Suggested Reading

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The course *Analysis of Algorithms* discusses many algorithms; however, this is not the main goal of this course. The primary purpose of the course is to introduce you to methods that allow you to *reason* about algorithms. We are curious about questions such as (i) How fast does the algorithm solve the problem? (ii) How much memory is needed to solve the problem? (iii) Why is the algorithm correct? (iv) Is it the best possible algorithm for a given problem?

Answering such questions requires problem solving skills and a solid mathematical background. The basics that you have learned in discrete mathematics, calculus, and other courses will be put to good use, but presumably you need more exercise so that you can comfortably handle the question that are raised in the analysis of algorithms.

In the summer months, you might wonder what kind of books you should read. I have assembled a list of six books that are considered classics. The books range from a fairly elementary level to an advanced level. Some of the books will be useful from now until you have completed your post-graduate studies, or might even last you a lifetime.

- G. Polya, *How to Solve It: A New Aspect of Mathematical Method*, 2nd edition, Princeton University Press, 2004.

  A classic about problem solving techniques. It is elementary, but still a very valuable book to read. One of the most common complaints from industry is that our students do not have enough problem solving skills; this is one of the best places to start. The book also contains a good exposisition of proof techniques.

- G. Polya, G. Szegö, *Problems and Theorems in Analysis*, Volumes I and II, Springer, 2004.

  One of the best collection of mathematical problems. The problems about series, binomial coefficients, number theory, are very valuable for computer scientists. You can only learn how to do proofs by exercising a lot. The best mathematicians and computer scientists trained with these problems.

- R.L. Graham, D.E. Knuth, O. Patashnik, *Concrete Mathematics: A Foundation for Computer Science*, 2nd edition, Addison-Wesley, 1994.

  The book develops the mathematics that one needs for the analysis of algorithms. The topics include recurrences, binomial coefficients, generating functions, probability, and asymptotic methods. The authors present the material in a very enganging style. The learning curve is quite steep, but you will learn invaluable lessons.

- D.E. Knuth, *The Art of Computer Programming*, Volumes I-III, Addison-Wesley, 1997–1998.

  The Art of Computer Programming is a must for every computer scientist. The books contain fundamental algorithms that are all carefully analyzed. The books contain a wealth of challenging exercises. If you can own only three books on computer science, then these three are probably your best choice.

- Programming Problems

  If you are looking for some problems to improve your programming skills, then I suggest that you solve some of the ACM programming contest problems, see

  http://icpc.baylor.edu/icpc/default.htm

Enjoy your summer!

Best regards,
Andreas Klappenecker