.
- Homework Questions
- Difficult Questions from Definitions

Thursday, 3/12: Completeness/Soundness of SL

- Metalogic Discussion
- Additional Sentential Connectives
- **Practice Quiz 5**

Monday – Friday, 3/16-3/20: SPRING RECESS (No classes!)

Unit 6: Translations of Monadic Logic (ML)

Monday, 3/23: Introduction to ML

- Syntax and Grammar of ML **[Handout 6.1]**
- (Your) Bondage (Your) Freedom

Tuesday, 3/24: ML to English
- Formal English of ML **[Handout 6.2]**
- Translation Practice
- **Quiz 5**

Wednesday, 3/25: English to ML
- Idiomatic Variants of Informal English for ML

Thursday, 3/26: Complicated Sentences
- Quantifying about Binary Sentences
- Practice with More Difficult Sentences

Monday, 3/30: Intermediate Translations
- Homework 6 Due
    - Read Section 3.1 and complete Exercises 8, 10, 11, 13, 15.
    - Read Section 3.2 and complete Exercise 17.
    - Read Section 3.3, 3.4 and complete Exercises 22, 23, 30, 32, 33, 34, 35, 38, 39, 55, 57.
- Homework Questions

Tuesday, 3/31: Challenging Translations
- Difficult Translations
- Limits of ML
- **Practice Quiz 6**

Unit 7: Models of Monadic Logic (ML)

Wednesday, 4/1: Modeling Basics
- Constructing Models **[Handout 7.1]**
- Satisfying Singular Sentences in ML

Thursday, 4/2: Grids and Possible Worlds
- Grid-Layouts of Arguments
- **Quiz 6**
- Satisfying Groups of Sentences in ML

Monday, 4/6: Invalidity of Arguments
- Invalidity in ML

Tuesday, 4/7: Modeling Practice
- Extra Exercises **[Worksheet 7.1]**
- Homework 7 Due
    - Skim Section 3.12 and complete Exercises 115 (#1), 117 (#2), 118, 122, 123, 124.
- Homework Questions

Wednesday, 4/8: Difficult Modeling Practice
- Modeling Spy Mission
- Infinite Models

Thursday, 4/9: Modeling and Validity
- Validity of Arguments in ML
- Enumerating Models
- **Practice Quiz 7**

Unit 8: Derivations in Monadic Logic (ML)

Monday, 4/13: Inference Rules of ML

- Inference Rules {UI, EG} **[Handout 8.1]**

Tuesday, 4/14: Derivations in ML

- New Boxing Rule {UD}
- **Quiz 7**

Wednesday, 4/15: ML Derivations Continued

- Inference Rule {EI}

Thursday, 4/16: ML Derivations Continued

- Derivations of QN
- Homework 8 Due
    - Read Section 3.5 and complete Exercises 59, 60, 61, 62.
    - Read Section 3.7 and complete Exercise 66.
    - Skim Section 3.8, 3.10 and complete Exercises 83, 84, 85, 89, 90, and do ONE of: {93, 98, 100, 105}
- Homework Questions

Monday, 4/20: Derivations Practice

- Long Derivations

Tuesday, 4/21: SCHOLARS' SYMPOSIUM (No regular classes: stay tuned for alternate plans!)

Wednesday, 4/22: Final Derivation

- Difficult Derivations
- Drunkard's Paradox
- **Practice Quiz 8**

Unit 9: Equality and Beyond

Thursday, 4/23: Many-Place Predicates

- Course Evaluations
- Grammar and Syntax Extensions
- Translations
- Equality and Numeracy

Monday, 4/27: Completeness and Soundness

- Metalogic Discussion
- Logic Murder Mystery **[Handout 9.1]**
- **Quiz 8**

Tuesday, 4/28: Retake Quiz Prep.

- Course Review
- Retake Questions
- Homework 9 (Optional) Due
    - Skim Sections 4.1 - 4.3
    - Read Section 4.4 and complete Exercises 15, 16, 17, 20, 21, 22, 23, 28, 30, 33, 34.

Final Exam

The final exam is on Friday, May 1st from 6:30 to 8:30 p.m. in our regular location, Colgate 220.

Assignments & Assessment

Attendance and active participation during class is crucial to success in mastering the course material and developing your skills. You are expected to come to class with informed questions about the relevant readings and exercises. I will keep track of attendance in class, but it is only one factor relevant to your participation grade. The quality and quantity of your contributions during class will be the primary basis for the participation aspect of your grade, but the quality and quantity of participation in office hours, email exchanges with the professor, and communication with the professor via note cards will also be considered.

If a student misses five classes without communicating an adequate justifying or excusing reason to me, I may initiate an administrative withdrawal to remove the student from the course, based on the student's performance in the course so far and my best estimation of whether the student will be able to successfully complete the course.

Homework assignments will be due regularly.

- If you turn in 2-4 satisfactory homework assignments, you will receive 5 points.
- If you turn in at least 5-7 satisfactory homework assignments, you will receive 10 points.
- If you turn in 8-10 satisfactory homework assignments, you will receive 15 points.

Thus it is only possible to earn 5, 10, or 15 points for the homework that you turn in.

Homework is due when class begins at 10:00 a.m., and late homework will NOT be accepted for credit unless (a) arrangements have been agreed upon with the professor in advance, which requires both planning and good reasons, or (b) in case of documented illness or other emergency beyond the student's control. If the latter, the student must contact me as soon as possible to make arrangements.

During the scheduled final exam period, I will provide alternate versions of the quizzes for all of the units that we have covered; the quizzes will be of the same approximate difficulty as the ones initially given, though (of course) the actual questions asked will be different. Any score you earn on a "Retake Quiz" will, if higher, replace the score you earned when you took the quiz for that unit the first time around. If you miss a quiz at any time throughout the term, you will be able to make up for that missed quiz by retaking it during the final exam time. Other than the two quizzes that you are allowed to make up during the final exam time, *there are no make-up quizzes*. Notice the italics: there will be no exceptions to this policy.

Your final grade will thus be based on:

Quizzes: 400 points worth (8 quizzes x 50 points each)
Homework: 15 points worth
Participation: 5 points worth

Total: 420 points possible

Final letter grades will be determined by adding up the number of points students earn throughout the term; one needs at least the number of points in the right hand column below in order to earn the corresponding letter grade. I will not "round up" the sum of points that you earn, and I do not grade on a curve.

A = 380 points
A- = 360 points
B+ = 348 points
B = 332 points
B- = 320 points
C+ = 308 points
C = 292 points
C- = 280 points
D+ = 268 points
D = 252 points
D- = 240 points
F = 239 points or fewer

Student Conduct

A respectful, civil environment is crucial for learning any subject, but especially so for philosophy, which involves questioning, defending, and criticizing the beliefs and practices that mean the most to us. Conduct that interferes with other students' ability to learn or my ability to teach is not acceptable and will not be tolerated. In particular, students should not interrupt other students or me, otherwise dominate class discussion, disparage or otherwise disrespect the ideas and beliefs of others (which does not mean that one cannot or should not respectfully provide reasons to disagree), habitually arrive late or leave early, make or receive phone calls, text, surf the internet, or use other technology that is not directly related to course goals.

Schedule Conflicts

Students are responsible for meeting all of their academic obligations, even if they are engaged in college-sponsored activities, i.e. theatre, athletics, or field trips. There are no excused absences for such activities. In the case of a scheduling conflict between two classes, students should make appropriate arrangements with the course instructors, being mindful that a regularly scheduled class has the higher priority.

Colby-Sawyer acknowledges that religious practices differ from tradition to tradition and that the demands of religious observance in some traditions may cause conflicts with student class schedules. If religious observance will cause a student to be absent from class or otherwise affect his or her ability to complete academic assignments, he or she must notify the instructor in advance and make necessary arrangements to complete the course materials.

Academic Integrity

All Colby-Sawyer College students are expected to understand the meaning of academic honesty and to behave in accordance with the college's policies on academic honesty as published in the Code of Community Responsibility. To read these policies, see the links found at http://www.colby-sawyer.edu/campus-life/conduct/honesty/index.html

Plagiarism is the use of creations, ideas, or words of others without formally acknowledging the author or source through appropriate use of quotation marks, references, and the like.

Plagiarizing is presenting someone else's work or thought as one's own original work or thought, whether it is intentional (on purpose) or unintentional (an accident).

More detailed resources explaining what counts as plagiarism and how to avoid plagiarizing are posted on the Moodle site for the class. If, after investigating those resources, you have questions about how to cite appropriately, please contact me *as soon as possible.* It is much better for everyone involved if a student gets help clearing up any confusion right away, before turning in the assignment, rather than waiting and having to deal with the bigger problem of plagiarism.

If I discover that a student has plagiarized or cheated in any way, the student will receive a score of zero for the assignment in question (and this may be sufficient to cause the student to receive a failing grade for the course overall). Whenever a student receives a score of zero for this reason, I arrange a meeting with the student so I can explain why the assignment constitutes plagiarism (or another form of academic dishonesty) and answer the student's questions. The main purpose of these meetings is to ensure that the student understands how to avoid similar problems in the future. After the meeting, I document my findings about the assignment and the content of our discussion in a letter, and send copies of that letter and the related evidence both to the student and to Dean Burton Kirkwood. The student is then asked to sign a copy of the letter (indicating that it is an accurate representation of what has occurred) and return the signed copy to Dean Kirkwood. Generally, for a first offense, no further penalties are assigned beyond the grade penalty on the specific assignment, but decisions about such things are in the hands of the dean, since only he has access to information about whether the student has been reported for a similar infraction before.

Disability Accommodations

Students who have a documented disability will be provided with reasonable accommodations. They are encouraged to contact Access Resources (accessresources@colby-sawyer.edu) as soon as possible to ensure that such accommodations are implemented in a timely manner. All accommodations must be approved by CSC Access Resources.

Concerns or Problems

If you have a concern or problem relating to any aspect of the course or your performance in it, get in touch with me, the professor, as soon as possible. I want to be able to help you, but if I do not know about your concern, I cannot address it. If discussing your concern with me (and implementing any plan we agree upon) does not resolve the issue, your next step would be to contact the chair of the department, Prof. Tom Kealy.