Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments

1. This request is submitted by the Department of Philosophy and Humanities

2. Course prefix, number and complete title of course: PHIL 641 Mathematical Logic I

3. Change requested
   a. Prerequisite(s): From: ___________________________ To: ___________________________
   b. Withdrawal (reason): ___________________________
   c. Cross-list with: ___________________________

   Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter complete current course title and current course description in item 4; enter proposed course title and proposed course description in item 5.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 6. Attach a course syllabus.

4. Complete current course title and current catalog course description:
   PHIL 641 Mathematical Logic I
   The metatheory of propositional and first-order logic; definitions of formal languages for these systems, their proof theory, model theory, and demonstrations of their soundness and completeness; overview of the basic elements of set theory, including functions and relations, infinite sets, infinite cardinal numbers, and Cantor’s Theory.

5. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
   PHIL 641 Mathematical Logic I
   The metatheory of propositional and first-order logic.

6. a. As currently in course inventory:

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   Approval recommended by:
   Daniel Conway 07-29-09
   Department Head – Type Name & Sign Date
   Department Head – Type Name & Sign (if cross-listed course) Date
   Submitted to Coordinating Board by:
   Patricia A. Harley 11-19-09
   Chair, College Review Committee Date
   Dean of College David W. Reed DEC 2009
   Date
   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.

Curricular Services – 12/08

ORIGINAL
Philosophy 641: Mathematical Logic I

Instructor: Christopher Menzel
Email: cmenzel@tamu.edu
AIM userid: TXLogic
Office/Telephone: Bolton 302G/845-8764
Office hours: Wed 2:00-4:00 and by appointment

Course Description/Objectives

The purpose of this course is to provide graduate students in philosophy with a relatively thorough knowledge of the theoretical foundations of classical propositional and first-order predicate logic. Additionally, we will investigate a variety of extensions and alternatives to classical logic that have some bearing on contemporary philosophical issues and methodology — particularly in analytic metaphysics, epistemology, philosophy of language, cognitive science, and philosophy of mind — and hence which are critical to a student's preparation for a career as a professional philosopher. By the end of this course, students should be able to actively participate in and understand the basic metatheories in classic prepositional and first-order predicate logic. Students should be able to apply such methods in their professional philosophy career, as well as teach advanced undergraduate courses.

Course Prerequisites

Graduate classification or approval of Instructor

Course Format

The format of the course will consist of lectures and some discussion. I may also occasionally ask students to prepare short lectures on course material.

Course Text and Supplementary Material

Our text for the course will be Bell, DeVidi, and Solomon, *Logical Options: An Introduction to Classical and Alternative Logics*, Broadview Press, 2001. A good supplement to the section on set theory in the book is:

Suber, P., “A Crash Course in the Mathematics of Infinite Sets”

Grading Policy
Grades will be assigned on the basis of two take-home exams: a midterm (due the first Monday of midterm week, Week 7) and a noncumulative final exam (due on Friday of Week 14). Each exam will count toward 50% of your grade.

**Grading Scale**

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<td>90-100%</td>
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<td>80-89%</td>
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<td>70-79%</td>
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<td>60-69%</td>
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**Schedule**

We will follow the text rather closely, covering the following topics in the following order:

**Weeks 1, 2, and 3**

1. Classical propositional logic
   - Basic Concepts (§1.1)
   - Propositional languages (§1.2.1)
   - Semantics for propositional languages (§1.2.2-§1.2.3)
   - Expressive completeness (§1.2.4)
   - Arithmetical representation of logical operators (§1.2.5)
   - Proof theory: truth trees (§1.3)
   - Metatheorems: correctness and adequacy (§1.4)
   - Proof theory: other methods (§1.5)

**Weeks 4 and 5**

2. Classical Predicate Logic
   - Introductory Remarks (§2.1)
   - Tree rules for classical predicate logic (§2.2)
   - Predicate languages (§2.3)
   - Set theory (§2.4 and Suber)
   - Semantics for predicate languages (§2.5-§2.6)
   - Metatheorems: Correctness and Adequacy (§2.7)

**Weeks 6 and 7**

3. Using and Extending Predicate Logic
   - Postulate Systems (§3.1)
   - Many-sorted logic (§3.2)
   - Second-order logic (§3.3)
   - Take Home Exams due Monday at 5pm of Week 7

**Weeks 8, 9, and 10**

4. Modal Logic
Propositional modal languages (§4.1.1)
- Possible world semantics for propositional modal languages (§4.1.2-§4.1.3)
- Trees and metatheorems for propositional modal ("contextual") logic (§4.2-§4.3)
- Multi-modal logic (§4.5)
- Quantified modal logic (§4.6)
  - Modal predicate languages (§4.6.1)
  - Tree rules and the Barcan formula (§4.6.2)
  - Semantics for quantified modal logic (§4.6.3-§4.6.4)

Weeks 11, 12, and 13
5. Getting Away from Bivalence: Three-valued and Intuitionistic Logic
- Three-valued logics — semantics and trees (§5.1)
- Propositional intuitionistic logic (§5.2)
  - Constructivism (§5.2.1)
  - Trees for propositional intuitionistic logic (§5.2.2)
  - Semantics for intuitionistic logic (§5.2.3)
  - Metatheorems: correctness and adequacy (§5.2.4)
  - Comparing intuitionistic logic to other logics (§5.2.5)
- Intuitionistic predicate logic (§5.3)
  - Semantics (§5.3.1)
  - Trees (§5.3.2)

Week 14
- Review for final exam
- Take Home Exam due Friday at 5pm

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 118 Cain Hall or call 845-1637.

Academic Integrity/Aggie Honor Code

"An Aggie does not lie, cheat, or steal or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

For additional information please visit: http://www.tamu.edu/aggiehonor/