

SYLLABUS, MATH 218 (SPRING 2022)

Canvas Webpage: <https://canvas.ucsc.edu/courses/52775>

Course Webpage: https://people.ucsc.edu/~yzou34/math218_s22

I will send announcements on Canvas and post notes on the Course webpage.

Lecture time and location: TuTh 11:40am-1:15pm, McHenry Library Classroom 1270.

Instructor: Joey Zou (email: [yzou34\(at\)ucsc\(dot\)edu](mailto:yzou34@ucsc.edu)).

Instructor Office Hours: Tu 2:30-3:30pm, in McHenry Library, Room 4167, and by appointment over Zoom.

COVID-19 Protocol: All class activities will be in-person whenever feasible. Lecture notes will be uploaded for each lecture for students who cannot attend lectures in-person. Students are asked to follow all university guidelines regarding masking in indoor settings, daily symptom checks, testing and self-isolation requirements, and respecting others' comfort with distancing. Any changes to the modality of the course (due to university guidelines, instructor self-isolation, etc.) will be announced on Canvas as soon as possible.

Textbook: There is no official textbook for the course. Some textbooks/papers that are worth referencing throughout the quarter (this will be a list in progress):

- Boutet de Monvel, L. *Hypoelliptic operators with double characteristics and related pseudo-differential operators*.
- Chavel, I. *Eigenvalues in Riemannian Geometry*.
- Evans, L.C. *Partial Differential Equations*.
- Grigis, A., and Sjöstrand, J. *Microlocal Analysis for Differential Operators*.
- Hörmander, L. *The Analysis of Partial Differential Operators*, Vol. I and III.
- Taylor, M., *Partial Differential Equations*.

Course description: The course will focus on various aspects of linear parabolic and hyperbolic equations, with a particular emphasis on the construction and properties of parametrices and solution operators to such equations. Towards the end of the quarter, I'll plan on giving an introduction to microlocal analysis, with a particular focus on applications to parabolic and hyperbolic problems.

Schedule: (may be subject to change depending on student interest)

- Week 1: Review of distribution theory and Fourier transform
- Weeks 2-4: Study of parabolic equations, with particular focus on parabolic regularity and the structure of the heat kernel
- Weeks 5-7: Study of hyperbolic equations
- Week 8: Introduction to microlocal analysis and parametrices for differential operators

- Week 9: Construction of parametrices for parabolic operators
- Week 10: Construction of parametrices for hyperbolic operators

Prerequisites: Math 205 and 206 (Analysis II and III). Some familiarity with distribution theory and Fourier transform would be ideal (these will be reviewed during Week 1). Some familiarity with analysis on manifolds is also recommended.

Homework: I plan on releasing 4 problem sets of approximately 10 problems each. You are encouraged, but not required, to submit solutions to some of the problems at any point in the quarter. I will be happy to look over solutions and offer feedback throughout the quarter.

DRC Accommodations: The Disability Resources Center reduces barriers to inclusion and full participation for students with disabilities by providing support to individually determine reasonable academic accommodations. If you have questions or concerns about exam accommodations or any other disability- related matter, please contact the DRC office, located in Hahn 125 or at 831-459-2089 or drc@ucsc.edu.