

## Syllabus

**Description:** **ME 6602 Viscous Flow (3-0-3)**  
Prerequisites: ME 6601 Introduction to Fluid Mechanics or equivalent

This course covers advanced aspects in fluid mechanics as well as emerging areas of research including latest computational methods and application of AI.

**Reference books:** "Viscous Flow" F. White  
"Hydrodynamic Stability" P.G. Drazin and W.H. Reid  
"Fluid Mechanics" Landau & Lifshitz

**Instructor:** Professor Cyrus K. Aidun  
Office: 320 Love Building  
e-mail: cyrus.aidun@me.gatech.edu

**Class hours and location:** MW 5:00 to 6:15 p.m.; Van Leer

**Office Hours** TTh 3:00 – 4:00 or by appointment

### Course Learning Outcomes

In-depth understanding of fluid mechanics principles, theoretical framework and analytical tools for research and development in engineering, environmental, physiological and natural applications.

Learning the fundamental concepts to analyze complex fluid flows, non-Newtonian and multiphase flow problems.

Becoming familiar with methods to compute the stability of fluid flows and nonlinear dynamics to explore phenomena involved with transition from steady to periodic to unsteady nonperiodic and turbulent flow regimes.

Learning perturbation techniques (regular and singular) to approximate flow physics at low (Stokes flow) and high (boundary layer) Reynolds numbers.

Becoming aware of emerging developments in fluid mechanics including physics informed AI in multiphase and other complex flows.

### Topics covered:

- Brief review of basic principles
- Steady and unsteady exact solutions of the Navier-Stokes equations
- Brief introduction to non-Newtonian fluid mechanics
- Asymptotic methods: perturbation theory; method of matched asymptotic expansions
- Boundary-layer theory
- Stokes/creeping flows
- Lubrication theory
- Recent advances and emerging methods in Fluid Mechanics

## Course Policies

### **Attendance and/or Participation**

This will be an active classroom, where you will be expected to participate. I have noticed a drastic difference in the exam performance between students who regularly attend class and those who don't. Therefore, I will count attendance in determining your final grade.

### **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.

### **Core IMPACTS**

[Core IMPACTS](#) is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

### **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.

### **Collaboration, Group Work, and Use of Generative AI**

You are allowed to work in groups on all homework and out-of-class assignments (and you may use my solutions), but any work you turn in must be written in your own hand. In-class tests and exams are to be your own work. All in-class tests and exams will be closed book and notes.

## **Exams and Grade**

There will be three exams (20% each) and one project (40%).

Do Not Miss an exam without a ‘valid excuse. A valid excuse includes:

- Illness or other valid reasons for inability to take the exam  
Must have letter or email from dean of students’ office confirming illness or other valid reasons for inability to take the exam. Do not include the type of illness or any health-related information in letter or email to me.
- Policy on ‘valid excuse’: <https://catalog.gatech.edu/rules/4/>

To complete an absence request, go to: <https://registrar.gatech.edu/info/institute-approved-absence-form-for-students>

## **Re-Scheduled/Missed Exams**

If you miss an exam with valid excuse, you will have an option to do an extra project instead of the exam.