

**MAE 598/494 Applied Computational Fluid Dynamics**  
Fall 2016 Tuesday/Thursday 1:30-2:45, Classroom: SCOB 150

Instructor: Huei-Ping Huang (hp.huang@asu.edu), ERC 359  
Office hours: Tuesday 3-5 PM, Wednesday 4-5 PM, or by appointment

**Course website <http://www.public.asu.edu/~hhuang38/ACFD2016.html>**

## **Topics to cover**

- **Techniques for solving incompressible and compressible flow equations using commercial/industrial solvers (We will use **Ansys-Fluent** as the principal tool)**
- **Computer-aided analysis of fluid systems**
- **Applications to thermofluid system engineering**

**No required textbook. Instructor will provide tutorials and lecture notes as needed.**

**Attendance is mandatory.**

## Planned activities

We will run two threads concurrently through the semester:

*Lecture* thread fills the background knowledge on fluid mechanics and numerical methods.

*Project* thread focuses on the execution and analysis of specific projects using Ansys-Fluent.

Ansys-Fluent is available on the computers at GWC 481/483 computing lab. You will have access to the lab. (Detail forthcoming.) You may also purchase a student version of the license of Ansys to run on your own computer.

## **Plan for the semester (Also see syllabus)**

### ***I. Lectures***

1. Survey of basic fluid mechanics and thermodynamics as preparation for the projects (4 weeks)
2. Survey of numerical methods for deepening the understanding of the functionality of Ansys-Fluent or similar industrial software (6 weeks)
3. Discussion on general methods for analyzing fluid systems (3 weeks)

### ***II. Projects***

1. Tutorials for Ansys-Fluent (2 weeks)
2. Main projects (12 weeks)

*At least four of the following projects (3 weeks each) will be chosen for this semester. The list is tentative and the detail of the individual project is subject to further adjustments.*

Project 1: Fluid system with heat transfer

Project 2: External flow (calculation of drag and lift; Reynolds number dependence)

Project 3: Compressible flow system

Project 4: Low Reynolds number flow; Microfluidics

Project 5: Moving boundary and moving grid

Project 6: Flow with an interface (two-phase or multi-phase)

**Grade:** Projects & homework - regular tasks ~ 75%

Projects & homework - credit from bonus pool ~ 15%

Audit of work 10%

Specific rules concerning collaboration for projects/homework will be released along with the release of each assignment.

Most projects will include a **bonus section** with one or a few problems that require extra effort to solve. For each problem, a bonus pool (with a certain fixed bonus points) will be divided by those who provide correct answers. This is modified from a system that was successfully tested in Fall 2015. Instructor will explain why the system is needed, and why it is useful.

Occasionally, a bonus question might be asked in class. A correct or useful answer will be awarded minor bonus credit.

## What is "Audit of work"?

- "Audit of work" consists of a mini project that tests your basic skill in using Ansys-Fluent. It will be administered as an in-class "instant challenge".
- Outcome is all or nothing. Those who pass receive full 10 points (10% of the total score for the semester). Those who fail receive 0 point.
- Everyone has two chances to pass AoW.

"Audit of work" is an exam. No collaboration or outside help is allowed.

The required work for the projects will be different for participants of MAE598 and MAE494. Details will be given in the individual assignments.

**Please make sure that you are familiar with ASU policies on academic integrity:** <https://provost.asu.edu/academicintegrity>