

MAE 433 – Computational Fluid Dynamics (CFD)
Mechanical and Aerospace Engineering Department
West Virginia University

Spring 2014

Tuesdays and Thursdays, 11:00 am – 12:15 pm, G-78 ESB

Pre-Requisites

MAE 316 (Numerical Methods) or equivalent
MAE 331 (Fluid Mechanics) or MAE 335 (Incompressible Aerodynamics), or equivalent
Some experience with a common programming language (FORTRAN, **MATLAB**, C)

Text

An Introduction to Computational Fluid Dynamics: The Finite Volume Method, 2nd Edition by H. K. Versteeg and W. Malalasekera

Reference

Computational Fluid Dynamics: The Basics with Applications, by J. D. Anderson, Jr.

Course Instructor

Dr. Christopher Griffin, MAE Department, cgriffin@mix.wvu.edu
118 ERB, 304-293-9227, Office Hours – TBA

Grading

The final grade in the course will be assigned on the following basis:

Homework	15%
Project	25%
Midterm Exam	30%
Final Exam	30%

Final letter grade will be based on 90-100 A; 80-89 B; 70-79 C, and so on.

NOTE: A final course score of 59.4% and below is a letter grade of “F”, whether you are graduating or not, have a job lined up or not. No exceptions.

Course Topics

- Introduction to Modern CFD
- CFD Solution Procedures
- Governing Equations of Fluid Dynamics
- Mesh Generation and Boundary Conditions
- Basic Numerical Methods and Solution Techniques
- CFD Solution Analysis
- Turbulence Modeling
- Practical Guidelines for Specific Applications
- Advanced Topics in CFD

Course Description

This is an introductory course on modern CFD methods focused on the topics outlined above. An emphasis will be placed on learning practical skills to solve real world fluid dynamics problems using the CFD tools introduced in this course. Fundamental background information will be presented where appropriate. Commercially available software, namely ANSYS Fluent, will be used to demonstrate industrial solution approaches, complimented by basic coding assignments using MATLAB to better understand numerical techniques.

Expected Learning Outcomes

Students completing this course will:

- Have an understanding of the governing equations of fluid dynamics.
- Understand basic discretization techniques, grid generation, and CFD techniques using MATLAB.
- Have a familiarity with some solution techniques.
- Understand some of the strengths and weaknesses of current CFD practices.
- Have some experience with a commercial CFD code.
- Appreciated the process of validation of CFD results.
- Possess an adequate background to take a more advanced graduate-level CFD course.

Attendance / Assignment Policy

Attendance is not required, but highly recommended. All assignments are due at the beginning of class unless otherwise specified. Make-up exams and late homework will NOT be allowed without prior approval, consistent with WVU policies. Unexcused absences on exams will NOT be made up, except as required by WVU policy. Neat work is expected on all material submitted for grading (i.e. have to be able to read it to grade it). You may use engineering problem paper or standard notebook paper, but NOT scratch paper or paper torn from a spiral notebook.

Teaching Philosophy

- As the instructor, I will do everything possible to help you learn and understand the material, but you must do your part. The student is ultimately responsible for actually learning the material.
- In my course, a grade of "C" means that you have gained an average knowledge of the topic material and have a grasp of only the basic concepts. It is not a trivial matter to obtain an "A" in my course, but by the same token, it is also difficult to get an "F".
- If you have a question on material, the textbook, homework, how I grade, and life in general, come and see me. I am always open to answering your questions or meeting to discuss your questions and concerns.

Notes on Class Etiquette

- Make sure cell phones are turned off, or at a minimum set to vibrate, during lecture. **I do not want to hear your cell phone.**
- If you are so tired that you will likely fall asleep in class, stay home. Your bed will be much more comfortable than the desk.
- Do not engage in idle chat with friends during lecture. It is distracting to me and there are students around you that may want to hear the lecture.

Social Justice Statement

"The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see <http://diversity.wvu.edu>."

Academic Dishonesty

Instances of academic dishonesty will be handled by the issuance of a grade of unforgivable "F". This includes evidence of cheating on exams, quizzes, homework assignments, etc... and is applied to both the individual using the work of another and the individual who allows his/her work to be used by another. Please refer to the West Virginia University Student Handbook for information relating to academic dishonesty.