

# Phil 513 — Mathematical Logic I

Fall 2011 – Prof. Kevin C. Klement (Please call me “Kevin.”)

Mondays, Wednesdays and Fridays 11:15am–12:05pm in 312 Bartlett

**Course description and goals:** This course covers elementary meta-mathematics and logical meta-theory. Topics include completeness and consistency proofs for first-order logic, model theory, elementary number theory (especially Peano arithmetic), and Gödel’s incompleteness theorems and related results.

**Prerequisites:** Phil 310 (Intermediate Logic) or equivalent and solid grasp of high school algebra, or consent of instructor. You must also be prepared for a lot of challenging work. *Fair warning: most students find this course exponentially more difficult than their earlier logic courses.*

**Contact info:** My office is 358 Bartlett. My office hours are Mondays 1:30–2:30pm, Wednesdays 3:30–4:30pm and by appt. My office phone is (413) 545-5784. The best way to contact me is by email at klement@philos.umass.edu.

**Web pages:** Our “public” website is <http://courses.umass.edu/phil513-klement/>. More useful is our Moodle page, where you can download lecture notes, an electronic copy of the text and more, and even view your grades. Moodle is available at <https://moodle.umass.edu/>.

**Textbook:** *Introduction to Mathematical Logic*, 5th edition, by Elliot Mendelson (Chapman & Hall/CRC Press, 2010, ISBN 978-1-58488-876-5), available at Amherst Books, in downtown Amherst. You may also use the 4th edition. We will also make heavy use of handouts. The materials will be available on our webpage and Moodle. **Recommended additional texts:** *Gödel’s Proof* by Ernest Nagel and James Newman (NYU Press, 2008, ISBN 978-0-814-75837-3); and/or *Gödel, Escher, Bach* by Douglas Hofstadter (Basic Books, 1999/1979, ISBN 978-0-465-02656-7).

**Requirements and Grading:** The grading system for the course is annoyingly complicated.

- There are four units, each with a homework set and take-home exam.
- The exam and homework set for a given unit are handed in together.
- Each homework set and each exam is graded on an unusual 1–10 scale (see chart), but with different criteria.  
**For homework** diligence, effort, and depth of engagement are most important in determining your score.  
**For exams** correctness, precision, rigor and originality in exposition are most important for your score.

Grade scale	
HW/Exam:	Course grade:
10 pt. = A+	91–100 pts. = A
9 pt. = A/A–	84–90 pts. = A–
8 pt. = B+	75–83 pts. = B+
7 pt. = B	67–74 pts. = B
6 pt. = B–	58–66 pts. = B–
5 pt. = C	53–57 pts. = C+
4 pt. = D	49–52 pts. = C
3 pt. = F	44–48 pts. = C–
2 pt. = F	41–43 pts. = D+
1 pt. = F	37–40 pts. = D
0 pt. = F	0–36 pts. = F

- For each unit, I multiply either your exam score or your homework score, *whichever is higher*, by 1.5, rounding fractions up, and add it to the other score, so that whichever you do better on counts more in determining your final grade. You may thus earn up to 25 points per unit.
- Adding your four unit scores gives a number out of 100, which determines your final grade.

**Policies:** Homework and exams may be handwritten. You may collaborate with your peers on *homework* assignments provided you do not *copy* from them. However, you may *not* collaborate with your peers on *exams*.

## Course Schedule – Subject to change!

DAY	MATERIAL	EXERCISES
W Sept 7	Course introduction	none
F Sept 9	Introduction (pp. xv–xxiv)	Handout pp. 5–6
M Sept 12	Introduction (pp. xv–xxiv), cont., §1.1	Handout p. 7, 1.10
W Sept 14	§§1.1–1.2	1.15, 1.16, 1.19 (any 3), 1.27 (any 3)
F Sept 16	§1.3	1.36, 1.38 (any 1), 1.40
M Sept 19	§1.4	1.47
W Sept 21	§1.4, cont.	1.49
F Sept 23	§1.4, cont.	1.48
M Sept 26	§1.4, cont.	1.50
W Sept 28	§§1.5–1.6	1.51
F Sept 30	§2.1	2.3, 2.6
M Oct 3	§2.2	2.10(a), 2.13
W Oct 5	§2.2, cont. <b>Homework/Exam 1 due!</b>	2.19, 2.26(a)
F Oct 7	§2.15	2.139 (any 5)
M Oct 10	Columbus day. Class moved to Tuesday.	
Tu Oct 11	§§2.3–2.4	2.27
W Oct 12	§§2.4–2.5	full proof of example, p. 68 (4th ed, p. 75); 2.31 (any 4), 2.32
F Oct 14	§2.6	2.38, 2.39, 2.44, 2.46
M Oct 17	§2.7	Corollary p. 78; 2.49 (4th ed.: both 2.49s)
W Oct 19	§2.7	2.51
F Oct 21	§2.7	2.63(a),(c)
M Oct 24	§2.8	2.64, 2.65 (any 3)
W Oct 26	§2.8, cont.	2.70 (any 2)
F Oct 28	§3.1	Prop. 3.2(k)–(o)
M Oct 31	Handouts sec. 3B	Handout p. 60
W Nov 2	§3.1, cont.	Prop. 3.5(e)
F Nov 4	§3.1, cont. <b>Homework/Exam 2 due!</b>	Prop. 3.6(a)-ii (rest); 3.2
M Nov 7	§§3.1–3.2	3.8
W Nov 9	§3.2, cont.	3.11, 3.14
F Nov 11	Veteran's day. No class.	
M Nov 14	§3.3	3.16, 3.22
W Nov 16	§3.3, cont.	3.25, 3.27
F Nov 18	§3.3, cont.	3.31
M Nov 21	Handouts secs. 4A–4B, §3.4	3.32, 3.34
W Nov 23	§3.4, cont.	3.36
F Nov 25	Thanksgiving break. No class.	
M Nov 28	§3.4, cont. <b>Homework/Exam 3 due!</b>	Lemma 3.32(d)–(f)
W Nov 30	§3.5	none
F Dec 2	§3.5, cont.	3.41, 3.47
M Dec 5	§3.5, cont.	3.48, 3.51 ((HB1) only)
W Dec 7	§§3.5–3.6	3.52, 3.54
F Dec 9	§3.6	3.54, 3.56
FINALS	<b>Homework/Exam 4 due, Sat., Dec. 17th.</b>	