Introduction to Scientific Computing

PSCB57
Fall 2014

Professor Hanno Rein

Lecture Mondays, 9 am - 11 am, MW 160
- The lectures start prompt at ten past the hour. Please be on time.
- There will be no break.

Tutorial Thursdays, 3 pm - 4 pm, BV 498
Fridays, 9 am - 10 am, BV 469

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Office hours Mondays, 1:00 pm - 2:00 pm, SW 504 C
or by appointment

Reading
- The Internet
- Charles Dyer's notes, `http://pathfinder.utsc.utoronto.ca/~pscb57/`
- Numerical Recipes, The Art of Scientific Computing, 2007, William H. Press

Software The course will use linux throughout the course as the preferred operating system. Linux is the industry standard for scientific computing. We will also work with the unix shell `bash`, the text editor `vi`, the version control system `git` and the programming language `python`.

You are not required to use linux on your personal computer. However, you have to get familiar with linux. You will be given an account on a linux machine to which you can connect remotely. To log in to this machine from a windows computer, you can use one of two free software packages:

- `MobaXterm`. A rich ssh client with file transfer, file editing and X forwarding capabilities. For personal use, the software is free and can be downloaded at `http://mobaxterm.mobatek.net`.
- `Putty`. A simple ssh client. It can be found at `http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html`.

Lectures The lectures might be different from what you have encountered before. I will use the blackboard to derive the mathematical parts of the material. The practical part of the lectures will be done using a live demonstration. There will be no powerpoint slides. You are encouraged to take notes. You are also encouraged to bring your personal computer to the lectures to do some of the programming simultaneously with the presentation.

Each lecture is two hours long. There will be no break. Please be on time. We start promptly at ten past the hour.

If something is unclear during the lecture or you would like to hear something again, please raise your hand and let me know. The more questions get asked, the better.

As a courtesy towards the lecturer and your fellow classmates, please refrain from eating any food during the lecture. Please turn off the sound of all your electronic devices. If your phone rings during the lecture, you will be asked to leave.

Tutorials and assignments

Each week, you will be given an assignment. The length of the assignments will vary throughout the course. The deadline for submission is the 9am Monday morning (just before the lecture). This is a hard deadline. You are required to submit the assignment electrontically. There is no other way to submit assignments. We will go over the details on how to do that in the first lecture.

The fraction of submitted and correctly solved problems will constitute towards your grade. Most importantly, *if you submit a solution to an assignment, you have to understand it*. Be prepared to present your answer to the instructor and other students during the tutorial. Failure to be able to present a submitted (and correct) answer will nullify your points from that week's assignment. The same happens if you do not show up for a tutorial (you cannot present your answer if you are not present). By the end of the course, your grade in the assignments has to be 40% or higher, otherwise you will not pass the course.

Grading Scheme

There are three necessary conditions for passing this course:

1. A final grade of at least 50%.
2. An assignments grade of at least 40%.
3. You have to write the final exam.

The final grade will be calculated from all assignments, the midterm and the final exam. The ratio is as follows:

Assignments	30
Midterm	25
Final exam	45
Total	100

If you miss the midterm for a valid reason (see below), your final exam will be worth more and cover the midterm contribution towards your final grade (75 out of 100). However, if you miss the midterm for a non-valid reason, it will be counted as zero points.

The final exam will take place during the exam period. The exam may include, but is not restricted to, material from all lectures and all tutorials. Neither a calculator nor an equation sheet will be allowed. Don't worry, you won't need them. The exam will focus on your understanding of the subject, rather then long mathematical calculations.

Absences

In the case of a problem that supports an absence to a tutorial session or an inability to hand in an assignment before the deadline, your grade will be calculated on the basis of all other tutorial work. In the case of a problem that supports the absence to the midterm, your grade will be calculated by increasing the weight of the final exam. Valid and *official supporting documentation* must be submitted within five business days of the missed tutorial or test.

Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or `ability@utsc.utoronto.ca`.

Academic Integrity

Academic integrity is one of the cornerstones of the University of Toronto. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. Detailed information about how to act with academic integrity, the Code of Behaviour on Academic Matters, and the processes by which allegations of academic misconduct are resolved can be found online: `http://www.artsci.utoronto.ca/osai/students`.

According to Section B of the University of Toronto's Code of Behaviour on Academic Matters (`http://www.governingcouncil.utoronto.ca/policies/behaveac.htm`) which all students are expected to know and respect, it is an offence for students to:

- To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted citations in their work.
- To obtain unauthorized assistance on any assignment.
- To provide unauthorized assistance to another student. This includes showing another student completed work.
- To submit their own work for credit in more than one course without the permission of the instructor.
- To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an unauthorized aid in any test or exam.

Specificlly to this course, please be reminded that you need to understand every solution that you submit. If you work together on an assignment, you still have to be able to present your submission.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the Code of Behaviour on Academic Matters.

Tentative Class Schedule

Week	Date	
1		Linux/unix, bash, vi and git
2		Assembler
3		Python
4		Floating point representation of numbers
5		LU Decomposition
6		Interpolation and Extrapolation
7		Roots finding algorithms
8		Numerical Integration
9		Differential Equations I
10		Differential Equations II
11		N-body integrations
12		Monte Carlo