

## **ME 4342 Syllabus**

Computational Fluid Dynamics, Section A, 3 Credits

Fall 2026

### **Instructor Information**

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**Instructor: Alexander Alexeev**

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### **General Course Information**

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#### **Description**

An introduction to computational fluid dynamics (CFD) in mechanical engineering. The theory and numerical techniques of CFD. Modern CFD software including grid generation and flow visualization tools will be used. Projects with complex fluid-flow systems.

#### **Topics Covered**

Introduction to the use of modern CFD software, including geometry building, mesh generation, solution techniques, and flow visualization.

The investigation of various fluid flow systems aimed at a deeper understanding of the basic principles of fluid mechanics.

Experience with some of the difficulties that one may encounter in CFD, such as geometry simplification, mesh problems, convergence problems, multiple solutions, etc.

An individual CFD project selected from a set contributed by the instructor or from the student's own experience. A written project report is required.

#### **Course Learning Outcomes**

Outcome 1: Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems.

1.1 The student will demonstrate the ability to use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.

1.2 The student will demonstrate the ability to analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc., using flow visualization and analysis tools.

Outcome 2: Improve the student's understanding of the basic principles of fluid mechanics.

2.1 The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow.

2.2 The student will demonstrate an ability to describe various flow features in terms of appropriate fluid mechanical principles and force balances.

Outcome 3: Improve the student's research and communication skills using a self-directed, detailed study of a complex fluid-flow problem and to communicate the results in written form.

3.1 The student will demonstrate the ability to simplify a real fluid-flow system into a simplified model problem, to select the proper governing equations for the physics involved in the system, to solve for the flow, to investigate the fluid-flow behavior, and to understand the results.

3.2 The student will demonstrate the ability to communicate the results of this detailed fluid-flow study in a written format.

### **Required Course Materials**

No textbook.

### **Grading Policy:**

The work during the term will be weighted to determine the final course score as follows.

CFD Labs - 72%

CFD Project - 20%

Project Presentation - 8%

A>90; B>80; C>70; D>60

## **Description of Graded Components**

**Computing Labs:** Six CFD lab assignments will be posted on the course web site during the term. The due date and time will be posted with each assignment. Only electronic homework submission will be allowed. The students will write a lab report for each assignment. A template for the report will be available on the course web site. A grading rubric will be posted with the assignment.

**Computing Project:** There will be one individual CFD project of student's choosing. The project topic has to be clear to the instructor to ensure the project can be accomplished in the time frame of the course. The students will have about four weeks to do this project. The students will prepare a project report. A template for the report will be available on the course web site. A grading rubric will be posted with the project assignment.

**Project Presentation:** The students will prepare a 5-minute video about their project and present it in class during the time slot allocated for the course final exam. The best videos will be posted on the course YouTube channel. The students can opt out of publishing the video without affecting their grade, if they prefer not to have their video posted on YouTube.

## **Course Policies**

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

You are expected to attend and participate in lectures and labs. Class attendance and participation may be considered in the assignment of final grades.

### **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**

Not applicable

### **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.

### **Pre- &/or Co-Requisites**

Prerequisites: ME 3340 Fluid Mechanics, ME 3345 Heat Transfer

## **Campus Resources for Students**

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### **Undergraduate Student Academic Success Resources:**

Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at [success.gatech.edu/tutoring](https://success.gatech.edu/tutoring), email us at [tutoring@gatech.edu](mailto:tutoring@gatech.edu), or come see us at Clough Undergraduate Learning Commons, Suite 283.