2014

311-01 Introduction to Logic

Stephen Wilson

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Syllabus – Course # PHIL-311, Section 01
Introduction to Logic
Fall, 2014
Room 1, Hailstones Hall
Tuesday & Thursday: 2:45PM – 3:55PM

INSTRUCTOR/LECTURER:
Stephen A. Wilson

e-mail: wils0ns20@xavier.edu
The easiest and quickest way to contact me is via e-mail. Please put “PHIL-311.01”, or “Intro Logic” in the Subject area.

Office Hours: Tuesday & Thursday, 4:00PM – 5:00 PM, 227 Hinkle Hall, and by appointment.

Teaching Assistant (TA): No TA

TEXT:

COURSE DESCRIPTION & OBJECTIVES:
This is an introductory course in logic, Syllogistic and Symbolic (mathematical) logic. Students will learn and become proficient with formal systems of logic, specifically:

- The Aristotelian Syllogistic system,
- The Natural Deduction system (i.e., modern logic).

The student will learn how to demonstrate that a conclusion follows (or does not follow) from the premises in deductive arguments. Concepts and skills that will be mastered are:

- Translations of English declarative sentences into standard-form categorical propositions,
- Operations on categorical propositions,
- Venn Diagramming of categorical propositions and Syllogistic arguments,
- Truth tables (propositional logic),
- Deductive proofs (propositional logic),
- Basic quantitative logic (translations into well-formed formulas, and deductive proofs),
- Define logical validity,
- Define sound and unsound arguments,
- Determine the validity of an argument,
  - Using Venn diagrams,
  - Using truth-tables,
  - Using deductive proofs.
GRADING:
There will be four components to each student’s grade:

1. Two mid-term exams.
2. One Final exam.
3. (14) Homework assignments.
4. There will be at least two extra credit assignments. The score earned on the assignment will be added as bonus points (i.e., extra credit points). **Note:** I “let” Bb keep track of total points (exams + homework + extra credit). In principle it is possible to earn more than 1000 points. However, the 1000 point grading scale (below) is used to assign the letter grade.

Breakdown:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mid-term exam</td>
<td>400 pts. [200 pts. each (~38%)]</td>
</tr>
<tr>
<td>1 final exam</td>
<td>275 pts. (~26%)</td>
</tr>
<tr>
<td>Homework assignments</td>
<td>375 pts. (~36%) (3 points per problem x 125 problems + 1 free point)</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>1050 pts. (100%)</strong></td>
</tr>
</tbody>
</table>

A 100% - 93% 1000 pts. – 930 pts.
A- 92% - 90% 929 pts. – 900 pts.
B+ 89% - 87% 890 pts. – 870 pts.
B 86% - 83% 860 pts. – 830 pts.
B- 82% - 80% 829 pts. – 800 pts.
C+ 79% - 77% 799 pts. – 770 pts.
C 76% - 73% 769 pts. – 730 pts.
C- 72% - 60% 729 pts. – 600 pts.
D+ 59% - 57% 599 pts. – 570 pts.
D 56% - 53 % 569 pts. – 530 pts.
D- 52% - 45 % 529 pts. – 450 pts.
F 44% - 0% 449 pts. – 0 pts.

MISCELLANEOUS ISSUES:

- I will make every effort to respond to your e-mail within twenty-four hours.
- An Assignment or an exam will be graded and returned within one week of the assignment, or exam, due date (barring unforeseen circumstances).
- Late homework will NOT be accepted.
- All students will be held to the standards listed in the University’s code of Conduct (http://www.xavier.edu/student-integrity/documents/studenthandbook.pdf). Cheating on any assignment, or exam, will result in an “Academic Action” of zero for that specific assignment, or exam. A second occurrence of cheating will result in failure of the course.
- Homework is marked in red, bold font and is due on the day it is listed. **Submit your homework in class on the day it is due.**
If you must miss an exam you must notify me prior to the exam and you must reschedule the exam at that time.

All lecture notes will be posted on Canvas under “Files.” Within the directory, Course Documents, a directory will be created for each week of the class (Week#_i, where \( i \in \{1-10\} \)).

The graded homework assignments are the minimum exercises that you should do. Symbolic logic is very similar to a mathematics course. Each lesson builds on the lessons before. Do more exercises than you are required to do in the homework assignments.

If the student’s total point score is within one point of the next highest letter grade, per the grading scale, then the student’s letter grade will “rounded up” to the next highest letter grade. For example, student Z’s total point score is greater than or equal to 869.00 and less than 870, thus student Z’s letter grade will be “rounded up” from a B to a B+.

12 December: Last day to withdraw from the course.

The instructor reserve the right to alter class Syllabus/schedule as needed.

**WEEKLY CLASS SCHEDULE:**

<table>
<thead>
<tr>
<th>Week #1</th>
<th>26 August &amp; 27 August</th>
<th>Homework/Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
<td>Introductions, &amp; review Syllabus.</td>
<td></td>
</tr>
<tr>
<td>o</td>
<td>CIL, Chapter 1, Basic Logical Concepts, (1.1-1.6).</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Objective:</strong> Explain what validity means, explain the definition of an argument, and learn premise words, learn conclusion words.</td>
<td></td>
</tr>
<tr>
<td>o</td>
<td>CIL, Chapter 4, Categorical Proposition, (4.1-4.2).</td>
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<tr>
<td></td>
<td><strong>Objective:</strong> Translate English sentences into standard-form categorical proposition, and symbolize the proposition using a Venn diagram.</td>
<td></td>
</tr>
</tbody>
</table>
Week #2   2 September & 4 September
- Sept 1st: Labor Day – Thank you to all those who labor – for your service!
- CIL, Chapter 4, Categorical Proposition (inferences), (4.4-4.6).
- **Objective**: Infer the truth-values of associated propositions given the truth-value of a single proposition, & derive the converse, obverse, & contraposition of categorical propositions, & assess their logical equivalence.
- CIL, Chapter 4, Categorical Proposition (Boolean interpretation), (4.3).
- **Objective**: Understand the concept of Boole’s reinterpretation of Aristotle’s square of the opposition & how to express categorical propositions as Boolean algebraic equalities or inequalities.

Thursday, 4 September.

**Homework #1**: 4.2 pg. 204,205
I. {2, 3, 6, 8}
II. {2}
III. {2}
IV. {3}

Week #3   9 September & 11 September.
- CIL, Chapter 5 Categorical Syllogisms, (5.1-5.2)
- **Objective**: Assess the validity of a Syllogistic argument using Venn diagramming.
- CIL, Chapter 6, Propositional Logic, (AND, OR, NOT) (6.1-6.3)
- **Objective**: Translate English sentences into well formed symbolic proposition using the Boolean connectives: {•, v, ~}.

Thursday, 11 September.

**Homework #2**: 4.4 pg. 225
II. {1b, 2c, 3c}
4.5 pg. 234
I. {2,5,6}
Week #4  16 September & 18 September.
- CIL, Chapter 6, Propositional Logic, (Conditional, Biconditional) (6.2-6.3)
- **Objective**: Translate English conditional sentences into well formed symbolic sentence using the Boolean connective: \( \rightarrow, \equiv \)
- **Objective**: Translate English Biconditionals (i.e., “if and only if”) sentences into well formed symbolic sentence using the Boolean connective: \( \equiv \), and assess the logical equivalence of the two sentences.

- CIL, Chapter 6, Propositional Logic, (Validity) (6.5)
- **Objective**: Assess the validity of a propositional argument using truth-tables.

Thursday, 18 September.

Homework #3:
5.1 pg. 265  
II \{2, 3, 5, 6, 8, 9\}  
**Note**: (Also give a demonstration of validity using Venn diagrams.)

Week #5  23 September – 25 September.
- CIL, Chapter 7, Methods of Deduction, (Basic Rules) (7.1-7.2)
- **Objective**: Assess the validity of propositional arguments using deductive proofs via the Basic Rules of Inference.

- CIL, Chapter 7, Methods of Deduction, (Rules of Replacement), (7.3-7.4)
- **Objective**: Assess the validity of propositional arguments using deductive proofs via Rules of Replacement.

Thursday, 25 September.

Homework #4:  
6.1 pg. 319-320  
I. \{2, 3, 5, 8, 11, 23, 26, 35, 41, 42\}  
**Note**: (Also create a truth-table for the Boolean sentence.)
Week #6  

30 September & 2 October.

- CIL, Chapter 7, Methods of Deduction, (Indirect Proof), (7.5)
- **Objective**: Assess the validity of arguments using the method of indirect proof.

Thursday, 2 October.

**Homework #5:**
- 6.2 pg. 333-334
- III. \{2, 5, 9, 15\}
- 6.3 pg. 342
- II. \{2, 5, 9, 14\}
- 6.4 pg. 348
- II. \{2, 3, 9, 18\}

Week #7  

7 October – 9 October.

- CIL, Chapter 7, Methods of Deduction, (Conditional Proof), (7.6 – 7.7)
- **Objective**: Assess the validity of arguments using the method of conditional proof, and how to demonstrate logical truths).

- “Proof Laboratory”
- **Objective**: This class will be set aside for doing proofs with the instructor and TAs to assist and tutor. The objective is for the student to gain proficiency and confidence in doing proofs.

Tuesday, 7 October.

**Homework #6:**
- 7.1 pg. 386-387
- I. \{2, 3, 9, 20\}

- Thursday, 9 October – no class: Fall Holiday.
Week #8  14 October & 16 October.
- CIL, Chapter 8, Quantification Theory, (Basic Concepts) (8.1)
- **Objective:** Translate English sentences into well formed quantified sentences using the Universal and Existential quantifiers: { ( ), ∃ }.
- CIL, Chapter 8, Quantification Theory: Quantifier Negation (8.3)
- **Objective:** Assess and produce logical equivalent of quantified sentences using CQ.

**Thursday, 16 October.**

**Homework #7:**
7.3 pg. 408-409
II.  {2, 3, 14, 15}
7.4 pg. 420-421
II.  {2, 3, 11, 12}

Week #9  21 October & 23 October.

Exam #2

- CIL, Chapter 8, Quantification Theory, (UI & UG) (8.2)
- **Objective:** Assess the validity of arguments using deductive proofs via the inference rules: Universal Instantiation (U.I.) and Universal Generalization (U.G.).

**Thursday, 23 October.**

**Homework #8:**
Allow 2 (or more) hours for this assignment.
7.4 pg. 421-423
III.  {2, 3, 11, 12, 20, 42}
Week #10  **28 October & 30 October.**
  o CIL, Chapter 8, Quantification Theory, (EI & EG) (8.2)
  o **Objective:** Assess the validity of arguments using deductive proofs via the inference rules: Existential Instantiation (E.I.) and Existential Generalization (E.G.).
  
  o CIL, Chapter 8, Quantification Theory, (C.Q.). (a.k.a. QN)) (8.3)
  o **Objective:** Learn and demonstrate the basic concepts of rules of replacement of negated quantified sentences.
  
  o CIL, Chapter 8, Quantification Theory, (Conditional and Indirect Proof) (8.4)
  o **Objective:** Learn the basic concepts of C.P. & I.P. in quantified sentences, and demonstrate validity via these rules of inference.

**Thursday, 30 October.**

**Homework #9:**
7.5 pg. 430-431
I. \{6, 11\}
7.6 pg. 436-437
I. \{2, 6, 17\}
7.7 pg. 440
\{2, 3, 9, 18\}

Week #11  **4 November & 6 November.**
  o CIL, Chapter 8, Quantification Theory, (Relations & Overlapping Quantifiers) (8.6)
  o **Objective:** Learn how to translate English sentences into well formed quantified sentences containing overlapping quantifiers: Relations \{n-adic, Rx.y…\}
  
  o CIL, Chapter 8, Quantification Theory, (Relations) (8.6)
  o **Objective:** Assess the validity of arguments using deductive proofs via the inference rules: (UI, UG, EI, EG), relations and overlapping quantifiers.

**Thursday, 6 November.**

**Homework #10:**
8.1 pg. 449-451
\{2, 3, 8, 9, 14, 18, 20, 27, 33, 35, 38, 51, 59\}
Week #12  11 November & 13 November.
  - Nov 11th: Veterans Day – Thank you to all those who have served!
  - CIL, Chapter 8, Quantification Theory, (identity, “except” statements, superlatives, and numerical statements) (8.7)
  - **Objective**: Learn the basic concepts of definite description: “the x is the …est”, “All x are F, except y”, “There are n x(s) that are F”.
  - **Objective**: Learn basic concepts of validity of arguments using deductive proofs via the inference rule: Identity {=, ≠}.
  - **Objective**: Learn the basic concepts of definite description: “the x is such and such…”
  - CIL, Chapter 8, Quantification Theory, (“except” statements, superlatives, and numerical statements) (8.7) (cont.)
  - **Objective**: Assess the validity of arguments using except, superlatives, and numerical sentences via the rules of inference.

Thursday, 13 November.

**Homework #11:**
8.2 pg. 460-461
I. {2, 3, 8, 12, 15}
8.2 pg. 461-462
II. {2, 3, 9}

Week #13  18 November – 19 November.
  - Proof Laboratory
  - **Objective**: This class will be set aside for doing proofs with the instructor and TAs to assist and tutor. The objective is for the student to gain proficiency and confidence in doing proofs having quantified sentences.
  - Introduction to another Language System – The Fitch System (material not in CIL).
  - **Objective**: Learn the basic concepts of another more parsimonious system, but having the same truth-functional connectives: {AND “∧”, OR “∨”, NOT “¬”, conditional “→”, biconditional “↔”}

Thursday, 20 November.

**Homework #12:**
8.3 pg. 467
I. {2, 6, 9, 14}
8.4 pg. 472-473
{2, 5, 9, 11, 17, 20}
Week #14  **25 November & 27 November.**
- Introduction to another Language System – The Fitch System (**material not in CIL**).
- **Objective**: Assess the validity of arguments using deductive proofs *via* the inference rules: conjunction introduction/elimination, disjunction introduction/elimination, and negation introduction/elimination.

**Tuesday, 25 November.**

Homework #13:
8.6 pg. 489-490
I.  {2, 3, 9, 11, 15, 20, 26}
   8.6 pg. 490-491
II. {2, 6, 9, 12, 20}

- **No Class - Thanksgiving Holiday, Thursday & Friday.**
Week #15  

2 December & 4 December.

- Introduction to another Language System – The Fitch System (material not in CIL).
- **Objective**: Assess the validity of arguments using deductive proofs *via* the inference rules: conjunction introduction/elimination, disjunction introduction/elimination, and negation introduction/elimination.

- Introduction to another Language System – The Fitch System (cont.)
- **Objective**: Assess the validity of arguments using deductive proofs *via* the inference rules: conditional introduction/elimination.

**Thursday, 4 December.**

**Homework #14:**
8.7 pg. 501-503
I. \{3, 6, 10, 17, 22, 25, 31, 34\}
8.7 pg. 504
II. \{2, 8, 9, 11, 14, 18\}

**FINAL EXAM: - Tuesday, 16 December, 1:00PM – 2:50PM, 2014.**