

LSC Use Only Proposal No: _____ UWUCC Use Only Proposal No: 11-888^C
 LSC Action-Date: AP-2/16/12 UWUCC Action-Date: App-3/6/12 Senate Action Date: App-3/20/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit PHIL	Phone x2310

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

<input type="checkbox"/> New Course	<input type="checkbox"/> Course Prefix Change	<input type="checkbox"/> Course Deletion
<input checked="" type="checkbox"/> Course Revision	<input type="checkbox"/> Course Number and/or Title Change	<input checked="" type="checkbox"/> Catalog Description Change

Current course prefix, number and full title: PHIL 221 Symbolic Logic

Proposed course prefix, number and full title, if changing: _____

2. Liberal Studies Course Designations, as appropriate
 This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

<input type="checkbox"/> Learning Skills	<input checked="" type="checkbox"/> Knowledge Area	<input type="checkbox"/> Global and Multicultural Awareness	<input type="checkbox"/> Writing Across the Curriculum (W Course)
<input type="checkbox"/> Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)			
<input type="checkbox"/> Global Citizenship	<input type="checkbox"/> Information Literacy	<input type="checkbox"/> Oral Communication	
<input type="checkbox"/> Quantitative Reasoning	<input type="checkbox"/> Scientific Literacy	<input type="checkbox"/> Technological Literacy	

3. Other Designations, as appropriate

<input type="checkbox"/> Honors College Course	<input type="checkbox"/> Other: (e.g. Women's Studies, Pan African)
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4. Program Proposals

<input type="checkbox"/> Catalog Description Change	<input type="checkbox"/> Program Revision	<input type="checkbox"/> Program Title Change	<input type="checkbox"/> New Track
<input type="checkbox"/> New Degree Program	<input type="checkbox"/> New Minor Program	<input type="checkbox"/> Liberal Studies Requirement Changes	<input type="checkbox"/> Other

Current program name: _____

Proposed program name, if changing: _____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	<i>Eric Rubenstein / Rives</i>	12/1/11
Department Chairperson(s)	<i>Mark Monahan</i>	12/14/11
College Curriculum Committee Chair	<i>Alan Berkowitz</i>	12/13/11
College Dean	<i>Sam</i>	12/26/12
Director of Liberal Studies (as needed)	<i>John H. ...</i>	2/29/12
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	<i>Gail Schriest</i>	3/6/12

Received
FEB 23 2012
Liberal Studies

Received
JAN 27 2012
Liberal Studies

PHIL 221—Symbolic Logic: New Syllabus of Record

Overview of changes from original syllabus of record:

1. The course description has been slightly revised.
2. The course objectives have been changed so that they are aligned with the Expected Undergraduate Student Learning Outcomes.
3. Bibliography has been updated.
4. Minor changes made to "Course Analysis Questionnaire."

Current Catalog Description:**PHIL 221 Symbolic Logic**

An introduction to fundamental concepts in deductive logic with an emphasis on teaching the basis of clear, logical thought. Some of the historical origins of logical theory are explored. Students learn to symbolize arguments in the truth-functional logic and the predicate logic. Ways of testing arguments for validity as well as proofs are covered, with a stressing of application to actual arguments drawn from numerous sources in the media, philosophical issues, and moral problems.

Proposed Catalog Description:

Introduces students to the study of formal patterns of good reasoning. Topics include symbolizing English sentences in an artificial language, distinguishing between the semantics and syntax of that language, and learning to test for logical properties and relations using semantic methods (truth-tables, models) and syntactic methods (derivations). Students with an interest in computer science and mathematics will find the material of particular interest and use.

Rationale: The basic elements of the proposed catalog description are the same as those in the current description. The changes are primarily stylistic, but also reflect a slight change in emphasis in how present faculty are teaching the course.

Syllabus of Record: Symbolic Logic PHIL 221

I. Catalogue Description

PHIL 221 Symbolic Logic

3 class hours, 0 lab hours, 3 credits (3c- 0l-3cr)

Prerequisites: None

Introduces students to the study of formal patterns of good reasoning. Topics include symbolizing English sentences in an artificial language, distinguishing between the semantics and syntax of that language, and learning to test for logical properties and relations using semantic methods (truth-tables, models) and syntactic methods (derivations). Students with an interest in computer science and mathematics will find the material of particular interest and use.

II. Course Outcomes

Objective 1:

Understand key concepts in the history and development of symbolic logic and the study of arguments, such as deductive validity, soundness, and logical truth.

Expected Student Learning Outcomes 1 and 3

Informed and Responsible Learners

Rationale:

This course involves concepts and skills akin to those in quantitative reasoning courses. It introduces students to an artificial, symbolic language which allows clear analysis of ordinary language English arguments. Students are introduced to the concepts of syntax and semantics in a language, and how to test sentences and arguments in both ordinary language and in these symbolic languages for various logical properties. Assignments will test students' comprehension of these important concepts, as well as the significance and importance of deductively valid and deductively valid reasoning. Exams, as illustrated in the sample exam below, combine questions that test students' comprehension of basic, important concepts. (EUSLO1)

The development of symbolic languages and the various techniques for testing properties of such languages came out of developments in the foundations of mathematics and philosophy in the late 19th century and which continue to this day. Students learn some of this important history, gain an appreciation of their intellectual heritage, and assignments will ask them to demonstrate their understanding of the need for the enhanced tools logicians created in the late 19th century for assessing deductive reasoning. Exam questions will include ones focused on testing student comprehension of these issues. (EUSLO3)

Objective 2:

Use the methods of truth-tables and derivations to test sentences and arguments for various logical properties.

Expected Student Learning Outcomes 2

Empowered Learners

Rationale:

Assignments will ask students to perform various tasks in the symbolic languages they will learn, to test for their ability to demonstrate logical properties in those languages. By developing the various skills mentioned above, students increase their ability to think clearly, carefully, and

critically. Among other benefits, students who take this course are particularly well prepared for the reasoning tasks found in the GRE and LSAT exams, and thus meet the objective for Empowered Learners. As this course is largely focused on the development of quantitative reasoning skills, it is appropriate that the bulk of the assignments be exams, though as indicated in the sample provided, the exams themselves offer a range of ways of testing students comprehension and ensuring that the various learning goals are met.

Objective 3:

Demonstrate critical thinking skills including analysis, application, evaluation, and an ability to apply these skills across disciplines and to everyday examples of reasoning, argumentation, and decision making.

Expected Student Learning Outcomes 2 and 3

Empowered and Responsible Learners

Rationale:

(Explanatory Remark for committee: Such skills listed above constitute what our discipline considers "good reasoning", and precise evaluation of whether an argument is an example of "good reasoning" depends on what kind of argument it is-- be it abductive, deductive, inductive, etc. Students will be tested on the different kinds of arguments, and asked to evaluate different types to see if they meet the requirements for good examples of that type of argumentation.)

Assignments will require students to apply the skills they've learned to everyday situations, such as using the method of symbolization to convert ordinary language arguments as found in advertising, political debates, editorials, etc. into proper symbolic form, and to assess these everyday arguments for validity, soundness, etc. (EUSLO2)

These same assignments will have the additional goal of providing students an opportunity to understand the implications of reasoning on their actions, and to be better able to critically assess one's own behavior and decision making. Increased awareness of the consequences of one's beliefs is an important part of being intellectually honest, which is itself constitutive of being a Responsible Learner. (EUSLO3)

III. Detailed Course Outline

- A. Introduction and History of The Study of Reasoning (3 hours)
 - i. Aristotle's Logic
 - ii. Confrontation of new questions in the foundations of mathematics
 - iii. Development of Symbolic Logic and tools of logical analysis as responses to those new questions/problems.

- B. Key Concepts in Good Reasoning (3 hours)
 - o. Recognition that "good reasoning" is relative to a standard, and that there are different standards for assessing reasoning, as there are different kinds of reasoning, such as inductive, deductive, and abductive arguments
 - i. Deductive vs. Inductive Arguments
 - ii. Standards for Evaluating Deductive and Non-Deductive Arguments
 - iii. Concepts of Validity, Soundness, Logical Truth/Falsity/Indeterminacy

- C. Introduction of a Simple Symbolic Language-- Sentential Logic (SL) (3 hours)

- i. Syntax of SL and Truth-Functional Connectives
 - ii. Translating English sentences into SL
- D. The Method of Truth-Tables (5 hours)
- i. Testing individual sentences in SL for various logical Properties (logically true, logically false, logically indeterminate)
 - ii. Testing SL Arguments for Validity
- EXAM ONE (1 hour)
- E. The Method of Derivations: (8 hours)
- i. Learning Derivation Rules for Truth-Functional Connectives
 - ii. Deriving Valid Arguments in SL using Rules of Derivation
 - iii. Deriving Theorems in SL, using Rules of Derivation
- F. Metalogic/Metatheory (3 hours)
- i. Understanding the relationship between the syntax and semantics of SL
 - ii. Introduction of meta-concepts of soundness and completeness
 - iii. Applying the results of soundness and completeness to generate further meta-theoretical results.
- EXAM TWO (1 hour)
- G. Introduction to an Advanced Symbolic Language: Predicate Logic (PL) (4 hours)
- i. The Syntax of PL
 - ii. Translation of English sentences/arguments into PL
- H. Derivations in Predicate Logic (4 hours)
- i. Learning new derivation rules for PL
 - ii. Deriving valid arguments in PL using new rules of derivation
- I. Semantics of Predicate Logic (3 hours)
- i. Testing sentences and arguments in PL for various semantic properties.
 - ii. The Method of Models for proving PL arguments valid or invalid.
- EXAM THREE (1 hour)
- J. Beyond Sentential and Predicate Logic (3 hours)
- i. Basic Concepts and Motivations for Advanced Logics, such as Modal Logic, Three Valued Logic, Intuitionist Logic
 - ii. Philosophical Issues about Logic: the nature of truth, how to understand the Existential Quantifier in PL, the relation between truth and meaning.
- Final Exam: (2 hours)

IV. Evaluation Methods

Evaluation methods may vary among instructors. This is a skills based course, focused on forms of quantitative reasoning similar to that found in a mathematics course. The evaluation methods will be based on different ways of testing student's command of the various skills.

Regular, Assigned Practice Problems/Exercises: 15%

Three Unit Exams: 60%

Comprehensive Final Exam: 25%

Exams will typically include a series of true/false, multiple choice, and short answer questions to test comprehension of concepts. Particular problems will be given to students to solve, with an emphasis on 'showing their work' to allow faculty to judge the degree of each student's facility with the skills in question.

V. Example Grading Scale

90-100% A, 80-89% B, 70-79% C, 60-69% D, 59% or less F.

VI. Undergraduate Course Attendance Policy

Individual faculty members will develop their own policy in compliance with the university attendance policy.

VII. Required Text

There are many high-quality Symbolic Logic textbooks. Two examples are:

Martin, Robert. *Introducing Symbolic Logic*. (Broadview Press, 2004).

Bergmann, Merrie; Moor, James; and Nelson, Jack. *The Logic Book*. 5th ed. (McGraw Hill Publishers, 2008).

Because of the focus on quantitative reasoning, non-textbooks or works of fiction are not appropriate. Select articles on particular logical concepts and philosophical concepts may be included at instructor's discretion, though most should find use of a Symbolic Logic text sufficient. (Possible additional readings are mentioned below in IX Bibliography.)

VIII. Special Resource Requirements

Not typically required. Some instructors may use textbooks that come with CD-roms containing extra problem sets.

IX. Bibliography

Boolos, G. *Logic, Logic, and Logic*. (Harvard University Press, 1998).

Davidson, D., "Truth and Meaning", *Synthese*, 1967, vol. 17: pp. 304–23.

Haack, Susan, *Philosophy of Logics*. (Cambridge University Press, 1978).

Haack, Susan, *Deviant Logic, Fuzzy Logic: Beyond the Formalism*. (University of Chicago Press, 1996).

Harman, G., "Logical Form", *Foundations of Language*, 1972, vol. 9: pp. 38–65.

Kalish, D. and Montague, R., *Logic: Techniques of Formal Reasoning*. (Oxford University Press, 1980).

- Kneale, William; Kneale, Margaret, *The Development of Logic*. (Oxford University Press, 1984)/
- Larson, R. and Ludlow, P., "Interpreted Logical Forms," *Synthese*, 1993, vol. 95: pp. 305–55.
- Lepore, E. and Ludwig, K., "What is Logical Form?," in Preyer, G. and G. Peter, G. (eds.), *Logical Form and Language* (Oxford University Press, 2002), pp. 54–90.
- Lycan, W., *Logical Form in Natural Language*. (MIT Press, 1984).
- Quine, W.V.O., *Methods of Logic*. (Henry Holt Press, 1950).
- Quine, W.V.O. *Philosophy of Logic*. (Prentice Hall, 1970).
- Sainsbury, M., *Logical Forms*. (Blackwell Publishing, 1991).

SAMPLE ASSIGNMENT FOR LS COURSE: PHIL 221 (Sample Exam)

I. *Concepts and Definitions* (20%)

Indicate whether the following are true or false.

- _____ 1. All deductively valid arguments have true premises and true conclusions.
- _____ 2. All deductively invalid arguments have true premises and false conclusions.
- _____ 3. All deductively valid arguments are deductively sound.
- _____ 4. All deductively sound arguments have true premises.
- _____ 5. A deductively sound argument can have a false conclusion.
- _____ 6. All truth-functionally indeterminate sentences are truth-functionally equivalent.
- _____ 7. Two truth-functionally false sentences are truth-functionally equivalent.
- _____ 8. An argument with a truth-functionally false premise is truth-functionally valid.
- _____ 9. A single row in a truth-table can be enough to show an argument is invalid.
- _____ 10. A single row in a truth-table can be enough to show a sentence is truth-functionally true.

II. *Short Answer* (15%)

1. Briefly explain how the language, SL, allows us to provide a better analysis of arguments than Aristotle's logic of syllogism.
2. Briefly explain why the best arguments are 'deductively sound', not just 'deductively valid'.

III. *Symbolization* (15%)

Translate the following English sentences into SL.

Symbolization Key:

A: Al jogs.

B: Bob jogs.

C: Carol jogs

1. Al jogs if Bob jogs.
2. Not both Al and Carol jog, if and only if Carol jogs.
3. Al or Carol jog, and neither Carol nor Bob jog.
4. It is not the case that if Al doesn't jog then both Carol and Bob jog.

IV. *Truth Tables* (50%)

On a separate sheet of paper, construct truth-tables for the following, as directed. Make sure to state your result on this document as well as on the separate sheet of paper.

1. Construct a full truth-table to determine whether the following sentence is truth-functionally true, truth-functionally false, or truth-functionally indeterminate. Be sure to state your result.

$$(A \vee \sim B) \ \& \ (A \supset C)$$

2. Construct a full truth-table to determine whether the following sentences are truth-functionally equivalent. Be sure to state your result.

$$(A \supset B) \ \& \ (A \supset \sim B) \qquad \sim (B \ \& \ \sim B) \ \& \ (A \supset A)$$

3. Construct a full truth-table to determine if the following argument is truth-functionally valid. Be sure to state your result.

$$\begin{array}{c} \sim B \\ D \supset (B \ \& \ \sim D) \\ \hline \sim (D \supset \sim B) \end{array}$$

Grading Criteria for Sample Exam:

As indicated on the exam, different sections are worth different percentages. A "groundfloor" of maximal missed points will be established for each section, to prevent students from losing too many points on one section, thereby making it impossible for them to do well on the exam as a whole.

- a. Grades for Section II: Short Answer questions will be graded on the following criteria:
 - Does the student demonstrate understanding of the issue/question being asked? (30%)
 - Does the student demonstrate sufficient understanding of the proper answer? (50%)
 - Is the short answer written in proper English, obeying appropriate rules of grammar and punctuation? (10%)
 - How clear and concise is the answer given? (10%)

- b. Grades for Section III: Symbolizations will be graded on the following criteria:
 - Is the 'main connective' correctly symbolized? Failure to properly symbolize the 'main connective' correct will result in loss of 50% of possible points.
 - Are the secondary/tertiary/etc connectives properly symbolized? Mistakes here will result in loss of 10% points per mistake.

- c. Grades for Section IV: Truth Tables will be graded on the following criteria:
 - Is the truth-table properly set up, following the rules that have been taught? (10%)
 - Does the student correctly calculate truth-values across the whole table, (excluding the column for the main connective)? (40%)
 - Does the student recognize where the final calculation/answer is to be found (i.e. under the 'main connective') and calculate values in that column correctly? (25%)
 - Does the student interpret the calculation results properly? That is, does the students demonstrate an understanding of how the truth-table shows whether a given logical property is present or not? (25%)

Answers to Liberal Studies Questions

1. Typically there will not be more than one section offered per semester, though different faculty may teach the course in different semesters. By relying on the syllabus of record, as well as through regular meetings and discussions about the goals of our lower-level, introductory type courses, we will be able to ensure that a similar range of topics are being taught, and that all who teach this class will share in the same objectives and learning outcomes. This is a practice we already have in place, to ensure a high degree of uniformity across different sections and faculty.

2. Given the abstract nature of the content of a course in Symbolic Logic, and the important similarities between it and courses that stress quantitative reasoning, we do not believe there is an appropriate place for including “perspectives and contributions of ethnic and racial minorities and of women.” We agree that in general those are important considerations for a course, however they are not typically appropriate, we believe, for this class. We are not, for instance, discussing historically important individuals; and the history we do discuss is of the concepts and evolution of artificial, symbolic languages and methods. The course is largely focused on the development of various formal skills (akin to those in a mathematics course), thus making this requirement not applicable for this course.

3. As above, the focus on quantitative-type reasoning, and the development of skills for working in an artificial, symbolic language, makes the use of a textbook essential. And it will typically preclude the need or relevance of other types of readings. Instructors may choose to explore some of the philosophical underpinnings of symbolic logic, in which case it may be appropriate to use an article or two, but that would be the exception, and doing so would depart from the standard format of a lower-level, introduction to Symbolic Logic class as typically taught in Philosophy departments across the country.

4. As philosophy courses aren't typically offered in high schools, most students have no exposure to the discipline prior to college. Given this, we, like most Philosophy departments, don't offer introductory courses designed for majors, as the vast majority of our majors declare after taking an introductory course. All of our knowledge area courses are thus designed to introduce the discipline to students, whomever they are. Students who decide to major in Philosophy will simply build on what they have learned in this general introductory course.

COURSE ANALYSIS QUESTIONNAIRE

A. Details of the Course

- A1. The course will be open to all IUP students.
- A2. This course does not require changes in any existing Philosophy department courses.
- A3. This course has not been offered on a trial basis.
- A4. This is not a dual-level course.
- A5. This course may not be taken for variable credit.
- A6. Symbolic Logic is a staple of Philosophy programs. The list of institutions that do not offer this course would be far shorter than the list of ones that do.
- A7. This specific course is not required by the American Philosophical Association (APA). In general the APA does not provide recommendations for undergraduate curriculum content.

B. Interdisciplinary Implications

- B1. This course will be taught by only one instructor, and always by the Philosophy Department.
- B2. This course does not duplicate or effect courses offered by other departments.
- B3. This course will not be cross-listed.
- B4. This course will be open to all enrolled undergraduate students, with no prerequisites in place. No seats will be set aside in particular for Continuing Education students, though they are welcome to register.

C. Implementation

- C1. The department can work this course into its rotation of courses.
- C2. No additional space, equipment, supplies, or library materials are needed.
- C3. None of the resources for this course is based on a grant.
- C4. The course will be offered approximately every semester.
- C5. We expect to typically offer one section each semester the course is taught.
- C6. Enrollment caps for lower-level classes are set by our College, and are presently at approximately 55 students.

C7. The American Philosophical Association does not recommend maximum enrollments for this type of course.

C8. This is not a distance education course.

D. Miscellaneous

None.

COURSE SYLLABUS

I. CATALOG DESCRIPTION

PH ²²¹~~122~~ Introduction to Symbolic Logic 3 credits
An introduction to fundamental concepts in deductive logic with an emphasis on teaching students the basis of clear logical thought. Some of the historical origins of logical theory are explored. Students learn to symbolize arguments in the truth-functional logic and the predicate logic. Ways of testing arguments for validity as well as proofs are covered, with a stressing of application to actual arguments drawn from numerous sources in the media, philosophical issues, and moral problems. No prerequisite.

I. COURSE OBJECTIVES

1. Students learn to recognize the variety of logical structures that underlie arguments.
2. Students learn important evaluative concepts that apply to arguments such as "validity" and "soundness".
3. Students are taught through practice how to apply these evaluative concepts to arguments.
4. Students hone their critical thinking skills by applying the learned techniques of logical analysis to actual arguments from a variety of sources.

III. TYPICAL COURSE OUTLINE: may vary somewhat with instructor

- A. The nature of reasoning.
 1. History of logic; contemporary issues in "critical thinking"
 2. Definition of Argument
 3. Deduction -- Induction distinction
 4. Truth, Validity, Soundness
- B. Truth-functional Logic
 1. History of truth-functional logic
 2. Truth operators defined
 3. Negation -- definition and symbolization
 4. Conjunction -- " " "
 5. Disjunction -- " " "
 6. Conditionals -- " " "
 7. Biconditionals -- " " "
 8. Truth table analysis
 9. Validity tests of arguments; numerous examples of arguments
 10. Proofs of arguments; numerous examples of arguments
- C. Predicate Logic
 1. History of categorical logic to modern predicate logic
 2. Predicates defined
 3. Variables and individuals
 4. Universal Quantifiers
 5. Existential Quantifiers
 6. Symbolization issues
 7. Validity tests of arguments; numerous examples of arguments
 8. Proofs of arguments; numerous examples of arguments

IV. EVALUATION METHODS

Actual methods of evaluation will vary from instructor to instructor, but all instructors will focus on testing the student's ability to analyze and evaluate actual arguments in written English form.

V. REQUIRED TEXTBOOKS

Will vary from instructor to instructor: many textbooks are available. Some possible texts are listed here:

- Howard Kahane, Logic and Philosophy, 5th edition, Wadsworth, 1986.
Virginia Klenk, Understanding Symbolic Logic, Prentice-Hall, 1983.
Richard L. Purtill, A Logical Introduction to Philosophy,
Prentice-Hall, 1989
Merrilee H. Salmon, Introduction to Logic and Critical Thinking,
Harcourt, Brace, Jovanovich, 1984.

Recommended reading for the history of logic would be:

- William and Martha Kneale, The Development of Logic, Oxford:
Clarendon, 1962.