

**18.784: SEMINAR IN NUMBER THEORY  
SYLLABUS**

INSTRUCTOR: TONY FENG

**Class Schedule:** Tuesdays and Thursdays 9:30-11 in 2-151.

**Office Hours:** Mondays and Fridays 5-6 in 2-178, and by appointment.

**E-mail:** fengt@mit.edu.

**Course website:** Canvas

**There is no final exam.**

**Course goals and description.** The mathematical content of the course will be about the theory of  $p$ -adic numbers, for which we will follow the book by Gouvea. As a designated communication-intensive class, there will be an emphasis on developing your abilities to learn and communicate mathematics, and more specifically your presentation, reading, and writing skills. To this end, participants will take turns presenting sections of the book to each other. There will also be weekly problem sets to test understanding of the material, but **no final exam**. Instead, students will write a final paper on a topic of their choice (to be discussed with me). Active engagement in class is encouraged; participants will offer feedback on each others' presentations and writings.

**Required textbook.** Fernando Gouvea, *p-adic numbers*. Although participants are expected to follow along in the textbook, even when they are not presenting. See this website for tips on reading mathematics (which will also be useful for preparing the term paper).

**Assignments.** The homework for the class will consist of the following.

- Two 75-minute presentations, to be prepared in collaboration with a teammate, plus lecture notes prepared for each. Everybody is required to hold one practice talk with me before their first presentation.
- Weekly problem sets. These are to make sure everybody is following along with the material, rather than to teach new material.
- Term paper of length about 10 pages, plus a 20-minute in-class presentation. Partial progress will be due in incremental stages.
- Peer review and feedback. Submit comments on your classmates' presentations and paper draft.

About the workload: the problem sets will be lighter than in the typical MIT class, but the presentation and paper will require a lot of work. Therefore, the workload in this course will be somewhat unevenly distributed by nature, so I strongly recommend spreading it out by getting started early on your presentation and term paper, and preparing consistently.

**Pre-requisites.** Analysis at the level of 18.100, Algebra at the level of 18.700 and 18.701.

**Policies.**

- **COVID-19.** According to MIT's COVID policies, participants need to wear masks in class. When speaking in a group setting where all others present are masked, a speaker may lower or remove their mask while speaking and then raise or replace their mask to allow others to speak, but in a given space only one mask should be down or off at a time.
- **Attendance (in-person) is mandatory.** However, I will be accommodating towards reasonable excuses. E-mail me as far in advance as possible if you are going to miss a class. Repeated absences without explanation may affect the final grade. On the other hand, **please do not come to class if you are sick**, or even if you have reason to suspect that you are sick.
- Problem sets and the term paper must be prepared using L<sup>A</sup>T<sub>E</sub>X; for help with this, see this link. Submit on Gradescope through the link that I will provide. **Late assignments will not be accepted.**
- You are encouraged to discuss problem sets with your classmates, but **you must write up solutions by yourself.** This means that you may not look at anybody else's solutions as you write your own. You are free to use the book (which contains many hints or partial solutions) or other outside sources, **as long as you acknowledge them properly.**
- MIT's policies on academic integrity, explained at <https://integrity.mit.edu/>, will be enforced.

**Resources.**

- The website has documents containing tips for reading, writing, and presenting.
- In addition to the assistance you will receive from your peers and from me, **help with presenting and writing is available from the departments mathematical communication specialist, Susan Ruff.** You can e-mail her to arrange a time to meet: [ruff@math.mit.edu](mailto:ruff@math.mit.edu).
- General help with writing and presenting (not specific to mathematics) is available from MIT's Writing Center: <http://cmsw.mit.edu/writing-and-communication-center>.

**Important dates.** Dates are subject to change.

- Sep 30 – Reading assignment due for in-class Workshop.
- Oct 8 – Paper topic selection due.
- Oct 1 – Paper outline and references due. Tony's Office Hours canceled.
- Nov 1 – Draft of first third of paper due.
- Nov 18 – Final presentations begin.
- Nov 22 – Paper first draft due. Tony's Office Hours canceled.
- Nov 23 – Class off for Thanksgiving.
- Dec 3 – Peer revision comments due.
- Dec 9 – Paper final draft due (last day of classes).

**Grading.** Final grades are based on the following division:

- 40% from the two in-class presentations and lecture notes. If it helps your grade, the first presentation will be worth 15% and the second worth 20%. The lecture notes will constitute 5%.
- 10% from participation, meaning in engaging in class, asking questions, and offering feedback to your peers on their talks and paper drafts.
- 20% from problem sets.
- 30% from final paper and presentation.

Consult the documents on the course website for rubrics on how each category will be graded. As with all MIT courses, **scores will not be curved.** In fact, the feedback component of the grade means that it is in your best interest to help your classmates improve. My ideal scenario is that everybody walks out of the class with an ‘A’.

**If a personal or medical issue is interfering with your studies:**

- Contact your medical provider if you need medical attention.
- Please do not come to class if you are sick. Instead read the sections in the textbook you missed.
- Email me.
- If it is an extended illness or serious personal problem, one that will cause you to miss completing an assignment, then please discuss this with Student Support Services (S<sup>3</sup>). You may consult with S<sup>3</sup> in 5-104 or call 617-253-4861. The deans in S<sup>3</sup> will verify your situation, and then discuss with you how to address the missed work. Students will not be excused from coursework without verification from S<sup>3</sup>.

If you have some other kind of conflict (e.g., varsity sports game), email only me (not a dean) as far in advance as possible, and I will make a decision on how to proceed.

**If you need disability accommodations:** Please speak with Kathleen Monagle, Associate Dean in Student Disability Services (SDS) in 5-104 or call 617-253-1674, ideally before the semester begins. If you have a disability but do not plan to use accommodations, it is still recommended that you meet with SDS staff to familiarize yourself with the services and resources of the office. If you have already been approved for accommodations, please bring the accommodation letter to Theresa Cummings, 617-253-4977 in Mathematics Academic Services 2-110 early in the semester.