I. Overview

Computer Science E-10b is the second half of a two-semester introduction to computer science using the Java language.

The official prerequisite for this course is Computer Science E-10a, which covers the fundamental principles of object-oriented programming using Java; however, students who are experienced in other languages (e.g., C++ or even C) may be able to succeed in this course if they master elementary Java during the first week or two. This means that by mid-February all registered students are expected to be comfortable with designing, coding and debugging programs of modest complexity while employing good programming style in the Java language. In particular, we presume that enrolled students are already competent at writing Java code that contains iterative and conditional control structures, parameter passing, elementary class declarations/object creation, and single-dimensioned array manipulation.

In CSCI E-10b you will write larger and more complex programs than in CSCI E-10a, including (at least for the graduate-credit students) a significant original term project. Most of the problem sets will involve programming on a Unix/Linux environment using the 1.7 (or greater) implementation of the Java language. You can use your own personal computer for much of the course work, but we’ll have more to say about that in lecture.

The main emphasis of CSCI E-10b is on learning the principles and practices of object-oriented programming (OOP), which includes the design and implementation of abstract data types (ADTs) such as stacks and queues. After a quick review of Java basics, we continue with recursive processes, bit manipulation, inheritance mechanisms and interface design, exception handling, and file and stream I/O. We then turn our attention to the design and implementation of
graphical user interfaces (GUIs) and related topics, such as event-handling, drawing and threading. We also touch on such data structures as singly linked-lists. The last unit of this course is concerned with the MIPS “RISC” architecture; at this point you will learn an assembly language and come to understand the underlying structure or “architecture” of a typical digital computer, including the low-level representation of diverse types of data.

Although we believe the content of CSCI E-10b is fairly straightforward, this is one of those computer courses in which the problem sets can be somewhat time-consuming. It is not unusual for students to spend as many as 10-15 (or more) hours per week, on the average, doing the homework. If you have other major time commitments (e.g., a part-time job, other courses, a family, friends, hobbies, etc.), then you might wish to reconsider whether or not to take Computer Science E-10b. You have been warned!

If you wish to use the computing facilities on campus, note that the Harvard Science Center is available for student use 24 hours a day, 7 days a week (in theory, at least). The 53 Church Street facilities are available from early in the morning until late in the evening, 7 days per week. Church Street classrooms are occasionally reserved for section meetings and are therefore inaccessible for general use at those times. More information about the University’s IT environment is at http://huit.harvard.edu/pages/students. The Church Street lab’s website is at http://lab.dce.harvard.edu
II.  Course Staff

Faculty:  Henry Leitner  51 Brattle St., rm. W-719  (617) 495-9096  
  e-mail: leitner@harvard.edu

The best way to get in touch is by sending an e-mail message to ask a question or to arrange an appointment.

Teaching Assistants:
  Mr. Christopher Morris  e-mail: christophermorris@college.harvard.edu
  Mr. David Habermehl  e-mail: dwhabermehl@gmail.com
  Mr. David Hughes  e-mail: davidralphhughes@college.harvard.edu
  Mr. Brandon Tineo  e-mail: brandontineo23@gmail.com

  others to be announced, if enrollment warrants

Each CSCI E-10b student will be assigned to one of the teaching assistants listed above. The TAs are responsible for grading homework and for helping students, in general, with the material covered in this course. They can all be contacted individually via e-mail. Students can reach the entire course staff at once by sending an e-mail message to cscie10@fas.harvard.edu.

Each student is expected to attend a mandatory 60-75 minute “section meeting” every week, beginning the week of January 30. During the first week of class (starting January 23), we may hold an optional section meeting, primarily for students who want to review elementary Java, including a brief introduction to writing Java programs under Unix using javac. This initial meeting will take place at 7:40 pm on Wednesday, January 25 in room 304 at One Story Street.

The section meetings are run entirely by the various teaching assistants; some are held in various classrooms on campus, while others are held exclusively online via “web conference” using Zoom software. The precise times and places for these meetings will be announced in lecture and will be posted at all times on our course website:

  http://www.fas.harvard.edu/~cscie10

In addition to running section meetings, the TAs will hold regular “office hours”

\footnote{Note that Dimitri will assume “head teaching fellow” responsibilities; he will be the one to contact for various administrative matters, such as questions about grading guidelines.}
to assist students with homework assignments and other course-related matters. The schedule of TA office hours will be announced shortly. Later on we will provide you with more detailed information on how the TAs are individually sharing their responsibilities; for the moment, you are encouraged to contact any one of the TAs if you need some quick help or advice.

In order to be assigned to a section, you must fill out a simple questionnaire, which will be available on our course website.

III. More Important Information ...

On-demand, streaming video of all lectures will be posted on the CSCI E-10b course website. These lectures will be posted on a weekly basis, generally within 24 hours of the live class meeting. Although the lectures are available online, we encourage you to attend class in person if you are able to, as most classes will have interactive exercises to help reinforce difficult subject matter.

Attendance at section meetings is essential, as this course moves very fast.

Important course announcements (e.g., problem set errata) may occasionally appear on our course website. Please pay careful attention to these notices. Some may be of immediate importance — we may send out an email alert if there’s something that’s especially important.

Note that the course handouts are numbered sequentially and are posted also on our course website.

You should get into the habit of consulting our website frequently (at least once per week) for late-breaking news! Electronic submission of homework is due, in general, prior to midnight on Monday evenings. Other important dates to be aware of (see the calendar at the end of this document):

- **March 20:** Open-book midterm quiz (75-minutes long)
- **April 10:** Graduate-student term project proposals due by 5:30 PM
- **May 5:** Graduate-student term projects are due by 5:30 PM.
- **May 8:** Open-book, two-hour final examination
As previously mentioned, CSCI E-10b lectures (along with course-related materials) are being made available online. These streaming video/audio presentations can be viewed by students anywhere in the world, so long as there is a reliable connection to the Internet and the required software has been installed onto the student computer. For additional requirements, and to view a sample lecture, see https://www.extension.harvard.edu/academics/courses/types-courses/video-course-guidelines

Information on taking exams if you cannot come to campus is found here: http://www.extension.harvard.edu/resources-policies/exams-grades-transcripts/exams-online-courses

IV. Readings

The two main textbooks for this course are for sale at the Harvard Coop bookstore. If you are at a distance from Harvard Square, you can order the books over the phone from the Coop or on online seller.


Many of you should already have this textbook if you enrolled in CSCI E-10a

There are several additional, supplementary textbooks you may want to check out — which are NOT required for purchase. Each should be for sale at the Harvard COOP, and will be on reserve at the Harvard Extension School’s Grossman Library in Sever Hall:

- **The Linux Command Line: A complete Introduction**, by William Shotts. Published by No Starch Press, San Francisco, 2012. ISBN #9781593273897. Since you will be writing your Java programs in a Linux environment, you may find it helpful to learn a bit more about this important operating system.


*Remember, you are not required to purchase any of the supplementary books at this time!*

An initial set of lecture slides will be available on our course website soon, along with demonstration program listings. Subsequent material will be available on our website for you to download (and print, if you choose to do so).
V. Doing the Problem Sets

The majority of the homework will involve problem-solving using either Cloud9 (a web-based Linux system) or one of the timeshared Linux computers located at the Science Center; the latter can be accessed through the Internet using an SSH software client running on a Mac (i.e., the Terminal application) or a Windows PC (e.g., using the SecureCrt application). Some of the homework exercises will be short paper-and-pencil problems. In addition, there may, on occasion, be a number of “extra credit” programming problems — you can decide which ones (if any) you want to work on.

Do not attempt to finish up a homework during lecture or during section! We will deduct 10% for a homework assignment that is turned in up to 3 days late. 20% will be deducted if the homework is more than 3 days late. No homework will be accepted more than 7 days late. Electronic submission of your homework is due prior to the start of lecture, and if it is more than 10 minutes late arriving, then it will be considered a full day late. At section meetings and during regular office hours, your assigned TA will return your graded homework to you. As I usually plead, please, please

Do NOT fall behind on problem sets!

Just as you cannot expect to learn how to drive a car by reading about it or by watching other people do it, the same holds true for programming a computer. Do your work on time — this is one course you simply cannot “cram” for at the last minute, so don’t even try! We cannot stress this strongly enough. Remember that the homework will be quite time-consuming, so please reconsider your other commitments before you decide to continue with CSCI E-10b.

Here are a few additional guidelines you should follow when turning in homework:

✦ Include your full name, course, date and assignment number in a comment line at the beginning of every program file.

✦ For the programming assignments, be sure to test your programs thoroughly. Remember that your homework will be graded on the

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2 If you know you will be turning in your work late, try to contact your teaching fellow via e-mail and inform him or her about the difficulty.
basis of both correctness and clarity (e.g., the use of meaningful
identifiers, appropriate indentation of statements, modular design,
comments). We will have more to say about this a bit later. Note that
we will **not** always be providing you with a set of standard “test cases”
on which your programs must operate successfully — so be careful
when you try out your programs. **In most cases, any feature that is**
**not demonstrated will be presumed **not** to work!**

- **Those of you who use personal computers for some or all of the**
homework assignments will need to upload the programs you write to
our course website and "submit" them electronically. Detailed
procedures for doing this will be provided on our course website.

- **You are NOT permitted to “borrow” code found on websites, magazines**
or books. Nor can you have friends or family members write your
programs. If you wish to reuse small “snippets” of code from lecture
demonstrations or from some other source, you may do so —
provided you annotate such use and give proper credit to the original
author. **Violators of this rule will be subject to disciplinary action.**

Student final grades in CSCI E-10b will be based on the problem sets, an open-
book midterm quiz, an open-book final, a term project — which is required of all
graduate-credit students only\(^3\) — and the teaching fellow’s appraisal of individual
achievement.

For graduate-credit students, the **final exam** will, on average, count towards **25%**
of the final grade; the **midterm quiz** will count an additional **15%**; the **term project**
will count **10%**; and the **homework** will count toward the remaining **50%**. For
undergraduate-credit students, the **final exam** will, on average, count towards **33%** of
the final grade; the **midterm quiz** will count an additional **17%**; and the **homework**
will count toward the remaining **50%**.

Please note that an **EXTension** in CSCI E-10b will be granted only in extreme
circumstances (e.g., illness), and only when appropriate documentation is provided.
Such cases must be cleared with Dr. Leitner or the head teaching assistant as early as
possible, and before May in any event.

\(^3\) Basically, an original, largish computer program written in *Java*. We will suggest some possible topics in a separate
document.
VI. The Syllabus

As a continuation of CSCI E-10a, the content of CSCI E-10b is divided into 4 additional “units” or components:

- **Unit 5** — Overview of the Unix operating system and useful shell commands. Quick examination of elementary Java control structures, including recursion; scope and the lifetime of variables and identifiers; classes/objects, member functions (including constructors), and data abstraction (*stack* and *queue* data types). Review of single and multi-dimensional arrays; introduction to *Vectors* and *ArrayLists*. Enumerated data types. File and stream I/O concepts, including exception handling. Programming with inheritance.

- **Unit 6** — Event-handling; the design and implementation of graphical user interfaces (GUIs) using the “abstract windowing toolkit” and the *Swing* components of the *Java Foundation Classes* (JFC) such as labels, buttons, textfields and textarea, layout managers, menus, events and listeners. *Graphics* objects for drawing simple figures such as lines, rectangles and ovals, and for displaying text using different fonts.

- **Unit 7** — Introduction to linked-lists, bit manipulation and bit fields. *Sets* as an abstract data type. Simulation example. Applets and multithreading, if time allows.

- **Unit 8** — Computer architecture. Instructions and addressing using the MIPS RISC assembly language. Internal representation of data structures. Stacks, subroutines and stack frames to explain how recursion operates. Bringing it all together: how high-level programming languages work: a *Java* program that implements an interpreter and a compiler for a high-level language.

“On the Internet, nobody knows you’re a dog.”
The following calendar should give you an idea of how CSCI E-10b will progress.

**Good Luck!**

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### January, 2017

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Spring, 2017

Handout #1

Dr. H. H. Leitner
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Above all, have fun in this course!