THINKING LOGICALLY
PHI 250-601 (DE course, 3 credit hours)
North Carolina State University
Spring 2016: Jan 6 – Apr 25

Prerequisites or co-requisites: none. **Other restrictions**: none.
GEP satisfaction: satisfies 3 credit hours of the 6-hour GEP Mathematical Sciences Requirement (at least one course towards this requirement must have an MA or ST prefix).

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Office hours (online): Mon, 10:45 a.m. – 11:45 a.m. and Wed, 10:45 a.m. – 12:45 p.m.
Office hours in this online course are held at my computer during which time I will be available to respond quickly to emails, chats, or discussion board comments. Outside of office hours, I intend to respond to all emails within 24 hours, probably sooner during the weekdays, perhaps longer during weekends. If you'd like to set up a time to talk on the phone, email me. [Campus office: 434A Withers Hall. Office phone: 919-515-6330]

SYLLABUS TABLE OF CONTENTS

1. COURSE DESCRIPTION

Course Catalog Description
"Deductive arguments attempt to guarantee their conclusions. Inductive arguments attempt to make their conclusions more probable. Using a small number of simple, powerful logical techniques, this course teaches you how to find, analyze and evaluate deductive and inductive arguments, and thus how to avoid the most common errors in reasoning."

Overview of the Course
Why should we think logically? Simply put: In order to arrive at better supported, more objective conclusions regarding every possible topic.

If we don't think logically, we are more likely led to false conclusions, thus hampering our search for theoretical and practical knowledge. If we don't think logically, we will be more likely deceived by

the illogical thinking of others who may wish to take advantage of us in the realms of politics, economics, etc. It is hard to persistently think logically. But the good news is that there are objective principles for thinking logically. Not only do we need to know the principles and techniques of logic, but we need to become habituated and disciplined in using them. We need to keep our guard up against faulty reasoning within others *and* ourselves.

To study logic is to study the nature of reasoning or argumentation. An argument is a set of two or more statements of which at least one statement, i.e., the premise (or premises), is purported to provide support for another statement, i.e., the conclusion. Human communication is typically filled with arguments—on news outlets, talk shows, in academia, in conversation between friends and family members—but not everything communicated is an argument. Sometimes we report events, or explain facts, or tell stories; other times, we argue for claims. The primary aim of this course is learn more about arguments: how to detect them, how to analyze them, how to evaluate them, and how to construct them. The course consists of three units.

The first unit covers **language and reasoning**. We will examine the nature of classification (organizing concepts) and propositions. We will also study techniques for analyzing arguments and determining the relationship between the premises and the conclusion of an argument. Moreover, we will explore twenty common fallacies, or errors in reasoning. The second unit covers **deductive logic**. After an introduction to categorical propositions, we will study the square of opposition and look at how Venn diagrams help in understanding categorical propositions. Then, we explore propositional logic, the foundation of modern symbolic logic and computation. We will study logical connectives, statement forms, truth values, formal properties and relationships, truth table tests for validity, and argument proofs using a set of inference rules. The third and last unit covers **inductive logic**. We will study inductive generalizations, Mill's methods for testing for causal relationships, and fundamental concepts of statistical reasoning while emphasizing how these topics relate to science as well as everyday situations.

Overview of course format and how to do well

This is a web-based, distance education introductory course on logic and critical thinking. Besides one book (hard copy or electronic copy), all other course materials are online at the course Moodle website, including assigned readings and instructor-prepared materials. Everyone in this course is an experienced student and learner, so it is assumed that everyone has the requisite study skills and habits to succeed in this course. **I strongly emphasize that, in order to do well in this course, you must be self-disciplined and dedicated.** You must be willing to develop an individual study schedule and practice good study habits. You will need to spend at least as much time with this course as you would if it were a regular, face-to-face course (including the time in and out of class involved in a face-to-face course).

You should do every activity listed under each topic and generally in the order the item appears in Moodle. The usual order of events will be reading an assigned chapter or part of a chapter, studying any instructor-created handouts (which often contain information not in the readings) and other materials (video or audio files), doing the assigned homework problems (listed at the end of the syllabus) and checking the solutions to these. You will likely discover your own particular method and order of doing things as you proceed.

If you do everything as assigned, and get help when needed, you should expect to pass the course (or do better than passing, depending on exact effort and skill). There is a lot of material in this course, but it can be absorbed by being disciplined and setting good habits. If you fall behind, set a plan to make up material you've missed. It is especially important to do homework problems and review the solutions, which will require you to review what you've studied and apply what you know.

2. GEP OBJECTIVES AND STUDENT LEARNING OUTCOMES

General Education Program (GEP) credit and the Mathematical Sciences GEP objectives

Successful completion of PHI 250 (Thinking Logically) satisfies **3 credit hours of the 6-hour Mathematical Sciences GEP requirement**, part of the NC State University General Education Program (GEP). However, *at least one* course towards this requirement *must* have an MA or ST prefix, which PHI 250 does not. Courses taken towards satisfying GEP requirements cannot be taken For Credit Only (S/U). Can this course count for the Mathematical Sciences GEP requirement and some other requirement? "A course taken to satisfy a Major requirement may also satisfy this requirement [Mathematical Sciences] if the course is on the approved GEP Mathematical Sciences course list [as PHI 250 is]. A course that satisfies the Mathematical Sciences requirement may also satisfy the Global Knowledge or U.S. Diversity co-requisite if the course also exists on either university approved GEP co-requisite course list." (http://oucc.ncsu.edu/gep-mathsci)

What is the rationale for the Mathematical Sciences GEP requirement? "A logical approach to problem solving is important for successful functioning in society. It is also important that students be able to formulate models, be critical consumers of quantitative information, communicate mathematically and solve problems." (http://oucc.ncsu.edu/gep-mathsci)

Because this course satisfies 3 credit hours of the 6-hour Mathematical Sciences GEP requirement, it "will provide instruction and guidance that help students to:
1. improve and refine mathematical problem-solving abilities;
2. develop logical reasoning skills." (http://oucc.ncsu.edu/gep-mathsci)

How the Mathematical Sciences GEP Objectives are satisfied by course-specific Student Learning Outcomes

Under each GEP Objective, course-specific Student Learning Outcomes are specified with explanations of *how* the Mathematical Sciences GEP Objectives are satisfied by specific Student Learning Outcomes, and *how* the Student Learning Outcomes are measured or assessed (some examples are given).

<u>Mathematical Sciences GEP Objective 1</u>: "improve and refine mathematical problem-solving abilities."

> **Student Learning Outcome**: Students will be able to precisely analyze arguments, identify errors in arguments, and evaluate arguments from a variety of contexts, by using logical principles and techniques that have objective status equivalent to mathematical principles and techniques.
>
> **How this Student Learning Outcome fulfills Mathematical Sciences GEP Objective 1**: In learning to precisely analyze arguments, identify errors in arguments, and evaluate arguments from a variety of contexts, students will become familiar with a variety of logical principles, tools, and techniques (call this a "logical toolkit"). The logical toolkit is strongly analogous to a mathematical toolkit because what's in it is equally precise, rigorously developed, and widely applicable to a variety of problems. However, the logical toolkit is typically applied to verbal and, qualitative content, whereas the mathematical toolkit is applied to quantitative content. Logic concerns words, math concerns numbers: but both give students tools for identifying and offering solutions to problems. Moreover,

many logical tools follow formats akin to mathematical tools, and both sets of tools require consistency and precision in applying them.

Outcome assessment: This outcome is assessed through objective questions on exams and quizzes. Question formats include multiple choice, true/false, and written responses requiring diagramming, proof-construction, or verbal analysis.

Below are example questions relevant to the above Student Learning Outcome.

Example written response question: Assign letters for each atomic statement in the argument below (use M, G), then use a truth table to determine if the argument is logically valid or not. If it is valid, then use the inference rules of propositional logic to demonstrate its validity and properly cite the rules.
1. The moon revolves around the Earth or it is not subject to the law of gravity.
2. The moon does not revolve around the Earth.
3. The moon is not subject to the law of gravity.

This is a disjunctive syllogism, a common form of argument. Once the argument is symbolized and the truth table is constructed (listing all the possible combinations of truth-values for M and G), it will be seen that there is no line on which the conclusion is false while both premises are true. So, the argument is valid. Here is the proof.

1. M v ~ G   (premise)
2. ~ M   /~ G   (premise/conclusion)
3. ~ G   (1, 2 DS)

This is a relatively simple argument. Students will deal with arguments that are more complex in the course.

Example multiple-choice question: Which rule is used in the following inference?

$[(J \lor K) \supset L] \cdot (M \supset N)$
$\underline{\sim L \lor \sim N}$
$\sim(J \lor K) \lor \sim M$

a.	Hypothetical Syllogism	d.	Constructive Dilemma
b.	Modus Ponens	e.	Destructive Dilemma
c.	Modus Tollens		

[The correct answer is *e*. The example is based on a problem in the test question bank provided by David Kelley, the author of the assigned textbook.]

Students may also be examined on the above Student Learning Outcome by having to compare two supposed proofs of a single valid argument in symbolic form, and determine which proof is correct.

Mathematical Sciences GEP Objective 2: "develop logical reasoning skills."

    Student Learning Outcome: Students will be able to analyze the logical structure of statements and arguments, and apply basic rules of deductive and inductive reasoning.

    How this Student Learning Outcome fulfills Mathematical Sciences GEP Objective 2: Understanding the reasons and ideas that support a claim, regarding questions of human knowledge, reality, and values, requires that one be aware that the same (or similar) reasons and ideas can often be used to support differing claims that one may claim to *know* that something is the case (where the idea of knowing is itself subject to interpretation and scrutiny in philosophy). In turn, this requires that one give a specific interpretation of the reasons and ideas, linking them to other reasons and ideas to generate a conclusion that yields possible new knowledge. In sum, understanding the rational basis (that is, relating to reasons) and conceptual basis (the basis in ideas) for different perspectives puts one in position to discuss different interpretations of those reasons and ideas.

    By learning logical concepts, like the concept of a valid argument, and studying examples of various forms of logical argument, students will begin to employ these in their own reasoning about philosophical issues. Additionally, they will notice philosophical principles and theories, as well as important empirical claims, in arguments, and learn to incorporate them into their own arguments. These theories and claims, given the nature of the course material, relate directly to human experience (e.g., theories about values and the nature of right and wrong, empirical facts about human perception and cognition, the nature of personhood, the nature of the divine, and free will and determinism). Given all of these factors, students will critique and formulate arguments—based on philosophical ideas, logical principles, and relevant facts—concerning human experience and values. In doing so, they will display rational sensitivity to competing arguments and objections.

    Outcome assessment: This outcome is assessed through objective questions on exams and quizzes. Question formats include multiple choice, true/false, and written responses requiring diagramming, proof-construction, or verbal analysis.

    Below is an example question relevant to the above Student Learning Outcome.

    Example question: Either some object's behavior can be predicted mathematically or its behavior is random. Human behavior cannot be predicted mathematically. Therefore, human behavior is random. If something's behavior is random, it is not a proper subject of physical science. Therefore, (*fill in the appropriate conclusion with one of the choices below*).

        a. …human behavior cannot be predicted mathematically.
        b. …human behavior is random.
        c. …human behavior is not a proper subject of physical science.
        d. …human behavior is hard for psychologists to study.
           [The correct answer is *c*] [This is an easy to moderately difficult exercise]

See section 5 of the syllabus for further details on assignments and exams, and see section 10 for a complete breakdown of all course topics and reading assignments.

3. **REQUIRED COURSE MATERIALS**

1. ***The Art of Reasoning: An Introduction to Logic and Critical Thinking***, by David Kelley. W.W. Norton. 2014. Either the hard copy (depending on the seller, $60-$110 new) or an electronic copy (approximately $50). Note: according to the publisher the electronic version is "Flash based and will not work on the iPad, iPhone, iPod Touch, and some Android devices." D.H. Hill Library at NC State has a copy of this book on physical reserve.

   Info about the different textbook versions: http://books.wwnorton.com/books/detail-formats.aspx?ID=4294977874.

   There are also online resources you automatically get access to by purchasing this book, such as the online Study Space (http://wwnorton.com/college/phil/artreas4/welcome.aspx), but all of these resources will be available through Moodle as well.

2. **Moodle.** It is assumed that you have reliable access to a computer and a reliable internet connection; if you do not own a computer, some are available for use at the University library, other areas of campus, and at public libraries. You will ***need*** to be able to access Moodle (https://moodle1516-courses.wolfware.ncsu.edu/my/), the University-approved Learning Management System this course utilizes.

   All learning materials (handouts, study tools, etc.) are available through Moodle. All quizzes and exams will be given through Moodle.

   Some recommended (but not required) materials will be linked from Moodle to **Electronic Reserve (e-reserve)** (https://reserves.lib.ncsu.edu/). All uploaded materials at e-reserve are approved by library staff for uploading. Video presentations will link from Moodle to Mediasite (http://accessibility.oit.ncsu.edu/profiles/mediasite.php).

3. **Handouts, audio files, and other course materials**. Handouts, slides, audio files, etc. will be available through Moodle. Their purpose is to provide analysis of assigned readings and help in learning the main concepts and principles; all of these materials are organized in Moodle in accordance with the schedule of units stated in Section 10 of the syllabus.

Copyright of course materials
All course materials are copyrighted, including instructor-prepared materials (handouts, presentations, etc.). They are intended solely for your personal, educational use. You may be required to access the NCSU library electronic reserve (in all cases where materials are on e-reserve, a link is provided from Moodle to the e-reserve site). Any electronic copies of journal articles assigned for this course are made accessible only to individuals enrolled in this course, and provided only for educational purposes consistent with fair use rules. Some resources may be linked within Moodle and are available on the Internet freely, but you should be aware of policies at those sites when visiting (again, it is assumed that you are using these only for educational purposes). Please consult with me if you have issues with accessing Internet material outside the confines of Moodle or library electronic reserves. Be familiar with the University Copyright Infringement Policy Statement, regarding the restriction on sharing content of course materials at http://policies.ncsu.edu/regulation/reg-01-25-02. When you access e-reserves or other copyrighted course material (including instructor-prepared material), you are affirming

this statement: "I acknowledge that all documents (hard-copy or electronic, to include articles, lecture notes, handouts, exams, etc.) made available to me for the course PHI 250 taught at NC State University in the current term are copyrighted and intended for my personal use. By logging into the PHI 250 website (through Moodle), you certify that you will not share any content of the class PHI 250 at NC State University website with a third party without written permission from the instructor, Prof. William Bauer" (statement based on University recommendation).

4. CLASS PROCEDURES & POLICIES

Instructor's role and perspective
My job is to guide you through the topics and exercises, answer questions as they arise via email or through the discussion board, and fairly assess your understanding of the material. I've carefully selected topics so that concepts build on each other as much as possible given that this is a broad introduction to logic. The materials I prepare to accompany the text are aimed at making more difficult material easier to understand, and highlighting the most important aspects. I am not teaching my own views about logic and critical thinking, but standard, well-established concepts, principles, and methods.

Using the discussion board/forum in Moodle
I ask that **all class members respect the rights of other class members to express their comments or questions**. If your tone or demeanor becomes disrespectful to others in class, I will let you know in a persona email. It is highly desirable in studying philosophy and logic that significant class discussion occur; to that end, **you are encouraged to express your reasoned opinions, questions, and comments during the course at any time** on the discussion board. You can use the discussion board (a continuously open online forum in Moodle) anytime for course-related questions and comments, either concerning content, readings, expectations, etc. (however, email me if you have *personal* concerns that need to be brought to my attention or you want to discuss quiz or exam questions before others answer them). If you post a message on the discussion forum, obviously it will not be private; if you are not comfortable doing this, yet you have a comment or observation you'd like to make, you can communicate to me, and I can post it anonymously.

If you know the answer to someone's question, go ahead and respond—help out your peers—I will check all comments and follow-up as appropriate. Exercise good judgment in what you post. The most important advice is to stick to the course content: e.g., ask about a method, or concept, or problem from the text, etc. Avoid simply sharing interesting links to sources outside of the course, unless you think it could be very helpful to everyone; if in doubt, you can ask me first.

Do NOT post questions from the quizzes or exams to the discussion forum while they are open for the rest of the class; doing so would constitute an integrity violation. Although you can work in small groups on quizzes and exams (more on this below), I don't want an open forum about quiz or exam questions; that goes too far. However, if you have a question about a particular quiz question, you can of course bring it to my attention.

If you post something, don't fret if no one responds. It doesn't mean it wasn't an interesting comment or question. I will always respond when I deem that a response is helpful to the majority of the participants, or a clarification needs to be made, or in other circumstances. If you want to respond to someone individually, you can do that too—I'm sure the person would appreciate the response; however, if your observation could be helpful to everyone, then let it be read by everyone. In all cases, stick to the topic and be respectful.

Lastly, I will keep track of good quality comments and questions. Good participation on the discussion board can be helpful to your grade at the end of the course (some insightful comments or good questions may give you a bump of 1 or more points), besides helping in your own understanding.

Informal surveys

I might sometimes conduct informal surveys (simply asking for responses to a question) on various topics; this is voluntary but it is extremely helpful in generating discussion or learning how better to present something.

Email and contacting the instructor

See the comments under Office Hours on page 1 of the syllabus. Also, see "Contacting the Instructor" near the top of the Moodle page.

Respect, discussion, and participation

Some of the examples and exercises in the course have controversial content, concerning philosophical, political, or religious issues. Please recognize that almost everyone will have an opinion or claim about almost every topic, but in this course we are interested only in logical and objective assessment. It is important to use examples that connect to the actual world so that we can see why logic is so important. There may be an argument for a controversial conclusion, but we are not interested in whether that conclusion is actually true in the course, rather we are interested in the logical support the argument gives to the conclusion.

Small groups are optional to you

There are no official groups of students, but you may find it beneficial to form such groups with peers, both for studying and working on quizzes/exams. Although you are allowed to take your individual quizzes and exams in groups, your final answers are your answers (more below on this). There are costs and benefits to this, based on your individual learning methods and desires. Some of you might highly appreciate not having assigned groups, and others might not. What is most important is that you personally engage with the material. You are invited to have as much discussion as you desire, based on your individual learning tendencies. The email of everyone enrolled in the course is at Moodle (this is a standard condition for being enrolled in a course at the University).

5. GRADED ASSIGNMENTS AND GRADING PROCEDURES

All exams and quizzes are online through Moodle, with open notes, open book, and open computer (i.e., you can search the Internet). All quizzes and exams combined are worth 250 points, consisting of the following.

3 exams, 150 points: 50 points each (60% of grade)
10 quizzes, 100 points: 10 points each (40% of grade)

In order to PASS the course, you must do all of the following: (i) achieve sufficient points to earn a passing grade (see the scale below), and (ii) take all three exams. This means you can miss some of the quizzes but still pass the course. It is advisable to take *all* the quizzes.

Course grading scale
The following scale, with 250 possible points, assigns letter grades according to traditional percentages: A's in the 90-100% range, B's in the 80-89% range, C's in the 70-79% range, D's in the 60-69% range, and F's at or below 59%.

Numerical total	Letter grade
242-250	A+
232-241	A
224-231	A-
217-223	B+
207-216	B
199-206	B-
192-198	C+
182-191	C
174-181	C-
167-173	D+
157-166	D
149-156	D-
148 or below	F

Exams – FURTHER DETAILS
Three exams constitute the bulk of your grade in the course. All exams are online. Exams are open notes and open books; however, if you don't know the material well, it will be hard to complete the questions in the given time limit (75 minutes). You must take your own exam (obviously), but you may work in small groups on exams (and quizzes) although this is discouraged (see the note below for further information). Each exam will open for about two days; see the schedule in section 10 of this syllabus. The exams mainly have multiple-choice questions (80% of the exam points, or 40 questions for 40 points) plus 1-2 short-answer or essay questions requiring you to explain a concept, analyze an argument, respond to a diagram, etc. (20%, for 10 points). Multiple-choice questions may refer to diagrams, pictures, or proofs embedded with the question; you may have to work out your answer on scratch paper. Questions may be factual, conceptual, or applied.

Quizzes – FURTHER DETAILS
Ten quizzes (10 questions for 10 points total; 20 minutes long in most cases but 30 minutes in some) on various topics are assigned throughout the course. You must take your own quiz (obviously), but you may work in small groups on exams (and quizzes) although this is discouraged (again, see the note below for further information). Each exam will open for about two days; see the schedule in section 10 of this syllabus. Quizzes will consist entirely of multiple-choice questions of the variety discussed under Exams above. Each quiz will open for at least one week; see the schedule in section 10 of this syllabus.

Further note on working in groups
On the quizzes and exams, you can work alone *or* consult others, and use all your notes, the book, handouts, or the Internet. But you must take the quiz or exam yourself, and you take responsibility for the answers you submit. I advise working alone. Trust your own studying and reasoning ability; be confident and stay focused, and you should do well. Although you may work in groups on quizzes and

exams, this is not "group work" in the strictest sense because you are not turning in a group product or a group exam; it is still your individual quiz or exam and your grade. You can discuss your questions and answers with each other to help you arrive at a better conclusion.

On one hand, this may help you feel more comfortable and in fact you may learn from each other in some instances. On the other hand, this is discouraged for several reasons. First, you won't be personally challenging yourself as much as possible; second, believing the answers of others is akin to believing rumors (what is your reason for believing that someone in a small group knows more than you about the material you've both been studying?); third, groupthink is problematic (psychologist Irving Janis in 1972 first described this phenomena in which people tend to conform to others in group decision-making); fourth, many of the questions you get will be different from the questions others get.

Homework exercises – not graded, but important to your success
Homework exercises or problem sets are assigned for every major topic covered. There are many problems in the text not assigned, but the ones that are assigned are carefully selected to challenge you (both in content and quantity) but not overwhelm you. If there are exercises not assigned that you want to inquire about or check answers for, let me know. If you do not the homework exercises, you will not do well. See the schedule in section 10 for a list of all assigned problems. Exercise sets are not graded; for all assigned exercises not answered in the assigned text (starred exercises), answers will be posted on Moodle. Doing the assigned exercises will significantly enhance your understanding of the material and improve your chances of earning the grade you want. If you need clarifications about exercises, do not hesitate to contact me.

Final grades
For the final course grade, the total points earned for exams and quizzes will be added and letter grades assigned according to the scale above. You can determine where you stand at any given point by dividing your points earned by points possible up to that point to; the percent will give you a good indicator of your current letter grade. The course is designed with a reasonable (though challenging) assignment load and fair standards, so *if you do the exercises, stay focused, and seek help when needed,* you should expect to pass the course. But the standard for earning an "A" is hard, as it should be. Extra studying, extra questioning, extra interest, extra attention to detail, etc., can all contribute a couple of extra points earned on an exam or quiz, and make the difference between a B+ and an A-, or a C+ and B. Please do not ask for an extra credit assignment at the end of the course, or to redo a quiz or exam to get a few more points.

Grades on Moodle
The Moodle grade book contains your official assignment grades and only you can see your grade (besides the instructor). I will back this up periodically, although it may be good for you to keep track of your scores separately in case there's a University server meltdown or something. Also, **if you need a report filled out on your current course performance** for athletics, sororities, fraternities, etc., please coordinate with me by email (I am happy to fill out these forms only when you take the initiative to contact me personally).

Attendance
"Attendance" consists of completing all assignments, quizzes and exams. Moodle keeps an activity log of individual users, which the instructor has access to. Please see University policy on attendance at http://policies.ncsu.edu/regulation/reg-02-20-03, which will be enforced as appropriate (including the Drop for Non-Attendance Policy).

Late assignments and make-ups
Make-up exams are **not allowed** without prior arrangement with the instructor, and are only allowed for reasons approved by University policy (see the previous passage) such as official University athletic obligations. If you miss a deadline, then you miss a deadline. That statement is a tautology, meant to emphasize that no extensions on quizzes will be given. There is one exception: if you can produce a written record of a verifiable emergency that covers a *significant* portion of the time the quiz or exam was open in Moodle, then an extension *may* be given.

Discussing grades and performance
I am always willing to discuss your performance on assignments, and reviewing your performance with me is a good way to make progress. If you wish to contest your grade on an assignment with me (by challenging a question's legitimacy, or how much was taken off for an incorrect answer, etc.), **do NOT expect an increase of your grade unless it is clear that a verifiable mistake was made**.

6. ACADEMIC INTEGRITY ON COURSEWORK

All students are required to follow the standards of academic honesty as stated in the NC State Code of Student Conduct. **Plagiarism and cheating are serious ethical violations** representing a lack of moral character and dedication to learning. Violations may lead to failure of the course. ***Don't do it.*** Don't cheat yourself, and don't cheat others. **On all assignments or exams, when you submit these in any format, by any means, you are automatically affirming the following statement:** *"I have neither given nor received unauthorized aid on this test or assignment."*

Furthermore, by enrolling in this course, you affirm that you will do your own work and not cheat in any way, e.g., by plagiarizing others' work, or having someone complete your work for you. As stated, on quizzes and exams in this course you can discussion questions with peers; so you take the exam with a few peers, for instance, and be there to talk to each other. But you must take your own exam, and you take ownership of the answers you submit. Penalties for integrity violations will range from grade-reduction to failure of the course; infringements will be reported to the Office of Student Conduct. Be familiar with the Code of Student Conduct addressing academic integrity and other important issues, as outlined by the Office of Student Conduct, at this web address: http://studentconduct.ncsu.edu/policies-and-procedures. The official University policy is available at http://policies.ncsu.edu/policy/pol-11-35-01, and you should be familiar with it too.

7. PRIVACY POLICY

"Students may be required to disclose personally identifiable information to other students in the course, including via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect one another's privacy by not sharing or using such information outside the course" (this statement is from official University policy). In this course, no personally identifiable information will be disclosed to individuals outside the class enrollment/roster (but those enrolled in the course can see who else is enrolled) or the course administrative chain (unless required by law or some other University policy).

Your assignments will of course be viewed by the instructor; but if you voluntarily raise a question or make a comment or advance an observation in class (on the discussion forum, for instance), then, of course, that is not private.

We will sometimes discuss controversial topics, via examples that we apply logical principles to evaluate. Each participant can raise questions that others (including the instructor) can respond to, make comments, and advance observations about course content. These discussions are for everyone's benefit, and everyone should feel free to express their personal opinions about the topics we discuss, or simply try out new opinions to test them. Treat your peers *with respect and courtesy*. See University regulation at: http://policies.ncsu.edu/regulation/reg-08-00-11.

8. STUDENTS WITH DISABILITIES

"Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at Suite 2221 Student Health Center, Campus Box 7509, 919-515-7653. http://dso.dasa.ncsu.edu/ For more information on NC State's policy on working with students with disabilities, see the **Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) http://policies.ncsu.edu/regulation/reg-02-20-01**."

"Students with verified disabilities are encouraged to make an appointment with the instructor to discuss academic accommodations."

(The above statements are from official University guidance.)

9. ADDITIONAL POLICIES AND IMPORTANT NOTES

NC State polices, regulations, and rules (PRR)
"Students are responsible for reviewing the NC State University PRR's located at **https://dso.dasa.ncsu.edu/responsibilities/** *which pertains to their course rights and responsibilities."*
(This statement is from official University guidance.) (The specified website includes links to policy statements on Equal Opportunity and Non-Discrimination, Code of Student Conduct, Grades and Grade Point Average, Credit-Only Courses, and Audits.)

Equality of opportunity
"NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations governing discrimination, harassment, and retaliation may be accessed at http://www.ncsu.edu/policies/campus_environ or http://www.ncsu.edu/equal_op. Any

person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 515-3148" (statement from official university policy).

Supporting fellow students in distress
"As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you. When this is the case, I would encourage you to report this behavior to the NC State Students of Concern website: http://studentsofconcern.ncsu.edu/. Although you can report anonymously, it is preferred that you share your contact information so they can follow-up with you personally" (statement from Division of Student and Academic Affairs).

Class evaluations
Your feedback about the course and the instruction is valuable. I might ask for informal feedback along the way about specific materials or activities in order to make appropriate adjustments to this and further courses. Formal, end-of-course, online evaluations will be conducted per NC State University policies. The evaluation system will be available during the last two weeks of the course, and will close before final exams begin. Here is the official University statement regarding class evaluations: "Students will receive an email message directing them to a website where they can login using their Unity ID and complete evaluations. All evaluations are confidential; instructors will not know how any one student responded to any question, and students will not know the ratings for any instructors." More information about class evaluations: http://www.ncsu.edu/UPA/classeval/;
Evaluation website: https://classeval.ncsu.edu/; Student help desk: classeval@ncsu.edu

Student grievances
Please see University regulation: http://policies.ncsu.edu/regulation/reg-11-40-01.

Adverse weather policy
Weather can affect Internet accessibility which is essential to the completion of this course. Check http://www.ncsu.edu/ for updates on the University's open/closed status, or call 919-513-8888. For the policy on Adverse Weather and Other Emergency Conditions, please see http://policies.ncsu.edu/regulation/reg-04-20-07.

Recording lectures and discussion
"Students may not use recording devices in the classroom without explicit prior permission of the instructor. If permission is granted, there must also be no member of the class who objects. Instructor and class permission is not required when an accommodation notification from Disability Services has been received by the instructor, which identifies a student that requires the use of a recording device. However, the instructor may prohibit the use of any recording device when it would inhibit free discussion and free exchange of ideas in the classroom" (statement from University policy at http://policies.ncsu.edu/regulation/reg-02-20-11).

Philosophy opportunities and CHASS Career Services
I might occasionally forward information about scholarship opportunities, graduate opportunities, etc., to the class. Additionally, I am happy to discuss with any of you how philosophy connects with various career paths, or about further undergraduate or graduate studies in philosophy.

Furthermore, here is a statement from CHASS Career Services that may be of interest especially if you are a CHASS major: "Explore career options related to your major, make decisions about your major or minor, build resumes and cover letters, prepare for interviews, develop internship/job search strategies, maximize career fairs, and more. Use ePACK to make an appointment with your career counselor […] through ePACK. Career Development Center, 2100 Pullen Hall. careers.ncsu.edu."

10. COURSE SCHEDULE: TOPICS, READINGS, AND ASSIGNMENTS

The instructor reserves the right to change the course schedule and syllabus content with appropriate notification to students. Any changes will be promptly announced in class or through email.

Important course dates combined with important University dates [course information is bolded]
- First day of classes: Wed, Jan 6
- Last day to add a course without instructor permission: Tue, Jan 12
- Holiday – NO CLASSES (Martin Luther King, Jr. Day): Mon, Jan 18
- Census Date/Official Enrollment Date – Last day to add a course; last day for tuition refunds due to dropping a course or changing from credit to audit; last day for undergraduates to drop below 12 hours or drop a course without a W grade: Wed, Jan 20
- **Quizzes 1-4 open when the course opens & close on Mon, Feb 15 (11:59 p.m.)**
- **Exam 1 is open Mon, Feb 15 (8 a.m.) through Tue, Feb 16 (11:59 p.m.)**
- Drop/Revision Deadline – MyPack Portal closes for drops at 11:59 p.m.: Wed, Mar 2
- Holiday – NO CLASSES (Spring Break): Mon – Fri, Mar 7 – 11
- Holiday – NO CLASSES (Spring Holiday): Fri, Mar 25
- **Quizzes 5-9 open when Exam 1 opens & close on Mon, Mar 28 (11:59 p.m.)**
- **Exam 2 is open Mon, Mar 28 (8 a.m.) through Tue, Mar 29 (11:59 p.m.)**
- Last day of classes: Mon, Apr 25
- Reading Day: Tue, Apr 26
- Final exam period: Wed, Apr 27 – Thu, May 5
- **Quiz 10 opens when Exam 2 opens & closes on Wed, Apr 27 (11:59 p.m.)**
- **Exam 3 is open Wed, Apr 27 (8 a.m.) through Thu, Apr 28 (11:59 p.m.)**

Recommended quiz schedule
The quizzes are open for a long time to give you flexibility. However, below is a recommended schedule to keep you on a reasonable learning pace.
- Quiz 1: Jan 15
- Quiz 2: Jan 22
- Quiz 3: Feb 1
- Quiz 4: Feb 12 [quizzes 1-4 officially close Feb 15, 11:59 p.m.]
- Quiz 5: Feb 26
- Quiz 6: Mar 4
- Quiz 7: Mar 11
- Quiz 8: Mar 18
- Quiz 9: Mar 25 [quizzes 5-9 officially close Mar 28, 11:59 p.m.]
- Quiz 10: Apr 25 [quiz 10 officially closes Apr 27, 11:59 p.m.]

You must do the assigned readings! If you do not do them, you will significantly hurt your chances of passing this course. It takes time to absorb the principles and techniques studied in this course, and that

starts with you being proactive and sticking to the assigned schedule. Additional materials created by the instructor will help you focus on essential points in the text, as well as supplement the text. Materials prepared by the instructor are designed to *complement* but not replace the assigned readings and exercise sets. *You are responsible* for being familiar with material both from the readings and other materials. In this five-week course, you should be completing major topic and the designate homework every 2-3 days. Exercise sets, quizzes, and exams are carefully designed to motivate your progress through the material while challenging you.

Recommended checklist to maximize your chances of doing well (earning a good grade and learning)
1. Read the assigned chapter (or sections) in each sub-unit.
2. Identify key concepts, principles, and techniques; make your own notes as needed.
3. Study the handouts, listen to audio files or watch videos (depending on topic) to reinforce your learning. Also, you will find flash cards and summary boxes on Moodle.
4. Try some of the self-reviewable (starred) exercises for each section of a chapter as you complete reading that section.
5. Do all assigned homework exercises, and check your work against the answers on Moodle. Try them again if needed.
6. Ask questions on the discussion board or via email.
7. Take all quizzes. Review problems you have trouble with.
8. Prepare yourself for the exams by taking the review quizzes, revisiting challenging concepts, and reviewing exercises.

Schedule and homework list starts on next page

Unit 1: Language and Reasoning

Topic: What is logic? – Philosophy, logic, and thinking [course introduction]
Reading assignment to complete: Kelley, Introduction (pp. 1-5) [optional]
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
No assigned homework

Topic: Classification – organizing our experience of the world
Reading assignment to complete: Kelley, Ch. 1 (entire)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Homework exercises to complete:
   Exercise set 1.1 (p. 12), *Group A*: 1, 2, 4, 5, 7, 9, 10, 13, 15; *Group B*: 1, 3, 4, 5, 7, 8, 13
   Exercise set 1.2 (p. 17): 1, 3-5, 7, 10, 11, 13, 15
   Exercise set 1.3 (p. 21), *Group A*: 1, 2; *Group B*: 1-3, 5; and exercise C
Review homework: starred exercise solutions are in Kelley; non-starred exercises solutions are posted on Moodle

Quiz #1
Covers Ch. 1   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Propositions – the units of reasoning
Reading assignment to complete: Kelley, Ch. 3 (intro and sections 3.1, 3.2 only)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete after class:
   Exercise set 3.1A (p. 50): 1-4, 7, 8, 10-13, 15
   Exercise set 3.1B (p. 52): 1-5, 7-9
   Exercise set 3.2A (p. 55), *Group A*: 1-4; *Group C*: 1-4
   Exercise set 3.2 B (p. 57): 1, 3-5, 7, 8

Quiz #2
Covers sections 3.1 and 3.2   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Argument Analysis
Reading assignment to complete: Kelley, Ch. 4 (intro and sections 4.1, 4.2, 4.3, 4.4 only)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
   Exercise set 4.1 (p. 71): 1-4, 7, 9, 10-13
   Exercise set 4.2 (p. 77), *Group A*: 1-5; *Group B*: 1-5, 7, 8, 10; *Group C*: 1-5, 7, 9
   Exercise set 4.3 (p. 81): 1-3, 5-7, 10
   Exercise set 4.4 (p. 86): 1, 2, 4-8, 10, 11, 13, 14, 15

Quiz #3
Covers sections 4.1 to 4.4   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Fallacies – common errors in reasoning
Reading assignment to complete: Kelley, Ch. 5 (entire)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 5.1 (p. 109): 1-7, 10, 11, 13, 14
    Exercise set 5.2 (p. 115): 1-3, 5-7, 9, 12
    Exercise set 5.3 (p. 126): 1-8, 11-14, 16, 19, 22, 23
    Exercise set 5.4 (p. 133): 1, 2, 4, 5, 7, 9, 10-14

Quiz #4
Covers Ch. 5   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Exam 1: Language & Reasoning (60 minutes)
Covers all topics in Unit 1   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Unit 2: Deductive Logic

Topic: Categorical Propositions
Reading assignment to complete: Kelley, Ch. 6 (intro and sections 6.1, 6.2, 6.3, 6.4)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 6.1A (p. 147): 1-8, 10, 11, 13, 15
    Exercise set 6.1B (p. 151): 1-4, 7-10, 18, 19
    Exercise set 6.2 (p. 155): 1-4, 7-10
    Exercise set 6.3 (p. 158): 1-4, 7-10
    Exercise set 6.4 (p. 161): 1, 2, 4, 5, 7, 10

Quiz #5
Covers sections 6.1 to 6.4   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Three types of syllogisms (with a focus on hypothetical syllogisms)
Reading assignment to complete: Kelley, Ch. 8 (sections 8.2A and 8.2B only)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 8.2A (p. 227): 1, 2, 4-10, 15, 16, 20
    Exercise set 8.2B (p. 231): 1-8, 19, 21, 22

Topic: Propositional Logic—Propositions (connectives)
Reading assignment to complete: Kelley, Ch. 9 (intro and section 9.1)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 9.1A (p. 266): 1, 2, 4-8, 10, 12, 13
    Exercise set 9.1B (p. 270): 1-7, 10, 12-14, 16, 17, 19
    Exercise set 9.1C (p. 274): 1, 3, 4, 6-10, 12-16, 19, 21, 22, 24, 25

Quiz #6
Covers section 9.1   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Propositional Logic—Propositions (statement forms; computing truth values)
Reading assignment to complete: Kelley, Ch. 9 (sections 9.2, 9.3)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 9.2 (p. 280), Group A: 1-10; Group B: 1-5, 7, 8, 10, 11, 13, 16, 19, 20, 25, 31, 32, 34, 35
    Exercise set 9.3 (p. 287): 1-5, 7, 8, 10, 13, 14

Quiz #7
Covers sections 9.2 to 9.3   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Propositional Logic—Propositions (formal properties & relationships)
Reading assignment to complete: Kelley, Ch. 9 (section 9.4)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 9.4A (p. 289): 1, 2, 4-7, 9-11, 13
    Exercise set 9.4B (p. 295): 1, 2, 4, 5, 7, 8, 13, 15, 16, 19

Topic: Propositional Logic—Arguments (truth table test for validity)
Reading assignment to complete: Kelley, Ch. 10 (intro and sections 10.1, 10.2)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 10.1 (p. 305): 1, 3, 4-7, 10
    Exercise set 10.2 (p. 310): 1, 2, 4, 7-9, 12, 13, 16

Quiz #8
Covers sections 9.4 to 10.2   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Propositional Logic—Arguments (proof construction)
Reading assignment to complete: Kelley, Ch. 10 (sections 10.3A, 10.3B, 10.3C)
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 10.3A (p. 315), *Group A*: 1-4, 9, 10, 13, 14, 17-19; *Group B*: 1, 2, 4, 6, 7, 9-11, 13
    Exercise set 10.3B (p. 320), *Group A*: 1-5, 7, 10-13, 16-19; *Group B*: 1-4, 6-8, 10, 13, 16, 17, 19
    Exercise set 10.3C (p. 326), Group A: 1-5; Group B: 1-5, 7, 10, 13, 15, 16, 18, 19, 21, 23, 31, 37
    Additional Exercises, set E (p. 356): 1, 2, 3, 11

Quiz #9
Covers sections 10.3A, 10.3B, 10.3C   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Exam 2: Deductive Logic (60 minutes)
Covers all topics in Unit 2   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Unit 3: Inductive Logic

Topic: Inductive Generalizations (focus on causal reasoning)
Reading assignment to complete: Kelley, Ch. 12
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 12.1 (p. 422), Group A: 1, 3, 4, 5, 7, 9, 10; plus Exercise B
    (No exercises for 12.2)
    Exercise set 12.3 (p. 430): 1, 2, 4, 6, 7, 9
    Exercise set 12.4 (p. 435), *Group A*: 1-4; *Group B*: 1, 3, 4, 6, 7, 9

Quiz #10
Covers Ch. 12   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

Topic: Statistical Reasoning
Reading assignment to complete before class: Kelley, Ch. 14
Complete all other activities in Moodle: study handouts, listen to audio files, watch videos, etc.
Exercises to complete:
    Exercise set 14.1 (p. 458), *Group A*: 1, 2, 4; *Group B*: 1, 2, 4, 5
    Exercise set 14.2A (p. 460): 1, 3-5, 7, 9
    Exercise set 14.2B (p. 463): 1, 2, 4, 5
    Exercise set 14.2C (p. 465): 1-5, 8, 10
    Exercise set 14.3 (p. 469): 1, 2, 4-6, 8, 10
    Exercise set 14.4B (p. 474): 1-3
    (No exercises for 14.4C)
    Exercise set 14.4D (p. 478): complete the exercise

EXAM 3/FINAL EXAM: Inductive Logic (60 minutes)
Covers all topics in Unit 3   (Opening & closing times: see Moodle or the list of important course dates at the start of section 10 above.)

11. BIBLIOGRAPHY: REQUIRED AND RECOMMENDED READINGS

Dvorsky, George. 2013. "The 12 cognitive biases that prevent you from being rational."
http://io9.com/5974468/the-most-common-cognitive-biases-that-prevent-you-from-being-rational
[Optional reading]

Kelley, David. 2014. *The Art of Reasoning: An Introduction to Logic and Critical Thinking* (Fourth Edition).
New York: W.W. Norton.

Wilke, A., and Mata, R. 2012. "Cognitive bias." In V. S. Ramachandran (Ed.), *Encyclopedia of Human Behavior* (Second Edition), Vol. 1 (pp. 531-535). Maryland Heights: Elsevier. [Optional reading; complements Dvorsky]

Yanofsky, Noson S. 2013. "Philosophical Conundrums." In *The Outer Limits of Reason: What Science, Mathematics, and Logic Cannot Tell Us*. Cambridge, MA: MIT Press, pp. 31-64. [Optional reading]

12. WILLIAM BAUER – MINI BIOGRAPHY (FYI)

I joined the Department of Philosophy and Religious Studies at NC State in the fall of 2010, as a Teaching Assistant Professor of Philosophy (equivalent to a visiting assistant professor at other universities).

Previously, I was at the University of Nebraska-Lincoln where I completed my doctoral studies in Philosophy and taught for five years. Before that, I studied Philosophy at Miami University (in Oxford, Ohio), served as a US Army officer for about six years, and completed a degree in Biology (minor in Philosophy) at Illinois Institute of Technology in Chicago. Before that, I was born, raised, and attended public schools in Arizona.

My primary areas of research and teaching interest include metaphysics (theory of reality, especially how to classify properties), philosophy of science, and bioethics. My interests in metaphysics overlap strongly with central problems of bioethics, such as the nature of persons and its importance for beginning-of-life and end-of-life moral issues. I also have an abiding interest in the structure of scientific reasoning.

I enjoy discussions with everyone taking my courses. I intend for my courses to be a place of open, respectful, rigorous philosophical exploration. For more information, see www.wabauer.com.

Thank you for taking my course.

The instructor reserves the right to change the course schedule and syllabus content with appropriate notification to students. Any changes will be promptly announced through Moodle or email.