



FACULTY OF ARTS
DEPARTMENT OF PHILOSOPHY

PHIL 579.02 — “Advanced Topics in Logic: Modal Logic”

Winter Term 2013

Course Outline

Lectures: W 16:00–18:45, 1253 Social Sciences

Instructor: Richard Zach
Office: 1254 Social Sciences
Phone: (403) 220–3170 **Email:** rzach@ucalgary.ca
Office Hours: MW 12:30–1:30 (subject to change)
or by appointment

Course Description

Modal logic is an extension of ordinary, “classical” logic which allows formalizations (for instance) of phrases such as “it is possible that” and “it is necessary that” (the alethic modalities). Modal logics have important applications in philosophy, but also in linguistics and computer science. The course will provide an introduction to the basics of modal logic, especially their semantics and model theory, and will also cover various specific systems and their applications—the particular choice of topics will depend on the interests of the class. We will cover the alethic modalities, and also study logics of belief and knowledge, of time, of agents and change, combinations thereof (e.g., dynamic epistemic logic), as well as related topics such as logics of counterfactual conditionals and intuitionistic logic.

Prerequisites

Phil 279 (Logic I) is a prerequisite for this course.

Required Text

We will use the following text as a guide:

Johan van Benthem, *Modal Logic for Open Minds*. (CSLI Publications, 2010)

The following are useful references:

Patrick Blackburn, Johan Van Benthem and Frank Wolter, *Handbook of Modal Logic* (Elsevier, 2007) – available online.

Patrick Blackburn, Maarten de Rijke, Yde Venema, *Modal Logic* (Cambridge University Press, 2002)

James Garson, *Modal Logic for Philosophers* (Cambridge University Press, 2006)

Requirements and Evaluation

Course Requirements. Three homework assignments (60%, 20% each) and a final paper (30%) are required to pass the course. There will be no exams. You will give a short presentation on the topic of your final project in the last week of (April 10); this presentation will make up 5% of your grade. The remaining 5% will be based on participation in discussion in-class and on the course website.

Final Project. The final project will be due on Friday, April 12, and you should submit an extended abstract (2–3 pages including bibliography) by Monday, April 1. It will consist in either a worked out presentation of an advanced topic (e.g., a proof of a theorem in the metatheory of modal logic, a survey article on some application of modal logic in computer science, logic, or linguistics), or a philosophical paper on a topic related to modal logic. A technical project should run about 7–10 pages; a more philosophical paper 10–15 pages. You will give a short presentation on your project/paper (10–20 minutes, depending on class size) in the last week of class. Technical projects may be completed in groups of up to 3 students. If done in a team, the paper should be 10–15 pages long, and the presentation 20–30 minutes shared between team members.

The evaluation of your final paper will take into account the difficulty of the chosen topic, the amount and quality of research evident in it, and the quality, clarity, and precision of your exposition. Your writing and the grading thereof is a factor in the evaluation of your work for this course.

Evaluation and Grades. On each assignment you will receive a letter grade reflecting the level of comprehension of the readings and your ability to assess philosophical arguments shown by the work you submit. There will be no +/- grades, but “slash” grades (e.g., A/B) are possible. The meanings of letter grades are defined in the *Calendar* as follows:

- A** Excellent—superior performance, showing comprehensive understanding of subject matter.
- B** Good—clearly above average performance with knowledge of subject matter generally complete.
- C** Satisfactory—basic understanding of the subject matter.
- D** Minimal pass—marginal performance.
- F** Fail—Unsatisfactory performance.

In computing your final grade, your marks will be converted to grade points and averaged according to the weights given above. The correspondence of letter grades with grade points is defined in the *Calendar* (A = 4, B = 3, C = 2, D = 1, F = 0). “Slash” grades receive 0.5 below the value of the higher grade (e.g., A/B = 3.5).

The final grade will be the letter grade corresponding to the weighted average of your assignments, paper, presentation, and participation plus a margin of 0.1. For the final grade, +’s and –’s are possible, too; as defined in the *Calendar*, +/- adds/subtracts 0.3 grade points. In other words, a course average of 3.9 or higher receives an A; at least 3.6 and less than 3.9, an A–; at least 3.2 and less than 3.6, a B+; at least 2.9 and less than 3.2, a B; and so on. There is no D– grade; to earn a D you require a course average of at least 0.9. The A+ grade is reserved for “truly outstanding” performance.

Assignments and Policies

Late work and extensions. Assignments handed in late will be penalized by the equivalent of one grade point per calendar day, unless you can document a medical or other valid reason for why your assignment is late. If you turn an assignment in late, you must give it to the instructor in person or put it in the department dropbox (it will then be date-stamped by department staff). Note that the dropboxes are cleared at 4 pm, the department closes at 4:30 pm on weekdays and *is closed Saturdays and Sundays*.

Collaboration. Collaboration on exercises is encouraged. However, you must write up your own solutions, and obviously you must not simply copy someone else’s solutions. You are also required to list the names of the students with whom you’ve collaborated on the assignment.

Plagiarism. You will find the University policy on plagiarism at the end of this outline. Plagiarism is a very serious academic offense. It is *not limited* to copying papers wholesale from the Internet; close paraphrase of the texts, of the lectures, or of anyone (other than you) without attribution constitutes plagiarism. Your assignments should only contain your own formulations. When in doubt, consult with the instructor. **Plagiarism will result in a failing grade on the assignment or in the course and a report to the Dean’s office.**

Checking your grades and reappraisals of work. University policies for reappraisal of term work and final grades apply (see the *Calendar* section “Reappraisal of Grades and Academic Appeals”). In particular, term work will only be reappraised within 15 days of the date you are advised of your marks. Please keep track of your assignments (make sure to pick them up in lecture or in office hours) and your marks (check them on the website) and compare them with the graded work returned to you.

Course Website

A course website on U of C’s BlackBoard server has been set up. You will be automatically registered if you’re registered in the class. To access the BlackBoard site, you can either go directly to blackboard.ucalgary.ca and log in with your UCIT account name and password, or you can access it through the myUofC portal at my.ucalgary.ca.

Tentative Schedule and Due Dates (topics subject to change)

Week 1 (Jan 9). Introduction. Modal languages. Relational models.

Week 2 (Jan 16). Frames and models. Validity and consequence. Bisimulations and modal invariance.

Week 3 (Jan 23). Model theoretic constructions. Unraveling and bulldozing.

Week 4 (Jan 30). Axiom systems. Canonical models and completeness.

Week 5 (Feb 5). Finite models and decidability.

Assignment 1 due

Week 6 (Feb 13). Proof systems for modal logics.

Week 7 (Feb 27). Translations and frame correspondence.

Week 8 (Mar 6). First-order modal logic.

Assignment 2 due

Week 9 (Mar 13). Applications 1

Week 10 (Mar 20). Applications 2

Week 11 (Mar 27). Applications 3

Assignment 3 due

Week 12 (Apr 3). Applications 4

Draft final paper due April 1

Week 13 (Apr 10). Student presentations.

Final project due April 12

INTELLECTUAL HONESTY

Intellectual honesty is the cornerstone of the development and acquisition of knowledge and requires that the contribution of others be acknowledged. As a result, cheating or plagiarism on any assignment or examination is regarded as **an extremely serious academic offence**, the penalty for which may be an F on the assignment and possibly also an F in the course, academic probation, or requirement to withdraw. The University Calendar states that plagiarism exists when:

- the work submitted or presented was done, in whole or in part, by an individual other than the one submitting or presenting the work (this includes having another impersonate the student or otherwise substituting the work of another for one's own in an examination or test);
- parts of the work are taken from another source without reference to the original author;
- the whole work (e.g., an essay) is copied from another source; and/or
- a student submits or presents work in one course which has also been submitted in another course (although it may be completely original with that student) without the knowledge of or prior agreement of the instructor involved.

While it is recognized that scholarly work often involves reference to the ideas, data and conclusions of other scholars, intellectual honesty requires that such references be explicitly and clearly noted. Plagiarism is an extremely serious offence. Plagiarism occurs not only when direct quotations are taken from a source without specific acknowledgement, but also when original ideas or data from the source are not acknowledged. A bibliography is insufficient to establish which portions of the student's work are taken from external sources; footnotes or other recognized forms of citation must be used for this purpose.

ACADEMIC ACCOMMODATION

It is the student's responsibility to request academic accommodation. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 403-220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the start of this course.

STUDENT'S UNION REPRESENTATIVES

The Faculty of Arts representatives are: Sarah Damberger arts1@su.ucalgary.ca, Hana Kadri arts2@su.ucalgary.ca, Kelsy Norman arts3@su.ucalgary.ca, Jack Mills arts4@su.ucalgary.ca

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY (FOIP) ACT

The University of Calgary is under the jurisdiction of the provincial FOIP Act in all aspects of its operations as a publicly funded institution. The Department of Philosophy ensures the student's right to privacy by requiring all graded assignments, papers, and exams be returned to the student directly from the instructor.

SAFEWALK: PROMOTING CAMPUS SAFETY AND AWARENESS

Twenty four hours a day, seven days a week, Safewalk volunteers walk people safely to their destination on campus. This service is free and available to students, staff, and campus visitors. Safewalks are done in male/female pairs. The volunteers walk anywhere on campus (including McMahon Stadium, Health Sciences, Student Family Housing, the Alberta Children's Hospital and the University LRT station). To request a Safewalk volunteer to walk with you, call 403-220-5333 (24 hours a day/seven days a week/365 days a year) or use one of the Help Phones located across campus (they are not just for emergencies).

PHILOSOPHY DEPARTMENT

The Department of Philosophy is located on the 12th floor of the Social Sciences Building and on the web at www.phil.ucalgary.ca.

Philosophy Undergraduate Program Advisors for Winter 2013:

Ann Levey (levey@ucalgary.ca)

Jeremy Fantl (jfantl@ucalgary.ca)

Lorraine Markotic (lmarkoti@ucalgary.ca)

For assistance with registration issues in Philosophy courses, contact Merlette Schnell (schnell@ucalgary.ca)