Study/Exam Tips

Success in engineering problem-solving classes requires participation by the student. It is not enough to attend class every day and watch the instructor solve problems. The student must study the text and class notes to understand the material and must solve additional problems to be sure that he/she understands the material and can apply the principles to new problems. Notice, you understand the material and then you work problems.

Following are a few tips on how to study and how to prepare for exams. The tips are arranged in blocks according to the normal sequence in which they apply:

- General study strategy.
- Doing the homework.
- Studying for a test.
- Creating a crib-sheet.
- Taking the test.

General Study Strategy.

1. Read the assignment prior to going to class. The goal here is to identify which items/topics are familiar to you, which items/topics are similar to things you already know, and which items/topics are totally new. A general familiarity with new topics will aid in following the class lecture or discussion.
   - Make notes on any topics that you do not understand.
   - Identify those items that you should know from previous (prerequisite) courses, and look them up in your old books or notes if necessary. (You do still have your old books and notes, don’t you?)
   - Try to identify which items are likely to be covered in the lecture or discussion and which relate to things from a previous lecture or discussion that you still don’t understand.
   - If you find yourself "daydreaming" or "dozing off", take a break and do something else for a while. Either you are studying or you are not studying. You can not study effectively while you
are thinking about something else or are too sleepy to stay awake.

2. **Try to do the homework assignment.** Treat this as a "pretest" to see how well you understand what you read and to identify topics you need to reread or ask about in class.
   - Identify which homework problems appear to be similar to the Example Problems in the book.
   - Make an initial attempt at solving all of the homework problems -- including the ones that appear to be different from the Example Problems, the ones that you think you know how to do, the ones you think you don't know how to do, the ones that look easy, and the ones that look difficult.
   - Make a list of the difficulties encountered.

3. **Attend class regularly.** *This is a must!*
   - Ask about any items from your list of questions that pertain to previous lectures/discussions or that you don’t think will be covered in the current lecture/discussion.
   - Pay attention to and participate in the class lecture or discussion. Take as complete of a set of notes as you can while still participating. Use shorthand and/or abbreviations freely -- you’ll be rewriting the notes later anyway.
   - Listen for answers to other questions from your list. If these questions are not covered during the normal lecture/discussion, ask about them.

4. **Rewrite your notes after class.** The goal here is to create a set of notes that will make sense later and will help you study for a test.
   - It is usually the case that you don’t have time to write down everything important. What you do write down often ends up sloppy and unorganized. A sloppily written, incomplete set of notes is of no long term value.
   - Reorganize the class notes as necessary into a logical order. Not only will a clearly written, well-organized set of notes help you study for tests in the current course, it will also be important when you get into another course and need to look back at this prerequisite material to remind yourself what you did.
   - Fill in details that you did not have time to write down in class.
   - Just the process of reorganizing and rewriting the notes will help firm up the ideas in your mind!
Doing the homework.

1. **Do all assigned problems.** The problems may look easy when your instructor does them on the board. But remember that your instructor has been doing these problems for a long time and has a lot of experience to draw on. The only way for you to get that experience is by solving problems yourself.

2. **Work with friends or classmates (Study-groups).** Everyone has their own method of approaching and solving problems. It is often useful to compare how you would approach a problem with how your classmates approach the same problem. However, you are ultimately responsible for being able to work the homework problems.
   - You are encouraged to work with other classmates or friends who may be taking or have already taken the class.
   - It is better to have help from a classmate, a friend, or the instructor than to sit staring at a problem and doing nothing.
   - Unless the assignment is a group project for which the instructor expects a group paper, you must prepare and turn in your own work, not just copy someone else’s paper -- even if you worked on the assignment together.

3. **Start on scratch paper.** You wouldn’t write a term paper and expect to have a perfect finished paper the first time. Working homework problems is no different.
   - Trying to work on the paper you’re going to hand in can inhibit the exploratory process necessary to solve problems.
   - You may try two or three different methods of solving a problem before deciding which is the right way or the best way to solve the problem.
   - You may make some mistakes in your calculations and have to start over.
   - When you have figured out how to do the problem and have the calculations correct, then copy the solution over onto a clean sheet of paper to hand in.

4. **Don’t get stuck on one problem.** If you are just sitting staring at the paper, you are not learning anything. It’s time to ask your instructor or a classmate for a little help on how to get started or what to do next.
   - If you get stuck on a problem, start with a fresh piece of scratch paper and write down...
     - What you are given.
     - What you are trying to find.
- The equations/principles that seem appropriate to the solution.
- The number of equations and the number of unknowns.
- Any assumptions or observations that seem appropriate.
- What you think is going to happen or how the solution is going to turn out.

Don’t be afraid to write down what you are thinking. (You’re going to rewrite the problem later anyway, right!)

- If you work more than 15 minutes on any problem without making any progress, seek help and/or go on to another problem. That’s not to say that all problems can be solved in 15 minutes or less, but frustration at not making any progress is counterproductive to learning.

5. **Check your calculations.** Not all mistakes are in the method or approach used. At least a quarter of all errors are simple calculation errors.
   - Remember Murphy’s Law - The number most obviously correct, beyond all need of checking, is the one that is usually in error.
   - If all else fails, put the problem aside and start over on a clean piece of paper. Once an error is down on paper it is hard to recognize. You are less likely to keep repeating the error if you start over from scratch.

6. **Make it legible.** The homework is not only for your instructor’s benefit. It is also for your use when you need to study for a test or to review a concept. If you leave steps out or write illegibly, it will be of no use to you later.
   - Write neatly and legibly.
   - Make your drawings large enough and tidy enough to be readable and useful.
   - Use a medium softness lead and press hard enough that the writing can be read.
   - Don’t use microscopic printing.
   - Don’t leave out important steps.

7. **Don’t crowd your work.**
   - Don’t try to squeeze five pages of work onto one page.
**Studying for a test.**

If you have been diligent in reading the assignments, attending class, asking questions, rewriting your notes after class, and doing the homework problems, you should not have to spend very much time studying for the test. The material and problem solving processes will be etched in your mind.

1. **Review your notes**, focusing on the problem-solving strategies and the sample problems.
2. **Rework problems** in the relevant homework assignments as well as extra homework problems.
3. **"Cramming" NEVER works.**
   - Do not stay up all night studying the night before. You’ll be less clear-headed if you don’t get some rest.
   - You’ll usually score higher if you’re thinking clearly, even if you don’t know every last detail.
   - Spend the time needed to make a good [crib sheet](#).

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**Creating a crib-sheet.**

1. **Make your crib sheet first.** Make your crib sheet before taking any practice exams. If you practice using your sheet ahead of time, you’ll be quicker on the actual exam.
2. **Make it legible.**
   - Don’t use microscopic handwriting!
3. **Keep it simple.** You may be tempted to include on your crib sheet every formula you’ve ever seen. Experience shows this to be counterproductive because...
   - Your crib sheet gets so long that you have trouble finding what you want.
   - With so many formulas, it gets difficult to remember what they all mean, when they apply, and when they don’t apply.
4. **Keep it simple.** Include all of the basic formulas, but only a few "special-situation" formulas.
   - A basic formula is a formula that you use to derive the more complicated formulas.
   - When you include a special-situation formula like that on your cheat sheet, you might accidentally use it when it doesn’t apply.
• Some special situations show up so commonly that you should include them on your cheat sheet. When you include a special-case formula on your cheat sheet, be sure to clearly label in which situation the formula does and does not apply.

5. You may also want to include some problem-solving strategies. That’s fine, although I think you’ll find that after working through enough old problems, those strategies will etch themselves permanently onto your brain.

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**Taking the test.**

1. **Don’t Panic.** Keep in mind the problem-solving skills you’ve practiced all semester, such as making sketches, formulating a strategy, etc. It’s easy to panic and become sloppy, reverting to formula-plugging and the like. The best way to ensure you won’t panic is to take practice exams ahead of time.

2. **Read the problems carefully.**
   - Make sure that you answer the question asked.
   - If a question has multiple parts, make sure that you answer every part.

3. **Take a watch** to the test and keep track of the time.
   - Make sure you allow equal time for trying all problems.
   - Divide the time allowed for the test by the number of problems and set a limit for how long you will work on any one problem. (For 3 problems in 50 minutes, spend no more than 15 minutes on a problem before going on to the next.)
   - If you have time left over after finishing the last problem, go back and fill in details in problems you did not finish earlier.

4. **Don’t always do the problems in order.**
   - Do the problems that are easiest for you (and worth the most points) first.
   - Go back later and try to get partial credit on the harder ones.

5. **Don’t waste precious time completing algebra** at the expense of getting to every problem.
   - You can usually earn some partial credit by setting up the relevant equations and describing in words how you would use those equations to finish the problem.
   - Don’t spend 10 minutes writing out a detailed description of how you would solve a problem when it would only take 5 minutes to actually perform the process. (I would interpret this as a
sign that you do not know how to complete the problem and are desperately trying to get a little more partial credit!)

6. **If you get completely stuck** on a problem, go on to the next one. Everyone else probably had trouble, too.

7. **Ask questions.** If you’re the slightest bit confused, ask the instructor to clarify what the question means. Students routinely misinterpret problems because they are unwilling to bother the instructor. *This is no time to be shy.*