

History of Mathematics Course Emphasizing Writing

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Spring 2006, 2007, 2009
3 semester-hours

Enrollment about 15, 20, 30

Targeted students junior math majors & secondary-credential candidates

Student characteristics a little older than usual and very diverse ethnically

Instructor characteristics . . . semi-retired former logician, geometer, and software engineer, now a full-time historian

Major course emphasis . . **researching and writing**

Minor emphases social contexts of mathematics
Giuseppe Peano

Course grade based on **term paper 1**, ≥ 12 pp. 27%

term paper 2, ≥ 12 pp. 33%

4 quizzes on texts 30%

2 oral presentations 10%

Overall justification I wanted to emphasize writing more than the Department syllabus did. I ignored its guidelines to “cover” and assign exercises on various subjects. I wanted to introduce social contexts of mathematics to which students could relate, and to introduce history of some subjects that they would study and teach later. They would choose paper topics from this landscape, with my guidance. I would provide instruction in research and writing.

Peano stemmed from a modest background, introduced many nuances in upper-division math courses, was deeply involved in linguistics, and participated in serious controversies. Lots of contact with SFSU students’ interests. Subject of a wonderful biography that is free online. And I know a lot about him and his context. A good theme to begin and end the course.

Texts Dirk J. Struik, *A Concise History of Mathematics* (Dover)
Hubert C. Kennedy, *Peano* (Lulu, online)

On the next page is the Spring 2009 schedule (two seventy-five-minute meetings per week) and an assessment and commentary.

Meetings Agenda

- 1–6 Reviews of texts. *Math Reviews*, *Dictionary of Scientific Biography*, *Wikipedia*. Struik chapters 1–2, Peano’s youth, school mathematics, axiomatics, Euclid. Term-paper topics, story-telling, documentation, researching, studying for quizzes.
- 7 Quiz 1. Journals.
- 8 **Paper topic 1 due.** Debrief quiz. Parallels.
- 9–14 Parallels, area, Pythagoras, similarity, irrational numbers, polyhedra, volume, trigonometry. Struik 3–5. Term-paper guidelines.
- 15 Quiz 2. Perspective.
- 16 **Term paper 1 due.** Debrief quiz. Struik 6. Cubics, logs, languages for math, precursors of calculus

Recess

- 17 **Debrief term paper 1.** Writing for the *Monthly*: referees, criticism. Kepler, Cavalieri.
- 18–20 Struik 6. Descartes, mathematics for commerce, Newton, Leibniz, Bernouillis, Euler. National rivalries. Academies of science.
- 21 **Paper topic 2 due.** European universities.
- 22 Quiz 3. Italian universities. Euler.
- 23–29 Debrief quiz. Struik 7–8. Development of calculus. Gauss. Oral term-paper reports. Real number system. Peano as university student and junior professor.
- 30 **Term paper 2 due.** Oral reports. Peano’s foundation of natural-number arithmetic. Hilbert. Hilbert’s radio address.
- 31 Quiz 4. **Debrief term paper 2.** Oral reports.

Assessment and Commentary

Lectures I prepared a detailed outline for each lecture, projected it in class with many illustrations, then edited it for the web. Attendance at lectures was good.

Quizzes The quizzes were meant to ensure that students kept up with the reading and lectures. Performance was terrible; it did not reflect their ability to do good work of other sorts. If I were still teaching, I’d consult history professors about ways to fix this problem.

Papers Students chose their paper topics with my guidance. *Warning*: It is hard to dissuade the most naive from basing their work on grade-school and commercial counterculture sources. I reviewed the first papers in deep detail, even copyediting professionally when that seemed useful. The second papers, due at semester’s end, received the same level of commentary but not the copyediting. They were much improved! Here are some examples, from the three years:

Newton’s circle, especially Wren’s reconstructing London by a retired contractor
Beppo Levi in Argentina by a credential candidate using Spanish sources
How did von Neumann become interested in game theory? by a mathematics major

Overall I proved that even mathematically very naive students can produce good history term papers, given major guidance. But this course was expensive to offer: I could not have instructed more than 30 students this way, even teaching just one course! It was the last, and very best, of my career. The website is still online:
<http://math.sfsu.edu/smith/Math300/Math300.htm>.