

Library E4310

Monday, Wednesday 2:30-3:50

Instructor: Theodore Drivas (tdrivas@math.stonybrook.edu)**Office:** Math Tower 4-114**Office Hours:** Tuesday 1:00-3:00pm, or by appointment.**Course Webpage:** <https://www.math.stonybrook.edu/~tdrivas/MAT402.html>

Course Description. This course will begin with elementary PDE, covering the transport equation, wave equation and heat equation. Next, aspects of fluid motion will be discussed, including their derivation of the Euler and Navier-Stokes equations as continuum mechanical system, their basic solution theory, and dynamical and geometric aspects of the resultant motion. This course will prepare for beginning research in PDE and fluid mechanics. Future research topics can range from understanding the structural properties of fluid equilibria, long-time behavior of slightly viscous flow, stabilization of fluid flow by addition of magnetic fields/polymers and analytical/numerical investigations of instability and singularity formation in model problems.

Textbook: There is no required text, however parts of the course will parallel discussion in:

- W. A. Strauss, Partial differential equations: An introduction. John Wiley & Sons, 2007,
- A. J. Chorin and J. E. Marsden, A mathematical introduction to fluid mechanics. Vol. 3. Springer, 1990.

Prerequisites: Analysis (MAT 319 or MAT 320), Multivariable calculus (MAT203 or MAT307 or AMS361), and basic differential equations (MAT308 or MAT303 or AMS361).

Homework. Homework will be posted on the course website. Although they will not be collected, students should attempt the problems and may present their solutions to the class.

Presentations. Towards the end of the course, I will assign material for the students to read and to present in class. This may be in the form of research papers, or passages from texts.

Student Absences Statement. Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed lectures, the student is responsible for the material covered. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information, visit <https://www.stonybrook.edu/commcms/comingback/students.php>.

Disability Support Services. If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services (631) 632-6748 or

studentaffairs.stonybrook.edu/dss/

They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to website:

www.sunysb.edu/facilities/ehs/fire/disabilities

Academic Integrity. Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at

www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management. Stony Brook expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.