

Course Outline: Math 4/5/7380, Fall 05

The web page for this course can be found at <http://livetoad.org/>. Please check there frequently for announcements, changes, due dates, solutions, scores, and other goodies.

Introduction

Welcome to Discrete Structures and Analysis of Algorithms! The syllabus for this course is the union of two topics, formerly taught in separate courses, back in the days of quarters. Discrete structures stand in contrast to the continuous structures you study in courses such as calculus. Finite mathematical structures are discrete, as are the structures of integer and rational arithmetic. Algorithms are step-by-step procedures. An example of an algorithm is the recipe for long division. Algorithms are intimately tied to discrete structures. They are best studied together.

We will learn about discrete structures from the text *Discrete Mathematics*, by L Lovász, J Pelikán, and K Vesztergombi. We will cover nearly all the material in this book. In fact, I will supplement this with material on public key cryptography, elliptic curves, and other topics.

We will use the programming language *python* to study algorithms. I do not assume that you have any prior programming experience. (More on this below.)

Office hours

My office is UH 4080e. The phone number is 419 530 2975. My email address is simply paul.hewitt, at utoledo.edu. I will be in my office for an hour after class. At these times you can call or stop by without an appointment. I am also available at other times, but for these you must make an appointment. Feel free to ask for appointments at other times if you cannot make it to my regular office hours. If you call me when I am not in my office then you can leave a voice mail message and I will get back to you as soon as I can.

Quizzes

There will be a short, 5-point quiz nearly every day, based on reading assignments which I will post on the web. Your 20 best quiz scores will count towards your final grade. I will not give make-up quizzes under any circumstances. If you miss a quiz then that will be one of the scores you drop.

Exercises

There will be 14 exercise sets. Altho there may be many problems assigned, I will randomly choose 10 to grade. Each exercise set will be worth 10 points. I will post the problems and due dates.

I will not accept exercises past the due date, under any circumstances. Your 10 best scores will count towards your final grade. If you do not submit an exercise set by the due date then that will be one of the scores you drop.

You can find the answers to the exercises in the back of the text. I encourage you to check your answers with those in the text. However, your scores will not depend on the answers, but on the clarity and accuracy of your explanations. In fact, the answers in the back of the book are usually far too sketchy to earn you any points as written. Do not merely copy these answers and turn them in as your own. (More on this below.)

Some of the exercises ask you for a complete proof. Some will ask you to elucidate an example. Some will ask you to find the flaw in a putative proof. *All* exercises require complete sentences. You will not get credit for a solution if you are vague or if you omit important details.

Before you turn in your homework, fold the papers lengthwise and write on the outside

your name, Math 4380, Fall 05, assignment number, due date

Computer labs

There will be 6 programming assignments, each worth 20 points. Each assignment will require you to study code, explain how it works, and write similar code. I will post the code and due dates. If you are an undergrad you may replace any two exercise sets with a computer lab report, or you may choose not to turn in a computer lab report for grade. However, I strongly suggest that you at least try some of the computer labs, since in my experience you will not learn the material if you skip the computer assignments completely. If you are a grad student then you are required to do all of the computer labs, and your 5 best scores will count towards your final grade.

Each computer lab will be assigned at least 3 weeks before the due date, and so you will have plenty of time to work on the lab before you decide whether to turn it in for grade. I will not accept lab reports past the due date.

The computer labs will use the programming language *python*. This will also be the language we use in lectures and on the exams when we discuss algorithms. Python is perhaps the easiest language to learn, but it is also very powerful. It is easy to learn even if you have never done any computer programming. There is a good online introduction to python, called *How to Think Like a Computer Scientist*, by Downey, Elkner, and Meyers, and available online at <http://www.ibiblio.org/obp/thinkCSpy/>. This tutorial does *not* assume you know anything about programming. One of the nice features of this tutorial is the glossary of terms at the end of each section.

I do not assume you know anything about computer programming, and in particular I do not assume you know the language python. I do know from experience that you will not learn the material in this course unless you try to implement for yourself some of the algorithms we study. Experimentation — and the many mistakes and false starts that implies — is an inimitable learning tool. Do not be afraid to experiment, to make mistakes, and to learn.

We will meet every Friday (including the date of exam 1) in the math department computer lab, UH 1000. In these labs I will introduce you to python, and we will use python to study the structures and algorithms from the lectures. I expect everyone to learn and use correct python syntax, on the assignments and the exams. You will lose a significant number of points for incorrect python syntax.

I believe the version of python installed in UH 1000 is 2.3, and so that is the version we will use in class. The latest version available is 2.4, and there are some significant differences between these versions. If you have your own computer then you should take the time to download and install python yourself. It is free. It is easy. Go to <http://python.org/>.

Plagiarism

I encourage you to work together. Studies show that students who work together consistently out-perform those who do not. However, your own work must be written in your own words. Do not “divide up the labor”. Do not turn in work that is not your own. Copying is cheating. This includes copying from another student or copying from a book. If you turn in work that is not your own then you will get a 0 on that assignment. If it happens a second time you will get an F in the course.

Exams

There will be two exams, worth 100 points each. The exam dates are listed on the calendar below. The exam questions will be derived from three sources: the quiz questions, possibly in modified form; the review exercises at the end of each chapter; and the computer labs. These latter will require that you write or analyze python code. On each exam you will have some choice in the problems you wish to do. Undergrads will have slightly wider choices than grad students. During the exams you will have access to python.

I will give make-up exams only in case of a documented exigency, such as illness or a funeral. If you are sick the day of the exam then you must call or email that same day if you expect to be able to make up the exam. Otherwise you must arrange for a make-up exam ahead of time. If I am not in my office then you can leave a voice mail message. If you fail to show up for an exam and do not contact me about it until afterwards then you will not be able to make up that exam — you will get a 0 for that exam.

<i>Labor Day</i>	Mon	5 Sep	<i>Veterans Day</i>	Fri	11 Nov
Exam 1	Fri	14 Oct	<i>Thanksgiving Break</i>	Wed–Fri	23–25 Nov
<i>Last Day to Withdraw</i>	Fri	14 Oct	Exam 1	Wed	14 Dec 12:30–2:30
<i>Fall Break</i>	Mon–Tue	17–18 Oct			

Grades

Your final grade will be determined from the distribution of total points earned, based on the following scale:

90% earns an A; 80–89% earns a B; 70–79% earns a C; 60–69% earns a D.

If you want me to post your scores under a nickname then bring me a 3 × 5 card with your name, an email address, and the nickname you want to use — preferably something not obvious! I will not accept email requests to email or post your scores or final grade. If you want me to post your scores then you must bring me a 3 × 5 card.

If you stop attending class then I will give you an IW grade. There are two points during the semester for submitting IW grades: the 4th and 10th weeks. After the 10th week an IW grade is impossible, so if you stop attending after this point then you will get an F.