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## CS 111: Scientific Data and Dynamics

### Spring 2016

**Course Description:** This course is an introduction to computational problem solving. Motivated by real-world problems, we will develop the ability to break complex problems down into simple pieces and produce efficient algorithmic solutions to such problems. We will practice these skills by developing computer programs in a programming language called *Python*, using an interface called *IDLE*. The course will cover programming fundamentals, as well as the development of algorithms and data manipulation techniques. No prior experience is necessary.

#### Course Goals:

1. Practice how to break a complex problem into simple pieces. Develop analytic thinking skills.
2. Develop problem-solving skills. Build confidence in your abilities. Learn how to troubleshoot without becoming frustrated.
3. Develop an algorithmic way of thinking, including attention to the design and complexity of a solution. Learn to mold theory-based approaches to solve messy real-world problems.
4. Develop time management skills, metacognitive skills, and the habit of thinking intentionally about your learning and your goals.
5. Implement algorithmic solutions in Python as a proof of concept.
6. Develop group work skills, test-taking skills, the ability to write clear programs with helpful comments, and the ability to write to a general audience about technical material.
7. Develop comfort with the idea of writing as a way of thinking and understanding. Become proficient at re-writing as a way of communicating to your reader.

#### Class Details:

Instructor: David White  
Office: Olin 202  
Extension: 6644  
Email: david.white@denison.edu  
Class: 8:30-9:20am MWF in Olin 217, 8:00-8:50pm Th in Olin 217  
Office Hours: 10:20-11:20 M, 11:30-12:20 W, 10-11 Th, 1:30-2:20 F, **and by appointment**, Olin 202  
Study Sessions: 6:00-11:00 pm Sunday-Thursday, Olin 217.  
Final: 9:00am-11:00am, Thursday, May 5, Olin 217  
Web Resources: <http://personal.denison.edu/~whiteda/cs111spring2015.html>  
<http://codingbat.com/home/david.white@denison.edu/cs111spring2015>

**Textbook:** *Discovering Computer Science: Interdisciplinary Problems, Principles, and Python Programming*, by Jessen Havill.

#### Course Evaluation:

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|----------------------|-----|------------|-----|
| Homework & Essays    | 10% | Quizzes    | 20% |
| Labs & Final Project | 35% | Midterm    | 10% |
| Participation        | 5%  | Final Exam | 20% |

#### Keys to Success

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- Prior to exams, be able to solve every quiz and homework problem quickly and with pen and paper rather than in IDLE.
  - Review the material from class the same day it is given. Find a way to attach this new knowledge to things you already understand.
  - Read the textbook slowly and carefully, at your desk, with a notebook nearby to write down questions. Have IDLE open while reading. Type code in, play around, and experiment to figure out what Python can do. Answer all reflection questions.
  - Start labs early. Give yourself time to get stumped and to get past these difficulties. Finish the programming part of the lab a full day before it is due so as to have time to write the lab report.
  - Study computer science a bit every day rather than in bursts just before an exam.
  - Keep a list of key definitions, built-in functions, and syntax, and commit them to memory throughout the course. Test your memory each week.
  - Have a perfect, hand-written copy of each homework and quizzes within one day after the problems have been discussed in class. Use this to study for exams.

**Exams and Quizzes** will cover material presented in lecture, homework, and the textbook. We will have a 20 minute quiz every 2 weeks, worth approximately 3% of your final grade. The best way to study is to attend all class meetings and to do all homework problems carefully. We will have a midterm exam will be on Thursday, March 10, 7:00-9:00pm in Olin 217. We will have a cumulative final exam on Thursday, May 5, 9-11am in 217. **Please mark your calendars!**

**Homework and Labs:** Homework will be due almost every day, and will contain both theoretical and coding exercises. The coding exercises will be submitted through a website called CodingBat, which ensures that your code is correct before accepting your submission. In addition there will be practice problems which will not be collected but which you are encouraged to solve. Quiz and exam questions will often be drawn from homework and practice problems. We will have 7-8 labs which allow you to synthesize the skills of the previous unit in order to solve a real-world problem. Each lab is worth about 4% of your final grade in the course, and that grade is split evenly between the code and the lab report. The lab report applies your model to answer real-world questions. You should write the introduction and methods part of your lab report, then write your code following the blueprint in your methods section, then answer the questions and re-write your lab report for clarity. For each lab you will have a lab partner, with whom you do the coding. Partners should hand in identical code, and will receive the same grade on the coding part of the lab, except in cases of extreme free-riding. To give you time to spend on writing you should finish your code a full 24 hours before writing the lab report.

Collaboration on homework and labs is strongly encouraged, but you should write up your lab report yourself, and you should never share code with your classmates (except for assigned lab partners). Part of the goal of the course is practicing your writing skills, so you are expected to hand in clear and readable submissions in which you show all work for written problems and leave detailed and useful comments on code. I am happy to answer questions, and I encourage you to come to office hours if you are confused about anything. You will get the most out of this time if

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you attempt the homework or lab first and come with questions already prepared. Late submissions will not be accepted. In consideration for sickness, personal emergencies, etc. I will drop the lowest lab grade.

Additionally, you are expected to keep up with the reading. I recommend you skim the relevant sections before class and try to understand which concepts might be difficult for you *and why*. This will help you have questions in mind when you arrive in class and will help you get the most out of class. After class, do an in-depth reading of the chapter, work through the “reflections” included in the text, and practice implementing the concepts in IDLE. Then do the homework for the day and skim the sections for the next class. The best way to read the book is with an IDLE console open so that you can play with the new commands you’re learning and work out a few toy cases. It’s usually best to try to learn one new thing at a time, and working out the kinks in IDLE before starting the homework will deepen your understanding of the material. After you are finished with the reading you should work on the homework problems. Expect to spend an average of 10-12 hours per week outside of class (and possibly more in weeks when there is a lab due).

**Essays and Final Project** It is a goal of this course that students will gain a big-picture understanding of the field of computer science, the type of work computer scientists do, and the places in everyday life where computer science makes our lives easier. Towards this goal, we will write periodic, short, low-stakes essays on the ways computer science affects our lives. In addition, there will be a final project worth 2 labs, where students will apply the techniques learned in this class to a real-world problem of their choosing.

**Course Format:** Each class meeting is 50 minutes. Please arrive on time or even early, as we will begin promptly. Class will begin with a review of old material and an introduction of new material. Please take advantage of this and use this time to ask questions on things which are confusing you. We’re all in this together and don’t want to leave anyone behind. We will then have a block of time for in-class programming to make sure we understand the implementation of the concepts discussed in the lecture and reading. Working on problems in class will give you a chance to identify things which may cause confusion on the homework and ask for clarification while we are all in the same room.

**Communication:** It cannot be stressed enough how essential communication is to succeeding in this course. After identifying topics that may be giving you trouble, please communicate this information to me. There’s no such thing as a bad or unwelcome question. Additionally, please communicate with each other. I view the class as a team trying to learn the material together. Collaboration will help all parties achieve this goal, as explaining concepts and examples to each other is a great way to learn.

**Participation:** Class meetings will be highly interactive and our goal will be to involve all participants. Attending class, answering questions, and asking questions is therefore essential and will be a significant factor in determining your participation grade. There will also be periodic group exercises which will factor into your participation grade, as will your ability to work well with your partner(s). Each day participation will be graded on a scale from 0-3, with 0 signifying an absence, 2 attending attentively, and 3 active participation such as asking or answering a question.

**Grading Scale:** A standard 10% grading scale will be used. Therefore, 60% is required to pass the class, 70% will be a C-, 80% will be a B-, and 90% will be an A-. At every moment, you will have

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the tools to compute your own grade. Since this is a course on computation, I will often ask you to compute it yourself, rather than computing it for you upon request.

**Disability:** Any student who feels he/she may need an accommodation based on the impact of a disability should contact me privately as soon as possible to discuss his/her specific needs. I rely on the Academic Support & Enrichment Center in Doane 104 to verify the need for reasonable accommodations based on documentation on file in that office.

**Academic Integrity:** The students and faculty of Denison University and the Department of Mathematics and Computer Science are committed to academic integrity and will not tolerate any violation of this principle. Academic honesty, the cornerstone of teaching and learning, lays the foundation for lifelong integrity. Academic dishonesty is, in most cases, intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from daily homework assignments to major exams. Students must clearly cite any sources consulted, including classmates who have been collaborators on the homework and online sources of aid. Neither ignorance nor carelessness is an acceptable defense in cases of plagiarism. As is indicated in Denison's Student Handbook, available through [my.denison.edu](http://my.denison.edu), instructors must refer every act of academic dishonesty to the Associate Provost, and violations may result in failure in the course, suspension, or expulsion. (For further information, see the Academic Misconduct and Sanctions sections of the Student Handbook or Section VII.B. of the Faculty Handbook.)

I expect that you will all abide by the honor code in this course. Please do not use resources outside of me, your fellow students, the tutors, and the textbook. Students are not allowed to copy code from online sources, and should not search for solutions online. Collaboration on homework and projects is permitted, but you are not allowed to share code, except with your assigned lab partner. You may discuss the problems with each other and the tutors, but when you leave you should not have any written or typed notes from those you collaborated with. Collaboration on quizzes and exams is not permitted. Violations of the honor code will be reported and may result in severe penalties, including failure of the course.

**Appropriate Use of Course Materials:** The materials distributed in this class, including the syllabus, exams, handouts, study aides, and in-class presentations, may be protected by copyright and are provided solely for the educational use of students enrolled in this course. You are not permitted to re-distribute them for purposes unapproved by the instructor; in particular you are not permitted to post course materials or your notes from lectures and discussions online. Unauthorized uses of course materials may be considered academic misconduct.

**Email:** I will frequently contact you via email. Please check your email regularly. I will also check my email regularly, but often not after 8pm. Experience has shown that students who begin labs early are much more successful, while those who try to do it the night before are unable. Thus, I will not respond to email about labs within 24 hours of the due date, because I do not want to enable students who wait till the last minute to begin.