

Course Outline: Math 4/5/7380, Fall 2013

All course information, including points earned and final grades, can be found on the BlackBoard home for this course. Much of the information is replicated at <http://livetoad.org/>. Please check frequently for announcements, changes, due dates, solutions, scores, and other goodies.

<i>Labor Day</i>	Mon, 2 Sep
Exam 1	Mon, 23 Sep (Changed!)
<i>Fall Break</i>	Mon–Tue, 30 Sep–1 Oct
Exam 2	Fri, 25 Oct
<i>Last Day to Withdraw</i>	Fri, 25 Oct
<i>Veterans Day</i>	Mon, 11 Nov
<i>Thanksgiving Break</i>	Wed–Fri, 27–29 Nov
Exam 3	Wed, 11 Dec, 12:30–2:30

Introduction

Welcome to Discrete Structures and Analysis of Algorithms! The syllabus for this course covers two closely related topics. *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. I will supplement this with material on public key cryptography, including its historical context and political ramifications.

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.) Although learning to program is not a learning outcome for this course writing and analyzing computer programs is a key tool to understanding algorithms and computational complexity, which are essential learning outcomes.

Office hours

My office is UH 4080c. The phone number is 419 530 2975. My email address is simply paul.hewitt, at utoledo.edu. I will be in my office *at noon Mondays and Fridays, and in the lab at noon Tuesdays and Wednesdays*. (Note the change!) 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 around 15–20 short, 10-point quizzes, based on reading assignments which I will post on the web. Quiz questions may ask for the definition of a mathematical term, the statement of an important theorem, or the application of a theorem or combinatorial technique to solve a problem. Your 10 best quiz scores will count towards your final grade.

Exercises

There will be 12–15 exercise sets. Most of these will be taken from the text; some will appear in supplementary lecture notes. I will post the problems and due dates. You may earn up to 100 points total for your work on the exercises.

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 4/5380, Fall 2013, assignment number, due date

Computer labs

There will be several programming assignments, each worth up to 10 points. These points will be added to your total for the assignments, again up to a maximum of 100 for the semester.

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 any of the computer lab reports 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 at least 5 of the computer labs.

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. It is also very powerful. It is easy to learn even if you have never done any computer programming.

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 a valuable learning tool. Do not be afraid to experiment, to make mistakes, and to learn.

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.

The version of python installed in UH 1000 is called *ipython*, and is based on python 2.7 but includes a working environment that makes it a bit easier to experiment with python. If you have your own computer then you should take the time to download and install python yourself. It is easiest to install ordinary python 2.7 from <http://python.org/>. You can also install ipython if you run Mac OS or linux.

Research paper

You have the option of earning up to 50 points extra credit by submitting a research paper on the history and politics of public key encryption. If you wish to take this option then you must submit a proposal, including an annotated bibliography, by Friday, 25 October.

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 three exams, worth 100 points each. The exam dates are listed on the calendar above. 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.

Grades

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

450 points earns an A; 400 points earns a B; 350 points earns a C; 300 points earns a D.

If you are still registered after the 10th week you will get a grade in this course, whether or not you have stopped attending.