

How to Study Aerospace Engineering Courses

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What follows is a list of suggestions for learning in a classroom setting that I have collected over the years from my own Professors and my fellow students. I have found them to be quite useful through 155 sem. hours of UG coursework and 49 sem. hours plus 92 qtr. hours of graduate coursework. These principles apply not only to learning compressible flow but are general approaches for learning efficiently any subject in an academic setting.

The first goal in any subject is to learn the concepts, ideas and fundamentals that are the basis for all of the details. As engineers, this usually means we need to understand what happens physically, how it happens, and why it happens. Once you achieve this level of understanding, the role of the mathematical equations in describing the physical processes (which is really all that they do) will become very apparent and straightforward.

In order to achieve this goal plus learn the detailed material:

- 1) Keep up with the course.
 - a. Read the book before the lecture on that section.
 - b. Go over the last set of notes before class each day.
 - c. After class, go over that days notes and fill in gaps, expand things, correct mistakes, etc.
 - d. As you do a., b. and c., note any questions that you have concerning the material to ask in class or during office hours.

- 2) Approach problems systematically, and use standard problem solving techniques.
 - a. Start on the homework problems as soon as they are assigned. Homework is a way to assess your knowledge of the material and to improve your engineering problem solving skills. Take advantage of it!
 - b. Read each problem through three times carefully before you start solving it. This is the step where you begin to analyze what the problem is about and compare the concepts with your knowledge base.
 - c. If you do not understand what is being asked, then return to your text and notes to review the concepts. If that doesn't help, contact me or your course TA. Note- I have found that some people are only "looking for an equation to plug into" at this point in the process. This is a sure path toward the bottom of the curve, both now and later.
 - d. Write down the givens and any required assumptions. Then write down and specialize the equations needed to solve the problem.

- e. Check units in your equations and check whether your answer agrees with what you expected to happen physically. If not, go back through and check for errors.
- f. If you miss a problem, go back through it to find out what went wrong and rework it. If you can't figure it out, come see us. If (in other courses) a solution to the homework is posted, ignore it. Copying down how someone else solved a problem is not going to help much to improve your problem solving skills. If it did, we could rely on example problems in the text and would not need to assign homework.

3) Studying for tests.

- a. If you practice 1) and 2) diligently, you will find you have invested about the same amount of extra time as the time that you would normally spend cramming for a test. However, you will also find that you no longer need to cram. A brief review to fill in any gaps should be sufficient, as follows.
- b. Review for understanding the concepts, ideas and principles in your notes and book.
- c. Make sure that you have cleared up any issues with the homework problems.
- d. Work extra, unassigned, problems. Make up problems and trade them with you classmates.
- e. Do not, under any circumstances, memorize "how to" work a specific problem or derivation. A small change in a problem is usually all it takes to give a memorizer trouble. As for derivations, actually doing the math is usually much easier and more accurate than trying to memorize.

Applying these principles to your courses will require effort and discipline. However, they will provide a good basis for developing the professional approaches that are required of practicing aerospace engineers. As I have stated in class, aerospace engineering is a demanding discipline in that people's lives depend on what you create. You must begin now to prepare yourself to meet this challenge.

Two final suggestions: First, I have found that many problem solving errors begin with reading and interpreting the problem statement (hence my "read three times---" instruction). If you are not already a daily recreational reader, I suggest strongly that you find an area that you enjoy (fiction, aerospace history, whatever) and make time for reading. Second, the "answer" to an aerospace problem is not just a number. The numerical results have to be interpreted, explained, justified, and otherwise evaluated in writing if they are to be accepted. Prepare for this by practicing writing, such as producing your own chapter summaries, etc.