Phil 513 — Mathematical Logic I

Spring 2017 — Prof. Kevin C. Klement

Mondays, Wednesdays and Fridays 11:15am–12:05pm in E301 South College

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 E319 South College. My office hours are Wednesdays and Fridays 10–11am, and by appointment. The best way to contact me is by email at `klement@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 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). You may also use the 4th or 6th editions. We will also make heavy use of lecture notes, which you are expected to print and bring to class. The materials are available on Moodle.

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
M 23 Jan	Course overview	None
W 25 Jan	Introduction	Lecture notes pp. 5–6 and 7
F 27 Jan	§§1.1–1.2	1.10, 1.15, 1.16
M 30 Jan	§1.2, cont.	1.19 (any 3), 1.27 (and 3)
W 1 Feb	§1.3	1.36, 1.38 (any 1)
F 3 Feb	§1.4	1.47
M 6 Feb	§1.4, cont.	1.49
W 8 Feb	§1.4, cont.	1.48
F 10 Feb	§1.4, cont.	1.50
M 13 Feb	§§1.5–1.6	1.51
W 15 Feb	Unit 1 discussion & review	Exam 1
F 17 Feb	§2.1	2.3, 2.6
M 20 Feb	Presidents' day; no class.	
W 22 Feb	§2.2; **Homework/exam 1 due**.	2.10, 2.13
F 24 Feb	§2.2, cont.	2.19, 2.26(a)
M 27 Feb	§2.15	2.139 (any 5)
W 1 Mar	§§2.3–2.4	2.27
F 3 Mar	§2.4, cont.	full proof of example, p. 68 (6th ed., p. 72; 4th, p. 75)
M 6 Mar	§2.5	2.31 (any 4), 2.32
W 8 Mar	§2.6	2.38, 2.39, 2.44, 2.46
F 10 Mar	§2.7	Prove the corollary p. 78; 2.49 (6th ed., p. 83; 4th ed.: both 2.49s)
13–17 Mar	Spring break; no class.	
M 20 Mar	§2.7, cont.	2.51, 2.63(a),(c)
W 22 Mar	§2.8	2.64, 2.65 (any 3)
F 24 Mar	§2.8	2.70 (any 2)
M 27 Mar	§3.1	Prop. 3.2(k)–(o)
W 29 Mar	Lecture notes sec. 3B	Lecture notes, p. 59
F 31 Mar	§3.1, cont. **Homework/exam 2 due**.	Prop. 3.5(e), Prop. 3.6(a)-ii (rest)
M 3 Apr	§3.1, cont.	3.2, 3.8
W 5 Apr	§3.2	3.11
F 7 Apr	§3.2, cont.–§3.3	3.14, 3.16
M 10 Apr	§3.3, cont.	3.22, 3.25
W 12 Apr	§3.3, cont.	3.27, 3.31
F 14 Apr	Lecture notes secs. 4A–4B, §3.4	3.32, 3.34
M 17 Apr	Patriots' day; class moved to Tuesday	
Tu 18 Apr	§3.4, cont.	3.36
W 19 Apr	§3.4, cont. **Homework/exam 3 due**.	Lemma 3.32(d)–(f)
F 21 Apr	§3.5	3.41
M 24 Apr	§3.5, cont.	3.47, 3.48
W 26 Apr	§3.5, cont.	3.51 ((HB1) only), 3.52
F 28 Apr	§3.5, cont.–§3.6	3.54
M 1 May	§3.6, cont.	3.56
Th 11 May	**Homework/exam 4 due** (finals week)	