

Gas Dynamics

Instructor

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Wednesday 12 -2 pm
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Course objectives

By the end of this course you should be able to:

1. Calculate the Mach number of compressible fluids.
2. Use the Mach number to distinguish between compressible and incompressible flow of gases.
3. Calculate properties of isentropic flow based on variation in cross sectional area.
4. Analyze flow in converging nozzles.
5. Determine when choking happens for isentropic flow.
6. Use normal shock tables to find flow conditions downstream of normal shocks.
7. Analyze flow in converging-diverging nozzles at different back pressure ratios.
8. Find flow conditions in cases of adiabatic flow in constant area ducts.
9. Find the maximum length of a pipe before choking may happen.
10. Calculate flow conditions after heating or cooling.

Tentative course outline (المحتوي المبني للمقرر)

Part I Introduction (2 lectures)

1. Ideal gas relationships
2. Mach number and speed of sound

Part II Isentropic flow (4 lectures)

3. Effect of variation in cross section area.
4. Working tables for isentropic flow.
5. Converging ducts.
6. Choking.
7. Converging-diverging ducts.

Part III Normal shock waves (6 lectures)

8. Normal shock waves.
9. Working tables for normal shock waves.
10. Converging-diverging nozzles.

Part IV Adiabatic flow (4 lectures)

11. Flow in constant area ducts with friction.
12. Working tables of adiabatic flow with friction.
13. Performance of long ducts at different pressure ratios.

Part V Flow in ducts with heating and cooling (4 lectures)

14. Simple heating relations for a perfect gas.
15. Duct flow with heat transfer.
16. Working tables for duct flow with heat transfer.

Text book

1. "The dynamics and thermodynamics of compressible fluid flow", Volume 1, A. H. Shapiro, The Ronald Press Company, New York, USA.
2. "Fundamentals of Fluid Mechanics", 4th Ed., Munson, Young, and Okishi, John Wiley and Sons, New York, USA.

Teaching methods

- Blackboard
- Powerpoint presentations
- Each student should prepare a separate notebook for the lecture notes of this course ONLY.

Assignments

- New assignment will be available every other week. Assignments will be posted on the course website and will be also available in the library.
<http://www.assiutmicrofluidics.com/courses>
- Assignment solution will be posted on the website 1~2 weeks after the assignment itself.
- Assignments should be solved in a separate notebook and may be requested at any time.

Tentative grading scheme (التوزيع المبدئي للدرجات)

Final exam	100
Midterm	30
Quizzes (2 quizzes x 5 marks each)	10
Class participation and assignments	10

Midterm test

- Wednesday December 7th, 2011

Quizzes

- Wednesday October 19th, 2011.
- Wednesday December 28th, 2011.

Bonus projects

- Bonus projects will be assigned and given extra marks.
- Bonus projects should be submitted within 1~3 days from the date of the assignment.

- Marking of bonus projects will be rigorous and the given mark will be proportional to effort done and quality of work. Not every one who submits a bonus project will get the full bonus mark. Only those who do the project right.
- Every student should create an e-mail with his first and last names (e.g. Mohamed.abdelgawad@gmail.com or m.abdelgawad@hotmail.com) Any assignment or project submitted by e-mail should be submitted from this e-mail address.
- When submitting a bonus project by e-mail, do not attach zip or rar formats and name the files using your name.
- When submitting a hard copy of a report or an assignment, DO NOT put the reports in plastic covers.

Class policy

- Cell phones must be turned off
- No food or drinks during lectures or tutorials
- Plagiarism will not be tolerated (سيعاقب الغش أو النسخ بأقصى عقوبة ممكنة)
- Any one who misses a quiz or a midterm without a medical necessity will get a zero mark in this quiz or midterm.
(إذا تغيب أي طالب عن أي امتحان بدون عذر طبي فسيحصل علي صفر في هذا الامتحان)