MATH 453 – SYLLABUS

PEYAM TABRIZIAN

Welcome to Math 453! This is the syllabus for this course, where you can find all the administrative info you need to know, such as office hours and grading. Should you have any other questions, please feel free to e-mail me. Enjoy the partial differential adventure!

- **Instructor:** Peyam (Pie-Am) Ryan Tabrizian
- **E-mail:** tabrizianpeyam@hotmail.com or prt2@williams.edu
- **Office:** 117 Bronfman
- **Class meeting times:** This course meets on MWF from 11 to 11:50 AM in 103 Bronfman, from Friday, February 3, up to and including Friday, December 12. I do not take attendance, so whether you show up to class is entirely up to you, but of course it is highly recommended
- **Office Hours:** My official office hours are on Wednesdays from 2 to 3 pm and on Thursdays 4 to 6 pm in 117 Bronfman. That said, my door is always open for you, even outside the above hours, so if you knock on my door and I'm in, I'd be glad to help! Best times to catch me in my office are Monday through Friday from 2 pm to 7 pm.
- **TA Session:** Thursdays from 8 to 9 pm in 106 Bronfman. The TA is glad to go over any questions or HW-related concerns you may have. Also, if no one shows up within the first 20 minutes, the TA reserves the right to leave the room.
- **TA:** Anand Hemmady, ash6@williams.edu. Please e-mail him in case you have a question that you don't feel comfortable asking me.
- **Important Dates:**
  - ▶ Friday, Feburary 10: Last day to add/drop classes
  - ▶ Friday, February 17: Winter Carnival (no classes)

Date: Friday, February 3, 2017.

- **Wednesday, March 15 – Friday, March 17: Take-Home Midterm**
- Friday, March 17: No Math 453−class (because of midterm)
- Saturday, March 18 to Sunday, April 2: Spring Break! (no classes)
- Thursday, April 6: Last day to drop a fifth class
- Friday, April 28: Last day to change the grading option of eligible courses to P/F
- Friday, April 28: Last day to withdraw from a course
- Friday, May 5: Last day to claim exam hardship
- Friday, May 12: Last day of class
- **Saturday, May 13 to Sunday, May 21: Final exam−period**

• **Online resources you can use:**

- sites.williams.edu/prt2: This is the most important resource that you'll need. It contains all homework assignments, as well as information about exams (once we'll get closer to them).
- www.glow.williams.edu: Mainly use this to check your scores on the homeworks and exams.

• **Required Textbook:** *Partial Differential Equations, Second Edition* by Lawrence C. Evans, Graduate Studies in Mathematics Vol 19. (2010). ISBN-10: ISBN-10: 0821849743, ISBN-13: 978-0821849743 . I will follow this book very carefully and the homework assignments will be taken from that book, so make sure to buy it!

• **Recommended Textbooks:**
  - *Partial Differential Equations: An Introduction to Theory and Applications* by Michael Shearer and Rachel Levy, Princeton University Press (2015), ISBN-10: 0691161291, ISBN-13: 978-0691161297. This book covers the same material I'm planning on covering and is a bit easier to read. You can use it as a supplement if you want in case you find the main textbook too hard to read.
  - *Partial Differential Equations, Second Edition* by Walter A. Strauss, Wiley (2007), ISBN-10: 0470054565, ISBN-13: 978-0470054567 . This book (although not my favorite) is the standard undergraduate introduction to PDEs.

• **Prerequisites:** Math 150/151 and Math 350/351 or an equivalent preparation in multivariable calculus and analysis, and mathematical maturity equivalent to a senior mathematics student. We'll also use a tiny bit of linear algebra, so Math 250 is useful, but not necessary. Notice that you

won't need to have taken an ODE course to survive this course; in fact the techniques to solve PDE are very different from the techniques to solve ODE. That said, it's useful to review how to solve simple ODE like $y' = ky$ or $y'' + y = 0$.

Note: In this course, we'll sometimes use concepts from advanced math courses (like measure theory), so don't freak out if there are some things you've never seen before; you are definitely not behind! There is a 'review' of prerequisites in the appendix of the book, which might be useful to look at (but again, not necessary)

- **What this course is about:** This course is an introduction to the magical world of Partial Differential Equations, with an emphasis on theory. My current plan is to cover the following chapters from the textbook:

  - Chapter 2: Four Important Linear PDE: Laplace's Equation, Heat Equation, Transport Equation, Wave Equation: This chapter will actually be the bulk of the course, and we might spend 6 weeks on this one. Those PDE are the building blocks for the study of more complicated PDE.
  - Chapter 5: Sobolev Spaces: They are the perfect spaces to study PDE Theory, and they are what $C(\mathbb{R})$ is to Analysis and $L^2(\mathbb{R})$ is to Fourier Analysis
  - Chapter 6: Second-Order Elliptic Equations: This chapter explains why the previous one is so important, because we will use Sobolev spaces and analysis to study very general elliptic PDE.
  - Chapter 3: Nonlinear First-Order PDE: (if time permits) This chapter studies first-order PDE, using an important technique called the method of characteristics. We will also talk about things like shocks

  That said, the nice thing about this course is that it is *completely* flexible. I'm definitely planning on covering Chapter 2, but if you feel that I should cover, say, Chapter 3 instead of Chapter 5 instead, just let me know and I can adapt accordingly! Also, please let me know if you want me to go slower (or faster).

- **Grading:**

  - 40 $\%$ Homework, due on Fridays at 11:50 AM in 103 Bronfman.
  - 20 $\%$ take-home Midterm, between Wednesday, March 15 and Friday, March 17.

- 40 % take-home Final Exam, between Saturday, May 13 and Sunday, May 21

Notes:

- The exams will be closed book and closed notes, and no cheat sheets will be allowed.
- The take-home midterm will be 2 hours long; it will be given out on Wednesday, March 15 at the end of class, and will be due on Friday, March 17, at noon. As a reward, there will be no class on Friday, March 17.
- The take-home final exam will be 24h long. You can pick it up from Hopkins Hall beginning on Saturday, May 13. The last day to take the exam is on Sunday, May 21.
- You will be graded on a curve. I will follow the standard grading policies of the math department, but I'll try to be as generous as I can.

- **Homeworks:** Homeworks are due on Fridays at 11:50 AM in 103 Bronfman, and usually consists of 3 problems from the textbook. You can find the homework assignments on my website. No late homework is allowed, and no homework scores will be dropped.

- **Cheating: DON'T!** I *will* catch you, and you will be prosecuted by the full extent of the Williams College law! In particular, by taking this course, you agree to abide by the following honor code:

- **Honor Code:** As a member of the Williams College community, you will act with honesty, integrity, and respect for others. You promise not cheat on the homework and the exams. If you used any outside sources or collaborated with someone on the homework, you will explicitly cite it, and, on the exams, *unless explicitly noted on the first page of the exam*, you will not consult any books (including the textbook) or people (except for me), use notes and/or portable electronic devices. Finally, you promise to take the exam in the allotted timeframe.

- **Accommodations:** Students who may need disability-related accomodations are encouraged to talk to me and the deans as soon as possible. Moreover, according to Williams policy: "Any student who is unable, because of his or her religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be

excused from any such requirement, and shall be provided an opportunity to make up such requirement which s/he may have missed because of such absence now-provided, however, that such makeup examination or work shall not create an unreasonable burden upon the College. No adverse or prejudicial effects shall result to any student."

- **Finally:** Sit back, relax, and enjoy the show! In this course we will explore a vast array of PDE, so hopefully you'll find one that you'll particularly like :)