I. ASCRC General Education Form

<table>
<thead>
<tr>
<th>Group</th>
<th>III – Symbolic Systems</th>
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</thead>
<tbody>
<tr>
<td>Dept/Program</td>
<td>Philosophy</td>
</tr>
<tr>
<td>Course #</td>
<td>210</td>
</tr>
<tr>
<td>Course Title</td>
<td>Introduction to Logic - Deduction</td>
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<tr>
<td>Prerequisite</td>
<td>None</td>
</tr>
<tr>
<td>Credits</td>
<td>3</td>
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II. Endorsement/Approvals

Complete the form and obtain signatures before submitting to Faculty Senate Office.

| Instructor        | Armond Duwell          |
| Phone / Email     | 243-6281               |
| Program Chair     | David Sherman          |
| Dean              | Jon Tompkins           |

Please type / print name | Signature | Date

[Signatures and dates]

III. Description and purpose of the course: General Education courses must be introductory and foundational. They must emphasize breadth, context, and connectedness, and relate course content to students' future lives. See Preamble:

[Link]

This course is an introduction to a formal language called First Order Logic (FOL). For people new to logic, this course is more akin to a mathematics course or computer science course than most philosophy courses. We will be doing a good deal of symbolic manipulation and proofs. That said, we will also be studying how FOL, as an abstract formal language is related to the natural language English. Juxtaposing the two highlight the interesting differences between the two, especially the context sensitivity and ambiguity of English in comparison to FOL. What you take away from this course will partly be a matter of your own interests. For mathematicians and computer scientists one will get a solid introduction to FOL that one can use as a basis for leaning the metatheory of FOL. For those with a more traditional philosophical bent, you will learn to tell good argumentation from bad, and sharpen your ability to analyze argumentation, and be able to better formulate arguments yourself.

IV. Criteria: Briefly explain how this course meets the criteria for the group. See:

[Link]
<table>
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<tr>
<th>Criteria Courses:</th>
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<tr>
<td>1. Rigorously present a mapping between a real-world system and a human abstraction of the system.</td>
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<td>2. Applies analysis, reasoning and creative thinking in the understanding and manipulation of symbolic codes.</td>
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<tr>
<td>3. Utilizes alternative methods of communication, perception, and expression in order to encourage rigorous thinking.</td>
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Criteria 1. In this course, we study the language First Order Logic (FOL). We will be translating sentences of FOL (an abstraction of natural languages) into natural English (a real-world system) as well as natural English sentences into FOL.

Criteria 2. We will be studying the syntax of FOL and studying how to apply the rules of FOL in order to construct rigorous proofs. Constructing proofs is an inherently creative process, as there is no algorithm for constructing them. To do so, a student must use their creative powers within the confines of the syntactical rules of FOL.

Criteria 3. The language of FOL is the ultimate tool for evaluating quality of argumentation. In this course students will learn to translate between FOL and natural languages. This allows them to take any argument stated in a natural language and translate it into FOL. Once translated into FOL it is a straightforward application of the rules of logic to determine whether the argument stated in a natural language is deductively valid or not. So, this class gives students a rigorous way to evaluate argumentation.

V. Student Learning Goals: Briefly explain how this course will meet the applicable learning goals. See: [Document](http://www.unit.edu/facultysenate/ASCRCx/Ad documents/GF_Criteria5-1-08.htm)
**Learning Goals**

Upon completion of this group, students will be able to:

1. Demonstrate an understanding of the symbols and the transformations of the system.
2. Relay and interpret information in terms of the given symbolic system.
3. Apply creative thinking using the symbolic system in order to solve problems and communicate ideas.

Learning Goal 1. Students will demonstrate a basic understanding of the syntax of FOL by being able to construct proofs that respect the rules of FOL.

Learning Goal 2. Students will be able to translate between statements in FOL and English. This means that claims or arguments made in FOL can be interpreted in terms of English.

Learning Goal 3. By the end of the course, students will be able to apply FOL to analyze paradoxes and delimit the class of acceptable solutions.

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**VIII. Syllabus:** Paste syllabus below or attach and send digital copy with form. The syllabus should clearly describe how the above criteria are satisfied. For assistance on syllabus preparation see: [http://teaching.berkeley.edu/bnp/syllabus.html](http://teaching.berkeley.edu/bnp/syllabus.html)

See attached document

*Please note: As an instructor of a general education course, you will be expected to provide sample assessment items and corresponding responses to the Assessment Advisory Committee.*
**Philosophy 210 Introduction to Logic: Deduction**

MWF 11:10-12:00

Professor Armond Duwell  
Office: LA 154  
Phone: 406-243-6281  
email: armond.duwell@umontana.edu  
Office hours: By appointment, and Monday 8-10

Textbook: Language, Proof, and Logic by Barwise and Etchemendy

DO NOT BUY A USED BOOK!!!! (For reasons specified below)

**Introduction:**

This course is an introduction to a formal language called First Order Logic (FOL). For people new to logic, this course is more akin to a mathematics course or computer science course than most philosophy courses. We will be doing a good deal of symbolic manipulation and proofs. That said, we will also be studying how FOL, as an abstract formal language is related to the natural language English. Juxtaposing the two highlight the interesting differences between the two, especially the context sensitivity and ambiguity of English in comparison to FOL. What you take away from this course will partly be a matter of your own interests. For mathematicians and computer scientists one will get a solid introduction to FOL that one can use as a basis for leaning the metatheory of FOL. For those with a more traditional philosophical bent, you will learn to tell good argumentation from bad, and sharpen your ability to analyze argumentation, and be able to better formulate arguments yourself.

**Learning Goals:**

1. Students will demonstrate a basic understanding of the syntax of FOL by being able to construct proofs that respect the rules of FOL.

2. Students will be able to translate between statements in FOL and English. This means that claims or arguments made in FOL can be interpreted in terms of English.

3. By the end of the course, students will be able to apply FOL to analyze paradoxes and delimit the class of acceptable solutions.

**About the book:**

This course is taught from a book that is closely tied to a software package. One of the best features of this package is the ability for you to get feedback on homework using a system called Grade Grinder. For many of the homeworks assigned, one may get their assignments graded online before they submit them to me. The homeworks are assessed electronically, and you can get feedback on where you went wrong, if anywhere. This
allows you to learn a lot by yourself, and gives you a lot of control over your homework grades.

Here's the big reason why you need a new book: Each book has a registration ID which allows you to access Grade Grinder over the web, using software provided by the book. Without the ID, you will not be able to submit homework over the web, and that is how the majority of homework is graded. PLEASE WRITE DOWN THE REGISTRATION ID IN MULTIPLE PLACES. NOTHING CAN BE DONE IF YOU LOOSE IT.

About homework:

You will have weekly homework that must be submitted before midnight on Sunday if it is to be submitted electronically. If you are to turn in something on paper, you must do so on Monday at the beginning of class. You are encouraged to collaborate with other people on homework, but you may not write the assignment up together. That means that you may not copy off of a single source for your assignments, nor may you copy and paste from one computer to another. The Grade Grinder can detect such attempts to cheat, and will report that to me. Any such collaboration will result in receiving no credit for the homework in question for the person copying and the person copied. No exceptions will be made.

When you submit an assignment make sure to choose "To Instructor". If I don't receive a copy of the homework, I will consider it late, and it will not be accepted. I allow you to drop two homeworks over the course of the semester, and this is meant to account for any reasons why homeworks could not be completed on time. Homeworks cannot be turned in past the due date.

I will be posting the assignments on Blackboard as well as any changes in schedule.

Grading and Exams:

Your final grade will consist of 20% HW, 20% (almost weekly) Quizes, 30% Midterms, 30% Final Exam. The midterms are scheduled for Friday 10/3 and Monday 11/3, and the Final on Friday 12/12 8:00-10:00 am. The final will be cumulative, with a weight on material from the second half of the course. Make up exams will be given only in the case of extreme circumstances, i.e. severe illness, family death, etc. Proof of extreme circumstances is required in order for me to schedule a make up exam. For those of you that work, please make arrangements now so there will be no conflict of interest on exam dates.

Classroom courtesy:

Please turn off cell phones when you come into class. If you have to leave early, please indicate that to me before class begins, and let me know why you must leave early.
Special Needs:

Students with disabilities will receive reasonable modifications in this course. Your responsibilities are to request them from me with sufficient advance notice, and to be prepared to provide verification of disability and its impact from Disability Services. Please speak with me after class or during my office hours to discuss the details. For more information, visit the Disability Services for Students website at www.umt.edu/dss/

Tentative Schedule: The schedule is subject to change. Please consult Blackboard for any modifications.

Week 1:
8/25, 8/27, 8/29 Introduction, Chapter 1, perhaps start Chapter 2


Week 2:
9/3, 9/5, Chapter 2


Week 3:
9/8, 9/10, 9/12, Chapter 3

Learning goals: Translating sentences from English into FOL using the Boolean connectives. Expressive power of the Boolean connectives: "neither . . . nor —" and "not both . . . and —"; how to express complicated things using the blocks language and the Boolean connectives.

Week 4:
9/15, 9/17, 9/19 Chapter 4

Week 5:
9/22, 9/24, 9/26 Chapter 5, start Chapter 6

Learning goals: Proving arguments valid by informal and formal proofs. Basic properties of $\land$ and $\lor$. Formal rules for $\land$ and $\lor$.

Week 6:
9/29, 10/1, 10/3

MIDTERM #1 ON FRIDAY 10/3

Learning goals: Basic properties of $\neg$. Indirect proof and formal proofs with $\neg$. Arguments with inconsistent premises. Informal proofs about FOL. Formal proofs of tautologies. Strategies for formal proofs.

Week 7:
10/6, 10/8, 10/10 Chapter 7, start Chapter 8

Learning goals: Truth tables for $\rightarrow$ and $\leftrightarrow$. Translations from English to FOL using the conditionals. Conversational implicature. Rules for formal proofs involving $\rightarrow$ and $\leftrightarrow$.

Week 8:
10/13, 10/15, 10/17 Chapter 8, perhaps start 9

Week 9:
10/20, 10/22, 10/24 Chapter 9


Week 10:
10/27, 10/29, 10/31 Chapter 10


Week 11:
11/3 MIDTERM #2 ON MONDAY
Week 12:
11/10, 11/12, 11/14, Chapter 11


Week 13:
11/17, 11/19, 11/21, Chapter 13


Week 14:
11/24 Catchup / review / questions on homework, etc

Week 15:
12/1, 12/3, 12/5 Chapter 14

Learning goals: Understanding numerical quantification: how to express ‘there are exactly/at most/at least n things of a certain kind.’ Russell’s and Strawson’s analyses of definite descriptions. How to express ‘both’ and ‘neither’ in FOL.

Week 16:
12/12 TUESDAY 1:10-3:10, FINAL EXAM

* Statements of Learning Goals are taken from Richard Zach’s website (U Calgary).