

2019 Fall Course Syllabus - Mathematics 4096

Course: Mathematics 4096.001.

Course Title: Senior Problem Solving.

Time: TR 3:30-4:50.

Place: Wachman 206.

Instructor: Gerardo A. Mendoza.

Instructor Office: Wachman 618.

Instructor Email: gerardo.mendoza@temple.edu

Instructor Phone: 1-5053.

Office Hours: TR 9:00-10:30 or by appointment.

TA: Shu-Ting Huang. Office hours Mondays 1:00-3:00 in the Math Tutoring Center (Wachman 1036).

Course Web Page:

<http://math.temple.edu/~gmendoza/courses/math.4096.2019/HW.html>

Prerequisites: As specified in the Undergraduate Bulletin.

Textbook: No textbook.

Course Goals: The two principal aims are: (*i*) To develop additional mathematical problem solving skills and knowledge of topics not necessarily covered in a standard undergraduate course, and (*ii*) to acquire or reinforce good writing and oral communication skills of mathematical topics. The course will provide a working acquaintance with tools of the profession such as using state-of-the art technical typesetting (\TeX and the macro package \LaTeX), mathematical software such as *Mathematica*, and online resources and repositories such as *MathSciNet*, *ArXiv.org*, and *JSTOR*.

How to get there: To achieve these goals you will be giving in-class oral (chalk and blackboard) presentations as well as turning in papers of your resolution of individual problems or related problem lists I will be posting online on the course's website throughout the semester. Follow the link at <http://math.temple.edu/~gmendoza> to the course web page. The papers **must** be written using the TeX typesetting system, for which basic instructions will be available on the course's webpage; if you need additional help come to my office (or ask in class).

The style of the written component of your work will be either in the form of a research paper or of a chapter in a textbook or monograph.

In the case of a research paper, it will consist of a title, abstract, introduction describing the context, stating or describing the problem, and subsequent sections presenting the solution of the problem(s), in the format of theorem (or proposition/lemma/claim) and proofs as needed, ending with relevant bibliography and references.

Papers turned in in the style of a chapter in a textbook will have a title, an introduction describing the problem and its context, and successive sections similar to that of papers (including bibliography and references cited).

The style of a chapter is more relaxed than that of a research paper, but in both cases a good narrative is important: the point of your work (eventually in a professional context) is to make yourself understood. A good guide is to write as if you are telling the story to a classmate, keeping a running dialogue in your mind, with your interlocutor asking you questions or clarification of your statements. When you write, think about the way ideas in your textbooks or in papers you have read are expressed, and mimic their style. Think and write professionally.

It is very important to include references consulted. It is a fundamental component of our discipline (as with any other) to be completely forthcoming about the origin of the ideas, whether they came from the literature, online searches, or through discussions with your classmate or others. You can acknowledge such discussions as a reference to *name, personal communication*, or a generic statement at the end of the introduction or the last section before the references. Only if they are your ideas will you omit a reference.

Typically, you will choose a topic to work on (from the list I provide) and start working on solving the problems. This first part is a paper-and-pencil process where you work on providing proofs of almost every statement you make; if you consult the literature, keep track of the sources you are using. The level of understanding of each problem should already be so that you can explain to your classmates, eventually also to me, your proof. Once you know how to prove the statements, you will have a good understanding of the topic you chose. At this stage you will start writing a draft (can still be paper and pencil) organizing the problems of you topic into a well structured unit. Once you have this, you start typing (T_EX) a first version.

Once you have typed substantial components of your paper (this can be just the abstract, or one or more proofs of statements, or complete sections), you can send me your work and I will look at it critically. You will then redo these components according to my observations and resubmit. This process may occur several times for the same part of your work, or for different parts of your paper as you make progress. At any time you can consult with me, in-class or during office hours if you need help clarifying your ideas. You have to be judicious about the level of detail needed; too little detail, and I will doubt your knowledge of the problem. Too much detail may mean a paper no one would like to read. (In the 4th to last paragraph of <https://www.theatlantic.com/entertainment/archive/2017/08/the-secret-life-of-a-book-manuscript/536982/> we read

The first draft is for the writer. The second draft is for the editor.

The last draft is for the reader.

This is very good advice.)

I expect your first *complete* draft within two weeks of starting to work on the topic, and partial drafts or preliminary versions twice per week while you are working on it (a good working discipline would be to send me your work the day after a class, i.e., W or F).

Topics Covered: Miscellaneous mathematical problems from multiple areas in mathematics, or in areas involving mathematics for their resolution. Instruction on T_EX and good mathematical writing skills.

Course Grading: Based on multiple papers (about one every two week) and presentations in class. Clarity of exposition, both oral and written, and correctness

of the mathematical content and form are fundamental. Your final grade will consist of 30% on first submissions, 30% in-class presentations, and 40% resubmission after revision.

Exam Dates: No exams. Individual grades will be based on papers and presentations. Paper submissions are expected at a rate of one per week or week-and-a-half starting with the second week. Resubmissions are due the next time the class meets after the paper are returned.

Attendance Policy: Attendance is required. An excessive number of unjustified absences will result in a failing grade.

Any student who has a need for accommodations based on the impact of a documented disability or medical condition should contact Disability Resources and Services (DRS) in 100 Ritter Annex (drs@temple.edu; 215-204-1280) to request accommodations and learn more about the resources available to you. If you have a DRS accommodation letter to share with me, or you would like to discuss your accommodations, please contact me as soon as practical. I will work with you and with DRS to coordinate reasonable accommodations for all students with documented disabilities. All discussions related to your accommodations will be confidential.

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has adopted a policy on Student and Faculty Academic Rights and Responsibilities (Policy # 03.70.02¹).

Students will be charged for a course unless dropped by the Drop/Add deadline date. Check the University calendar² for exact dates.

During the Drop/Add period, students may drop a course with no record of the class appearing on their transcript. Students are not financially responsible for any courses dropped during this period. In the following weeks prior to or on the withdrawal date students may withdraw from a course with the grade of “W” appearing on their transcript. After the withdrawal date students may not withdraw from courses. Check the University calendar² for exact dates. Consult the full policy.³

The grade “I” (an “incomplete”) is only given if students cannot complete the course work due to circumstances beyond their control. It is necessary for the student to have completed the majority of the course work with a passing average and to sign an incomplete contract which clearly states what is left for the student to do and the deadline by which the work must be completed. The incomplete contract must also include a default grade that will be used in case the “I” grade is not resolved by the agreed deadline. See the full policy.⁴

¹<http://policies.temple.edu>

²<http://www.temple.edu/registrar/documents/calendars/>

³<http://bulletin.temple.edu/undergraduate/academic-policies/withdrawal-policies/>

⁴<http://bulletin.temple.edu/undergraduate/academic-policies/incomplete-coursework/>