

MATH 8803 Syllabus

Formation of shocks in multidimensional nonlinear waves and fluids, Section ABB, 3 credit hours

Fall 2026

Instructor Information

Instructor: Dr. Leonardo Abbrescia

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General Course Information

Description

The goal of the course is to prove shock formation to quasilinear wave equations in multiple spatial dimensions. Applications to Galilean and relativistic fluids will be discussed. The mathematical framework will revolve around PDE analysis and Lorentzian geometry. Necessary background material will be presented as needed.

Course Learning Outcomes

- Understand the relationship between eikonal coordinates and Cartesian coordinates in the context of shock formation.
- Understand how to derive energy estimates at top order without losing derivatives.

Required Course Materials

Speck, Jared, Gustav Holzegel, Jonathan Luk, and Willie Wong. “Stable shock formation for nearly simple outgoing plane symmetric waves.” *Annals of PDE* 2.2 (2016): 10.

Grading Policy

Grades will be awarded as follows:

$A = [90\%, 100\%]$, $B = [80\%, 90\%)$, $C = [70\%, 80\%)$, $D = [60\%, 70\%)$, $F = [0\%, 60\%)$.

Assignments

- Participation: 20%
- Final presentation: 80%

Description of Graded Components

- Participation: students are expected to come and actively engage with the course material. At most one percentage point will be awarded for asking questions per day. A maximum of 20 percentage points will be awarded.
- Final presentation: students will present the main ideas of a rigorous proof based math research paper assigned by the instructor (or with permission if suggested by the student).

Course Policies

Attendance and Participation

Regular attendance is expected, as the course material is cumulative and often not fully captured in written notes. Students are responsible for all material covered in lectures. Although attendance is not graded, the only way to earn participation points is by attending class.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.