How to succeed in CSCC63

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This course will provide you with a basic understanding of some fundamental questions in computer science: What is algorithmically computable? What is efficiently computable? Success in this course means learning how to make these questions precise and how to prove that certain problems have no algorithmic solutions at all, while others, although solvable, are not likely to have efficient solutions.

A necessary condition to succeed in this course is to devote sufficient time to it. The time a student needs to master the material depends on the individual, but a typical student should plan to devote 10-12 hours per week to the course, **every week** of the semester. This includes the three hours needed to attend the lectures, and the occasional tutorial sessions. I emphasize "every week" because the subject matter does not lend itself to cramming: You need time to engage with and absorb the material in the ways I describe below.

Devoting enough time is a necessary, but not sufficient, condition for success. In the rest of this note I will suggest how you can make **effective** use of your time.

1. Before the lecture. The most important preparation before each lecture (other than the first one!) is to review the previous lecture. This is because a lecture often builds on concepts introduced in the preceding one.

2. During the lecture. Pay attention, take notes, ask questions. Don't get distracted or distract others — so, just before the lecture starts, turn off your mobile and the wifi on your laptop. Lectures are very compact; if you miss a key definition or remark, you may find it impossible to pick up the thread of the argument later on.

3. Soon after the lecture. Carefully go over your notes and over the assigned material in the textbook. As a student, I found it useful in some courses to reorganize and rewrite my class notes into my "official" course notebook. This allowed me to review the material and make corrections to my notes while the lecture was still fresh in my mind.

You are not merely reading, you are **studying** — and this requires a more active engagement. You need pen and paper to sketch out ideas, create examples, draw pictures, work out detailed calculations, etc. You need to do this in a quiet environment with no distractions, and you need sustained focus for this effort to pay off.

It is OK to study in (small) groups, as long as the group isn't a distraction but a resource to help you learn. In fact, a (small) group can be helpful not only because you will have some of your own questions answered but also because it will afford you the opportunity to answer other people's questions. Nothing helps understanding a subject better than explaining it to someone else. I learned more as a teacher than I did as a student. In connection with study groups, however, take careful note of the course policy on homework collaboration (see the course web page, http://www.cs.toronto.edu/˜vassos/teaching/c63).

Make sure you understand **everything**. Jot down anything that is unclear and return to it later on your own; if you cannot understand it on your own, ask me or post a question on the course forum. But do make an honest attempt to understand on your own: One of the destructive consequences of discussion forums like Piazza is the ease with which one can get answers without trying on one's own. If not checked, this makes us good information gatherers but shallow thinkers.

4. Do the homework; start early. Homework assignments are a crucial learning tool in this course. They enhance learning in two ways: One is by exposing gaps in your understanding. If you are unable

to do a problem, you need to reflect more deeply on it. You may well need to go back and study more carefully the material on which the problem is based. The second way in which homework assignments enhance learning is by having you actually **use** your newly acquired knowledge to solve new problems — the definition of success in this course. This requires a deeper level of understanding and is a form of the much venerated "experiential learning": learning by actively doing.[1]

The assignments are designed to be reasonably challenging; they are not meant to be routine exercises, and they cannot be completed in a short period of time. A typical student should plan to spend three to four hours per week on average on the homework assignments. (Note: this is per week, not per assignment!) It is therefore important that you start working on each homework assignment as soon as it is posted.

Don't start working on your homework until after you have completed item 3, i.e., until you have studied carefully the material on which the homework is based. Failing to heed this advice is a surprisingly common mistake. It seems like an expedient shortcut ("I will study only what I need to get this blasted homework out of my way") but it is counterproductive and ultimately wasteful. You are very unlikely to do a good job on a homework assignment if you haven't studied the material on which it is based; moreover, you are unlikely to identify the minimal material necessary to solve a problem you have not yet solved.

As per the course policy, you may work with a partner on homework assignments. *Don't share the work by dividing the homework in two and having each partner do half of it.* Doing so will rob you of half of the above-mentioned benefit of doing homework. Instead, each partner should initially work on all problems alone; after an honest first effort, you can get together with your partner to exchange ideas and try to make progress on the parts that you were unable to solve on your own, or to perfect the better of the approaches you devised.

5. Do more than the assigned homework! The amount of homework we assign is limited by the time your TAs have available for grading. (In fact, as stated in the course policies, we may not even get to grading all of the assigned homework.) The amount of practice the assigned homework provides is not enough to master the material. Your textbook has lots of exercises at different levels of sophistication. You should do as many of them as you can. You are welcome to discuss **non-assigned** exercises with your classmates in the course forum or in your study groups. (Regarding collaboration for **assigned** exercises, see the course policies.) Keep in mind that passively reading or listening to exercise solutions provided by others is of little benefit, if you have not made a serious attempt to solve the problems on your own.

6. Seek help when you need it. I am here to help. If you don't understand something, don't hesitate to ask. I do not judge your intelligence by, or base your course performance on, the questions you ask, so don't let such inhibitions get in the way of learning. Individual interaction during office hours is the best way to get help. The Piazza forum is another option. Email affords neither the immediacy of individual interaction nor the efficiency of Piazza's multi-party interaction; it should be used only when the other two options are not available. (Note that you can ask me questions privately on Piazza.)

My answers to your questions may well take the form of other questions or of advice as to what to study again, more carefully. This isn't because I am too lazy or too coy to give a straight answer, but because arriving at the answer by yourself with some guidance puts you in a better position to tackle a new problem than simply being handed the answer.

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[1] "I hear and I forget; I see and I remember; I do and I understand." —Confucius