CS4 Syllabus/Course Missive

Spring 2019

1 Introduction

Welcome to CS 0040, Introduction to Scientific Computing and Problem Solving. CS 0040 provides an introduction to using computers to solve STEM (Science, Technology, Engineering, and Mathematics) data analysis, visualization, simulation, and numerical analysis problems. The course begins with an introduction to the basics of programming, accompanied by several applications of fundamental coding elements and concepts. As we do this we will explore some of the breadth of Computer Science as a discipline. This first part of the course (which runs until spring break) will be taught in Python. Following this, we will explore more specialized topics related to scientific computing and mathematics that will allow students to access and analyze a number of "real world" problems. The later portion of the course will be taught in MATLAB.

Lectures are in B&H 168, on Mondays and Wednesdays from 5:40-7:00 pm.

2 Goals and Content

The strategic goals of this course are as follows:

- Help students to feel justifiably confident of their ability to write small programs

- Map scientific problems into computational frameworks

- Provide competence and confidence in computational problem solving

- Prepare students to make profitable use of computational methods in their chosen field

The content can be summarized with the following six major topics or objectives:

- Learn languages for expressing computations – Python and MATLAB

- Learn about the process of writing and debugging a program

- Learn about the process of moving from a problem statement to a computational formulation of a method for solving the problem

- Learning a basic set of "recipes" – algorithms

- Learn how to use simulations to shed light on problems that don't easily succumb to closed form solutions

- Learn about how to model and understand data with computational tools

This course is designed to help you become skillful at making the computer do what you want it to do. Once you acquire this skill, your first instinct when confronted with many tasks will be to write a program to do the task for you. Said another way, we want to help you learn to apply computational modes of thought to frame problems, and to guide the process of deducing information in a computational manner.

This means that the primary knowledge you will take away from this course is the art of computational problem solving. Unlike many introductory level courses, having an ability to memorize facts will be of little help in CS 0040. This course is about learning to solve problems, not learning facts.

3   Prerequisite and Preparation

This course is aimed at students with little or no prior programming experience but a desire to understand computational approaches to problem solving. Now, by definition, none of you are underqualified for this course. In terms of being overqualified – if you have a lot of prior programming experience, we really don't want you wasting your time, and in this case we would suggest that you talk to Professor Gaudette about how well this class suits your needs, and to discuss other options. In addition, we want to maintain a productive educational environment, and thus we don't want overqualified students making other students feel inadequate, when in fact they are only inexperienced.

No prior programming experience is required (Python and MATLAB are easy and fun to use). However, basic calculus and linear algebra knowledge is highly recommended. As far as math goes, we will use some simple algebra and trigonometry, vector and matrix operations, systems of equations, and basic calculus. Domain-specific topics from various sciences (engineering, economics, and other fields) may be discussed in lecture and covered in assignments and exams. However, you don't need to be already familiar with this material. For the most part, we will teach you what you need to know and provide equations to use in your programming assignments.

4 Diversity

Our intent is that this course provide a welcoming environment for all students. Our TAs have undergone training in diversity and inclusion; all members of the CS community, including faculty and staff, are expected to treat one another in a professional manner. If you feel you have not been treated in a professional manner by any of the course staff, please contact either Professor Gaudette (the instructor), Professor Cetintemel (the department chair), or Laura Dobler (the department's coordinator for diversity and inclusion initiatives). You could also fill out our course's **anonymous feedback form**. We take all complaints about unprofessional behavior seriously.

5 Course Website

The CS 0040 course website can be found at http://cs.brown.edu/courses/cs004. This website contains most of the information you will need for this course, including lecture slides, homeworks, projects, and the contact information for the HTAs and UTAs, as well as some documentation pertinent to the course.

We will also be using Piazza, a discussion forum where you will be able to ask questions about the course assignments. The sign-up link is located here: https://piazza.com/brown/spring2019/cs4. Please use your Brown email account to register.

6 Teaching Staff

Professor	CS Account	Brown Email
Jason Gaudette	jegaudet	jason_gaudette@brown.edu

HTAs		
Griffin Kao	gk16	griffin_kao@brown.edu
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Emails sent to

cs0040tas@lists.brown.edu will go to all TAs and Head TAs. You should almost never need to use this list.
cs0040headtas@lists.brown.edu will go only to the Head TAs. Please use this list for any logistical questions!

To reach the instructor, email him directly.

7 Textbook and Additional Resources

The textbook and course lectures parallel each at some points, while at others one may provide more detail than the other. The primary Python textbook for the course is CS for All by Alvarado, Dodds, Kuenning, Libeskind-Hadas. You can find a copy online (for free!) at http://www.cs.hmc.edu/csforall/. The built-in MATLAB doc command provides a superb introduction to MATLAB language fundamentals, and provides a more thorough and concise perspective than any textbook we have encountered. During the semester we will update

Piazza with links to additional specialized readings as appropriate.

8 Technical Requirements

Since one of the goals of this course is to become familiar with programming, you will need to install and use programming environments for Python and MAT-LAB. Please see the Python and MATLAB quick links on the course website for information and instructions on downloading the required software. NOTE: For the first part of the course you will only need Python.

Assignments will be uploaded to the CS4 website along with instructions for how to download the assignments from the department machines. If you do not have a CS login, you will not be able to properly download these files.

Any additional material (code from class, section notes, etc.) will be uploaded in the lecture slides tab of the course website. These should be downloadable without access to a CS account.

If you do not have access to a laptop, please see the section entitled Loaner Laptops.

9 Schedule and Workload

The current schedule for CS4 is given under the schedule link at the course website. You will note that there is a homework due almost every week, and there are 3 projects that will each be out for 3 weeks at a time. You should expect to spend 10-15 hours a week on this course.

The homeworks are primarily to ensure that you are becoming familiar with Python/MATLAB and are following the textbook content. The projects are more varied and open-ended. Later in the semester, they will also be more in-depth.

10 Lecture

We introduce you to new material in lectures. They are designed to give you an opportunity to digest the material being presented, and to allow the professor to adapt to your needs. You are encouraged to take advantage of this design.

Asking questions during lecture is an important part of the learning process. If you are confused, then chances are that someone else also is, so please don't be shy: ask for clarification when you don't understand something that is being discussed.

Taking questions offline that are too advanced, off-topic, or tangential, given the context of the class, will help keep the class flowing smoothly.

Before each lecture, it is highly recommended that you review the sections of the textbook and any other readings indicated on the lecture schedule as well as the previous lectures slides. We ask this of you because the course material builds on itself rather intensely, and we feel that mastering the material from each lecture as it happens will be easier in the long run than falling behind and having to catch up.

You are responsible for the material covered in class even if you do not attend or if the material is not mentioned in the online materials or textbook.

You are expected to attend all lectures.

11   Assignments and Grading Schemes

Your final grade is determined by your grades on individual assignments, as follows:

Homework..................40%
Project 1....................10%
Project 2....................15%
Project 3....................15%
Quiz 1........................7.5%
Quiz 2........................7.5%
Attendance...................5%

11.1   Homework (EDITED)

Homework assignments are designed to help you internalize the course material. They consist of written problems and programming tasks. Homeworks will generally be due by 4:00 PM on Wednesday the week after they are released. You will hand in your homework electronically using the instructions given on each homework. In order to allow for hand-in system problems, an automatic grace period will be applied. After that, submissions will be marked late.

Please note that assignments are graded anonymously, and we take anonymity very seriously. Identifying information on your assignments can and will lead to a 5% deduction. This deduction applies to all assignments, including homeworks, quizzes, and projects. Furthermore, due to this anonymity, you will not be able to email in additional files for your homeworks. We can grade you only on what you submit through our handin scripts.

For each homework, the TAs will hold sections to introduce the main goals

of the homework as well as the concepts necessary to complete it. TA hours exist as a resource to help you complete this homeworks.

Our late homework policy is that you have 6 combined homework and project late days to use at any time. However, you can use a max of 3 on any given assignment. An example of proper adherence to this policy is turning in 8 homeworks on time and using 3 late days on the 9th homework and 3 late days on the 10th homework. Or using 3 on the first homework and 3 on the last project. After your late days are used up, late homeworks may be handed in with a 20% deduction for each day after the deadline up to 3 days. After 3 days, the homework will receive no credit.

If you have an extenuating circumstance that requires extension, please read the "Additional Extensions" policy below and then contact the HTAs describing your situation.

11.2 Projects (EDITED)

Programming projects give you practice putting together larger, more complicated programs than you undertake in class and in homeworks. Completing these projects will require you to manage your time responsibly. You are expected to start on each project when it is assigned and to work steadily. Working on a project is a learning experience. Start early!

Before each project is due, the TAs may, in section, discuss the main goals of the project, as well as the relevant concepts necessary to complete it. TA hours exist as a resource to help you complete these projects.

Homework and project late days are joint, so there are, again, 6 total late days that can be used for homeworks or projects. If you are out of late days, late projects may be handed in with a 20% deduction for each day after the deadline, up to 3 days late. After 3 days, the project will receive no credit. A short grace period will also apply to the stated submission deadline for projects.

11.3 Quizzes (NEW)

The course will have 2 quizzes, each assessing your knowledge of basic syntax and structures in Python and MATLAB respectively. These quizzes will be held on March 7, 2019 and April 18, 2019 from 7-8 pm. Please note that you will only be permitted to take the quizzes at an alternate time if you have a note from the Dean of the College or Health Services. Without these permissions, you will be expected to take the quiz at the scheduled time or forfeit credit. Unless you have extenuating circumstances that could not be foreseen, you are expected to make requests for an alternate time at least **one week** in advance to the quiz date. For extensions, please email the HTA list. For accomodations, please email the professor.

11.4   Attendance (NEW)

Attendance will be recorded during both lecture and section. Please contact the HTAs or the professor for conflicts with lecture. For one time section conflicts, please email the TAs of the section you normally attend and the section you plan to attend **at least 24 hours in advance** to receive full credit for section. If you do not email your TA's or you arrive more than 10 minutes late to section, you will receive half credit for that section. If you have a one time section conflict and cannot attend any other sections, please email the HTA list.

11.5   Additional Extensions (EDITED)

Beyond the three late day policy for homework and project handins, no other late work will be accepted unless an extension has been pre-approved. Extensions, except in dire circumstances, generally must be approved **at least 48 hours in advance** of the assignment due date. Only the HTAs or the course instructor Professor Gaudette can grant late days. Please contact either party as soon as you need an extension. Legitimate reasons for extensions include physical or mental health issues (a note from Health Services or the Dean of the College will be required; you may submit a photo of the note instead of an original copy). Family tragedies are also a legitimate reason to receive an extension (here again, documentation will be required). Please note that if you are granted an extension, you cannot stack late days on the extension. For example, if you receive a 3 day extension, you cannot also use 3 late days and submit 6 days later.

12   The Collaboration Policy

In order to make sure that every student is evaluated fairly and according to the amount they learn, we have instituted a Collaboration Policy for CS4, which is available as a separate document on the course website. Please note that **this collaboration policy is different than it has been in previous years**. In particular, it is stricter than in semesters prior to 2019. Located here

Click me for the collaboration policy document!

The course collaboration policy must be fully understood before you begin work on any of the assignments. **You are required to submit an online form acknowledging that you will abide by its contents. You will not receive credit for any of your work until this contract has been completed.** The link to this form is included at the end of the Collaboration Policy document.

13 Grade Disputes

You have one calendar week after you receive a graded assignment to request a grade review. You should first contact the TA(s) who originally graded the problem(s) in question. If you and the grader cannot resolve the issue, you may request a HTA review of the issue(s). If you still cannot resolve the issue(s), you may ask the HTA to forward the dispute to the course instructor for a final review.

14 Where To Get Help If You Need It

14.1 Sections

Each student will sign up for a weekly TA section, which will be led by a team of TAs. Attendance to this section is mandatory and counts towards part of the 5% attendance grade in this course. These sections are meant to provide you with the support you need to successfully complete course assignments.

TAs will gladly clarify homework questions, review concepts covered in lectures, explain Python/MATLAB functions and syntax, introduce new material, and help you with general questions about the class. In general, these sections will be relatively structured.

In addition, please refer to and make use of the MATLAB Style Guide and Python Style Guide (posted on the course website), which contains a list of common errors and pitfalls. These document can serve as a checklist before you consult the TAs or submit an assignment. After the first few weeks of class, you may not expect the TAs to pinpoint issues that are already covered on this document.

TAs may give answers to general questions asked during these sections to the entire section, so that everyone will take away the same content or help. In addition, you are encouraged to discuss your issues with other students during these sections, as long as you are abiding by the Collaboration Policy.

Please note that these policies may be adjusted based on feedback as the semester progresses. TAs are here to help you, but remember that TAs are students, too. TAs have their own coursework to do. Please don't ask them questions outside of official TA labs or help sessions.

14.2 Piazza (EDITED)

In CS4, we use an online academic forum called Piazza, where students can convene virtually to further explore the course materials and have their questions addressed. You can access a link to the Piazza course via Canvas, the course website.

On Piazza, you may ask clarification questions about course materials, including assignments, however the standard policy guidelines still apply. That means, collaboration policy consequences are in effect. If in doubt, to ensure that no extra hints or solutions are published, you must first post your questions so that only the instructors may see them (select "Individual Student(s)/Instructor(s)" for "Post to", then type "Instructors" in the text box). If your question pertains to basic course material and content and does not violate the collaboration policy, you may post publicly.

If the Instructor or the TA who answers a private question finds that it is appropriate and could be helpful for the entire course, we will make the post and the answer public.

Important announcements regarding the assignments and course logistics will also be posted on Piazza. *You are responsible for all the information posted on Piazza regardless of whether you choose to check the platform.*

14.3   Email (EDITED)

Administrative and logistical questions should be emailed to the HTA list only at cs0040headtas@lists.brown.edu.

Do not email individual course staff with questions pertaining to course material, homework assignments, or projects (unless it is a grade complaint towards your particular grader). If you are confused about course material or assignments, please use Piazza, talk to a TA during your designated section, or come to regularly scheduled TA hours!

15   Accommodations

If you feel you have physical, psychological, or learning disabilities that could affect your performance in the course, we urge you to contact **SEAS**. Additionally, we ask that you email the professor. We will do whatever we can to support accommodations recommended by SEAS.

16   Loaner Laptops

Since this course is programming-intensive, you will definitely need a laptop (unless you feel comfortable doing homework using the Brown/CIT desktop machines). In the case that you do not have a working laptop for whatever reason, the CIS IT Service Center has a loaner laptop policy. Please follow **this link** to learn more. For any loan terms longer than three weeks, it is possible to request a dean's help to appeal for extensions of laptop loans, although this is not guaranteed. If you for any reason feel you cannot complete your assignments

due to lack of resources, please reach out to the HTA's so that we can find a solution that's comfortable for you.

17   Mental Health

Being a student can be very stressful. If you feel you are under too much pressure or there are psychological issues that are keeping you from performing well in this course or at Brown as a whole, we encourage you to contact **Brown's Counseling and Psychological Services (CAPS)**. They provide confidential counseling. You can also feel free to reach out to the HTAs if you feel the course is impacting your mental health.

18   Coping with Unforeseen Events

If there are events that are upsetting to you, whether political, family-related, weather-related, etc., that affect your ability to do well in class, we are happy to take them into account with respect to our late and incomplete policies. Please feel free to talk to Professor Gaudette or the HTAs about this. We are here to support you.

19   Feedback

If you find any mistakes, inconsistencies, or confusing language in this or any other CS4 document, or if you have input regarding the course administration/staff, please let us know by filling out **the anonymous feedback form**. This form will be live for the entirety of the semester, and we intend to check it often and make changes to the course as necessary.

20   Acknowledgements and Content Use

The projects and homeworks used in CS4 represent the collective efforts of many outstanding CS4 TAs, without whom teaching a course like CS4 would not be possible.

The Python section of this course borrows heavily (with permission) from similar courses developed at Harvey Mudd College, Bucknell University and Boston University.

Some of the materials (slides, homework problems, and project ideas) used in CS4 related to MATLAB were generously contributed by the author's of the course textbook Alexandre Bayen and Timmy Sauw, and also by Charles F. Van Loan and K.-Y. Daisy Fan, author's of *Insight Through Computing*. Many were also borrowed from Professor Dan Potter, who taught this course in 2018.