

ME 691-IV | Advanced Computational Fluid Dynamics

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Lecture hours: 2-3 PM on Monday, Wednesday, and Thursday

Teaching Assistant: Mr. Roshith Mittakolu

General description

This course is a follow up to the ME 605 (Computational Fluid Dynamics) course. While the ME 605 course is a basic course on CFD with its scope restricted to incompressible flows, the Advanced CFD course will build on the contents of ME 605 and will largely focus on *compressible* fluid flows. It is recommended that the students complete the ME 605 course before registering for the Advanced CFD course. This is an advanced postgraduate level course, but third and fourth year undergraduate students would also find this course interesting and useful. In this course, students will learn and apply different computational methods to solve compressible fluid flow problems. A project-based learning approach will be adopted in the course. All the projects will involve code development from scratch.

Learning objectives

Upon completion of this course, students should be able to:

1. appreciate the difference between incompressible and compressible fluid flows in the context of CFD
2. demonstrate a strong understanding of different numerical methods commonly used to solve compressible fluid flow problems
3. make a judicious choice of numerical methods for a particular problem/application
4. independently write and develop CFD codes for 1D and 2D compressible flows from scratch

Texts and references

The course content will be largely based on the reading materials of the ME 527 course taught by Prof. Vigor Yang at Penn State. The course material is not available as a textbook or in any other form for distribution. The following textbooks would be helpful:

1. Riemann Solvers and Numerical Methods for Fluid Dynamics, Eleuterio F. Toro, Springer, 3rd edition.
2. Computational Fluid Dynamics: The basics with applications, John D. Anderson, McGraw-Hill (1995).

Grading

Assignments – 25 %

Projects – 75 %

Assignment and Project policy

Students can discuss to solve assignment and work on projects. However, each student must submit his/her own independent assignment and project. Assignments and projects have to be submitted by the due date and time to avoid any late submission penalty. The late submission penalty is as follows:

- a. For submissions past the due time on the due date, a penalty of 10 % will be applied.
- b. For submission after midnight of the due date, a penalty of 25 % will be applied.
- c. For submissions past 24 hours after the midnight of the due date, a penalty of 50 % will be applied and so forth.

Honor code

Students are expected to adhere to the IIT Gandhinagar honor code.