Compressible Flow (AEEM 6041)

Dr. P.J. Disimile
Associate Professor of Aerospace Engineering
e-mail: Peter.Disimile@uc.edu

Office: 722 Rhodes Hall
Phone: 556-3355

Text: Abridged Lecture Notes

Lecture Mtg. Time: TuTh (9:30-10:50 am)
Lecture Mtg. Place: 1215 Lindhall
Fall Semester: 26August - 14December 2019

Office Hours: TBD

Major Topics:

1] Introduction & Review of Fluid Dynamics
2] Reynolds Transport Equation
3] Conservation of Mass
4] Conservation of Momentum
5] 1st & 2nd Law of Thermodynamics
6] Conservation of Energy
7] Wave Propagation in Compressible Media
8] Isentropic Flow of an Ideal Gas
9] Normal Shock Waves
10] Compressible Flow Applications
11] Oblique Shock Waves
12] Prandtl Meyer Flow
13] Fanno Flow: Compressible Flow w/Friction
14] Rayleigh Flow: Compressible Flow w/Heat Transfer

References

- The Dynamics and Thermodynamics of Compressible Flow by A.H. Shapiro, The RONALD PRESS COMPANY.
- An Introduction to Fluid Dynamics by G.K. Batchelor, Cambridge Press
- Viscous Flow by F. White, McGraw Hill
- Boundary Layer Theory by H. Schlichting, McGraw Hill
- Viscous Flow by F. Sherman, McGraw Hill
- Convective Heat and Mass Transfer, Kays, Crawford, and Weigand, McGraw Hill
- Introduction to Convective Heat transfer Analysis, P.H. Oosthuizen and D. Naylor, WCB McGraw Hill
Policies

a. Missed exams without notice, prior to test date receive a zero grade.

b. Final Grade Calculation = In class exams (50%) + Final experience (50%)
   Final experience could consist of a separate final exam and/or a project (~25% each).

c. Grading: Straight Scale.

d. Inappropriate language will not be accepted the classroom, and individuals
displaying such behavior will be asked to leave that lecture.

e. Due to the distraction caused by electronic communications during class, all electronic
communication devices must be placed on silent mode and stored. There is no looking
up information during lectures. If you are found using such devices in class you will be
warned or asked to leave the room.

f. All electronic communication devices must be turned off during exams. If a device
is found activated during an exam a 20% grade penalty will be imposed. No
Exceptions!!!

Goals

1. To be able to derive the governing equations used in compressible flow.
2. To be able to apply the isentropic equations to flow problems.
3. Be able to understand the effect of Normal and oblique shock waves.
4. Be able to expansion waves.
5. Understand the effect of friction in compressible flows.
6. Understand the effect of heat transfer in compressible flows.

Expectations of Students

1. Attend each class.
2. Print out abridged lecture notes.
3. Read and fill in missing information in abridged notes.
4. Complete assignments in a timely manner.
5. Interact in class through questions and discussions.
6. Contribute to the classroom discussion.
7. Seek out additional study material from external sources (library, etc.).
8. Interact with other students.
9. Begin to formulate questions regarding the term project (if available) in a timely manner.