Syllabus

Contents

Syllabus

Welcome to CSC302: Introduction to Computer Systems.

In this syllabus you will find an overview of the course, information about your instructor, course policies, restatements of URI policies, reminders of relevant resources, and a schedule for the course.

This is a live document that will change over time, but a pdf copy is available for direct download or to view on GitHub. Note that this will become outdated over time.

Basic Facts

About this course

About this syllabus

This syllabus is a *living* document. You can get notification of changes from GitHub by “watching” the You can view the date of changes and exactly what changes were made on the Github commit history page.

Creating an issue is also a good way to ask questions about anything in the course it will prompt additions and expand the FAQ section.

About your instructor

Name: Dr. Sarah M Brown Office hours: TBA via zoom, link on BrightSpace

Dr. Sarah M Brown is a third year Assistant Professor of Computer Science, who does research on how social context changes machine learning. Dr. Brown earned a PhD in Electrical Engineering from Northeastern University, completed a postdoctoral fellowship at University of California Berkeley, and worked as a postdoctoral research associate at Brown University before joining URI. At Brown University, Dr. Brown taught the Data and Society course for the Master’s in Data Science Program. You can learn more about me at my website or my research on my lab site.

You can call me Professor Brown or Dr. Brown, I use she/her pronouns.

The best way to contact me is e-mail or an issue on an assignment repo. For more details, see the Communication Section

Tools and Resources

We will use a variety of tools to conduct class and to facilitate your programming. You will need a computer with Linux, MacOS, or Windows. It is unlikely that a tablet will be able to do all of the things required in this course. A Chromebook may work, especially with developer tools turned on. Ask Dr. Brown if you need help getting access to an adequate computer.

All of the tools and resources below are either:

- paid for by URI **OR**
- freely available online.

BrightSpace

This will be the central location from which you can access all other materials. Any links that are for private discussion among those enrolled in the course will be available only from our course Brightspace site .

This is also where your grades will appear and how I will post announcements.

For announcements, you can customize how you receive them.

> **Note**
>
> Seeing the BrightSpace site requires logging in with your URI SSO and being enrolled in the course

Prismia chat

Our class link for Prismia chat is available on Brightspace. Once you've joined once, you can use the link above or type the url: prismia.chat. We will use this for chatting and in-class understanding checks.

On Prismia, all students see the instructor's messages, but only the Instructor and TA see student responses.

Course Manual

The course manual will have content including the class policies, scheduling, class notes, assignment information, and additional resources.

Links to the course reference text and code documentation will also be included here in the assignments and class notes.

GitHub

You will need a GitHub Account. If you do not already have one, please create one by the first day of class. If you have one, but have not used it recently, you may need to update your password and login credentials as the Authentication rules changed in Summer 2021. In order to use the command line with https, you will need to create a Personal Access Token for each device you use. In order to use the command line with SSH, set up your public key.

Programming Environment

In this course, we will use several programming environments. In order to complete assignments you need the items listed in the requirements list. The easiest way to meet these requirements is to follow the recommendations below. I will provide instruction assuming that you have followed the recommendations. We will add tools throughout the semester, but the following will be enough to get started.

> **Warning**
>
> This is not technically a *programming* class, so you will not need to know how to write code from scratch in specific languages, but we will rely on programming environments to apply concepts.

Requirements:

- Python with scientific computing packages (numpy, scipy, jupyter, pandas, seaborn, sklearn)
- Git
- A bash shell
- A web browser compatible with Jupyter Notebooks
- nano text editor

> **Warning**
>
> Everything in this class will be tested with the up to date (or otherwise specified) version of Jupyter Notebooks. Google Colab is similar, but not the same, and some things may not work there. It is an okay backup, but should not be your primary work environment.

> **Note**
>
> all Git instructions will be given as instructions for the command line interface and GitHub specific instructions via the web interface. You may choose to use GitHub desktop or built in IDE tools, but the instructional team may not be able to help.

Recommendation:

- Install python via Anaconda
- if you use Windows, install Git and Bash with GitBash (video instructions).
- if you use MacOS, install Git with the Xcode Command Line Tools. On Mavericks (10.9) or above you can do this by trying to run git from the Terminal the very first time.`git --version`
- if you use Chrome OS, follow these instructions:

1. Find Linux (Beta) in your settings and turn that on.
2. Once the download finishes a Linux terminal will open, then enter the commands: `sudo apt-get update` and `sudo apt-get upgrade`. These commands will ensure you are up to date.
3. Install tmux with:

```
sudo apt -t stretch-backports install tmux
```

4. Next you will install nodejs, to do this, use the following commands:

```
curl -sL https://deb.nodesource.com/setup_14.x | sudo -E bash
sudo apt-get install -y nodejs
sudo apt-get install -y build-essential.
```

5. Next install Anaconda's Python from the website provided by the instructor and use the top download link under the Linux options.
6. You will then see a .sh file in your downloads, move this into your Linux files.
7. Make sure you are in your home directory (something like home/YOURUSERNAME), do this by using the `pwd` command.
8. Use the `bash` command followed by the file name of the installer you just downloaded to start the installation.
9. Next you will add Anaconda to your Linux PATH, do this by using the `vim .bashrc` command to enter the .bashrc file, then add the `export PATH=/home/YOURUSERNAME/anaconda3/bin/:$PATH` line. This can be placed at the end of the file.
10. Once that is inserted you may close and save the file, to do this hold escape and type `:x`, then press enter. After doing that you will be returned to the terminal where you will then type the source .bashrc command.
11. Next, use the `jupyter notebook –generate-config` command to generate a Jupyter Notebook.
12. Then just type `jupyter lab` and a Jupyter Notebook should open up.

Video install instructions for Anaconda:

- Windows

- Mac

On Mac, to install python via environment, this article may be helpful

- I don't have a video for linux, but it's a little more straight forward.

Zoom (backup only & office hours only, Fall 2022 is in person)

This is where we will meet if for any reason we cannot be in person. You will find the link to class zoom sessions on Brightspace.

URI provides all faculty, staff, and students with a paid Zoom account. It *can* run in your browser or on a mobile device, but you will be able to participate in class best if you download the Zoom client on your computer. Please log in and configure your account. Please add a photo of yourself to your account so that we can still see your likeness in some form when your camera is off. You may also wish to use a virtual background and you are welcome to do so.

For help, you can access the instructions provided by IT.

Grading

This section of the syllabus describes the principles and mechanics of the grading for the course.

Learning Outcomes

The goal is for you to learn and the grading is designed to as close as possible actually align to how much you have learned. So, the first thing to keep in mind, always is the course learning outcomes:

By the end of the semester, students will be able to:

1. Differentiate the different classes of tools used in computer science in terms of their features, roles, and how they interact and justify positions and preferences among popular tools
2. Identify the computational pipeline from hardware to high level programming language
3. Discuss implications of choices across levels of abstraction
4. Describe the context under which essential components of computing systems were developed and explain the impact of that context on the systems.

These are what I will be looking for evidence of to say that you met those or not.

Principles of Grading

Learning happens through practice and feedback. My goal as a teacher is for you to learn. The grading in this course is based on your learning of the material, whether it takes one try or multiple tries.

This course is designed to encourage you to work steadily at learning the material and demonstrating your new knowledge. There are no single points of failure, where you lose points that cannot be recovered. Also, you cannot cram anything one time and then forget it. The material will build and you have to demonstrate that you retained things.

- Earning a C in this class means you have a general understanding; you will know what all the terms mean and could follow along if in a meeting where others were discussing systems concepts.
- Earning a B means that you can apply the course concepts in other programming environments; you can solve basic common errors without looking much up.
- Earning an A means that you can use knowledge from this course to debug tricky scenarios and/or design aspects of systems; you can solve uncommon error while only looking up specific syntax, but you have an idea of where to start.

The course is designed for you to *succeed* at a level of your choice. No matter what level of work you choose to engage in, you will be expected to revise work until it is correct. As you accumulate knowledge, the grading in this course is designed to be cumulative instead of based on deducting points.

No Grade Zone

At the beginning of the course we will have a grade free zone where you practice with both course concepts and the tooling and assignment types to get used to expectations. You will get feedback on lots of work and begin your Know, Want to know, Learned (KWL) Chart in this period.

Grading Contract

In about the third week you will complete, from a provided template, a grading contract. In that you will state what grade you want to earn in the class and what work you are going to do to show that. If you complete all of that work to a satisfactory level, you will get that grade. The grade free zone is a chance for you to get used to the type of feedback in the course and the grading contract template will have example contracts for you to use.

Most work will be small, frequent activities, but for an A you will also do larger, more in depth activities.

All contracts will include maintaining a KWL Chart for the duration of the semester, coming to class prepared, participating in class activities, and collaborating with peers to maintain reference materials.

Grading Contract Reference

Sample Contracts

Creative Sample A Grading Contract

To earn this grade I will:

- attend class prepared or makeup in class and preparation activities asynchronously
- review class notes regularly
- keep my KWL chart up to date
- complete all review and prepare activities in my KWL repo as directed
- complete priority more practice tasks for at least 10 class sessions after the grade free zone
- complete two projects:
    - one on tools of the trade
    - one on software infrastructure or hardware

For each project I will:

- (if needed) consult during office hours to develop the idea
- submit a proposal to this repository for approval
- submit regular updates and work in progress for review and revision
- complete the project as agreed
- submit a summary report with links as appropriate to this repository

Guided Sample A Grading Contract

To earn this grade I will:

- attend class prepared or makeup in class and preparation activities asynchronously
- review class notes regularly
- keep my KWL chart up to date
- complete all review and prepare activities in my KWL repo as directed
- complete all of the more practice tasks for at least 16 of the class sessions after the grade free zone

- complete a deeper exploration on one `more practice` task or related question of my own for at least 10 classes after the grade free zone (approximately once per week).

Creative Sample B Grading Contract

To earn this grade I will:

- attend class prepared or makeup in class and preparation activities asynchronously
- review class notes regularly
- keep my KWL chart up to date
- complete all review and prepare activities in my KWL repo as directed
- complete a deeper exploration on one `more practice` task or related question of my own for at least 16 classes after the grade free zone (approximately once per week).

Guided Sample B Grading Contract

To earn this grade I will:

- attend class prepared or makeup in class and preparation activities asynchronously
- review class notes regularly
- keep my KWL chart up to date
- complete all review and prepare activities in my KWL repo as directed
- complete all of the more practice tasks for at least 16 of the class sessions after the grade free zone.

For each deeper exploration I will write up a report with references and/or a tutorial style post with code excerpts or detailed steps and images as appropriate.

Sample C Grading Contract

To earn this grade I will:

- attend class prepared or makeup in class and preparation activities asynchronously
- review class notes regularly
- keep my KWL chart up to date
- complete all review and prepare activities in my KWL repo as directed

Schedule

Overview

The following is a rough outline of topics in an order, these things will be filled into the concrete schedule above as we go. These are, in most cases bigger questions than we can tackle in one class, but will give the general idea of how the class will go.

How does this class work?

one week

We'll spend the first two classes introducing some basics of GitHub and setting expectations for how the course will work. This will include how you are expected to learn in this class which requires a bit about how knowledge production in computer science works and a bit of the history.

How do all of these topics relate?

approximatley two weeks

We'll spend a few classes doing an overview where we go through each topic in a little more depth than an introduction, but not as deep as the rest of the semester. In this section, we will focus on how the different things we will see later all relate to one another more than a deep understanding of each one. At the end of this unit, we'll work on your grading contracts.

We'll also learn more key points in history of computing to help tie concepts together in a narrative.

Topics:

- bash
- man pages (built in help)
- terminal text editor
- git
- survey of hardware
- compilation
- information vs data

What tools do Computer Scientists use?

approximately four weeks

Next we'll focus in on tools we use as computer scientists to do our work. We will use this as a way to motivate how different aspects of a computer work in greater detail.

Topics:

- linux
- git
- i/o
- ssh and ssh keys
- number systems
- file systems

What Happens When I run code?

approximately five weeks

Finally, we'll go in really deep on the compilation and running of code. In this part, we will work from the compilation through to assembly down to hardware and then into machine representation of data.

Topics:

- software system and Abstraction
- programming languages
- cache and memory
- compiliation
- linking
- basic hardware components

Tenative Schedule

Content from above will be expanded and slotted into specific classes as we go. This will always be a place you can get reminders of what you need to do next and/or what you missed if you miss a class as an overview. More Details will be in other parts of the site, linked to here.

> **Tip**
>
> We will integrate history throughout the whole course. Connecting ideas to one another, and especially in a sort of narrative form can help improve retention of ideas. My goal is for you to learn.
>
> We'll also come back to different topics multiple times with a slightly different framing each time. This will both connect ideas, give you chance to practice recalling (more recall practice improves long term retention of things you learn), and give you a chance to learn things in different ways.

Date	Key Question	Prepation	Activities
2022-09-07	What are we doing this semester?	Create GitHub and Prismia accounts, take stock of dev environments	introductions, tool practice
2022-09-12	How does knowledge work in computing?	Read through the class site, notes, reflect on a thing you know well	course FAQ, knowledge discussion
2022-09-14	How do I use git offline?	review notes, reflect on issues, check environment, map cs knowledge	cloning, pushing, terminal basics
2022-09-19	Why do I need to use a terminal?	review notes, practice git offline 2 ways, update kwl	bash, organizing a project
2022-09-21	What are the software parts of a computer system?	practice bash, contribute to the course site, examine a software project	hardware simulator
2022-09-26	What are the hardware parts of a computer system?	practice, install h/w sim, review memory	hardware simulation
2022-09-28	How does git really work?	practice, begin contract, understand git	grading contract Q&A, git diff, hash
2022-20-03	What happens under the hood of git?		git plumbing and more bash (pipes and find)
2022-10-05	Why are git commit numbers so long?	review, map git	more git, number systems
2022-10-12	How can git help me when I need it?	reveiw numbers and hypothesize what git could help with	git merges
2022-10-17	How do programmers build documentation?	review git recovery, practice with rebase, merge, revert, etc; confirm jupyterbook is installed	templating, jupyterbook
2022-10-19	How do programmers auotmate mundane tasks?	convert your kwlrepo	shell scripting, pipes, more redirects, grep
2022-10-24	How do I work remotely ?	install reqs, reflect on grade, practice scrip	ssh/ ssh keys, sed/ awk, file permissions
2022-10-26	How do programmers keep track of all these tools?	summarize IDE reflections	IDE anatomy
2022-10-31	How do Developers keep track of all these tools?	[compare languages you know]	
2022-11-02	How do we choose among different programming languages?	[install c compiler]	
2022-11-07	What happens when I compile code?		
2022-11-09	Why is the object file unreadable?	[what are operators]	bits, bytes, and integers/character representtion
2022-11-14	What about non integer numbers?		floating point representation
2022-11-16	Where do those bitwise operations come from?	[review simulator]	gates, registers, more integer

Date	Key Question	Prepation	Activities
2022-11-21	What actually is a gate?		physics, history
2022-11-23	How do components work together?		memmory, IO, bus, clocks,
2022-11-28	(sub)		
2022-11-30	(sub)		
2022-12-05			
2022-12-07			

Table 1 Schedule

Grading Policies

Deadlines

You will get feedback on items at the next feedback period after it is submitted. During each feedback hours (twice per week) you can get feedback on new submissions from up to 2 class sessions and revision feedback on an unlimited number of submissions.

> **Important**
>
> Work does not have specific deadlines, to give you more flexibility, but to ensure timely feedback and to be fair to me at the end of the semester, there is a limit of how much material you can get feedback at a time. The 2 class session limit means that you should aim to complete things within about 1 week most of the time, but no more than 2 weeks to ensure that all of your work can be reviewed.

Makeup Work

If you have extenuating circumstances and need to submit a large amount of work at once, first submit a PR to your grading contract outlining your plan to get caught back up for approval. Requests will typically be approved, but having a plan is required.

Regrading

Re-request a review on your Feedback Pull request.

For general questions, post on the conversation tab of your Feedback PR with your request.

For specific questions, reply to a specific comment.

If you think we missed *where* you did something, add a comment on that line (on the code tab of the PR, click the plus (+) next to the line) and then post on the conversation tab with an overview of what you're requesting and tag @brownsarahm

Support

Academic Enhancement Center

Academic Enhancement Center (for undergraduate courses): Located in Roosevelt Hall, the AEC offers free face-to-face and web-based services to undergraduate students seeking academic support. Peer tutoring is available for STEM-related courses by appointment online and in-person. The Writing Center offers peer tutoring focused on supporting undergraduate writers at any stage of a writing assignment. The UCS160 course and academic skills consultations offer students strategies and

activities aimed at improving their studying and test-taking skills. Complete details about each of these programs, up-to-date schedules, contact information and self-service study resources are all available on the AEC website.

- **STEM Tutoring** helps students navigate 100 and 200 level math, chemistry, physics, biology, and other select STEM courses. The STEM Tutoring program offers free online and limited in-person peer-tutoring this fall. Undergraduates in introductory STEM courses have a variety of small group times to choose from and can select occasional or weekly appointments. Appointments and locations will be visible in the TutorTrac system on September 14th, 2020. The TutorTrac application is available through URI Microsoft 365 single sign-on and by visiting aec.uri.edu. More detailed information and instructions can be found on the AEC tutoring page.
- **Academic Skills Development** resources helps students plan work, manage time, and study more effectively. In Fall 2020, all Academic Skills and Strategies programming are offered both online and in-person. UCS160: Success in Higher Education is a one-credit course on developing a more effective approach to studying. Academic Consultations are 30-minute, 1 to 1 appointments that students can schedule on Starfish with Dr. David Hayes to address individual academic issues. Study Your Way to Success is a self-guided web portal connecting students to tips and strategies on studying and time management related topics. For more information on these programs, visit the Academic Skills Page or contact Dr. Hayes directly at davidhayes@uri.edu.
- The **Undergraduate Writing Center** provides free writing support to students in any class, at any stage of the writing process: from understanding an assignment and brainstorming ideas, to developing, organizing, and revising a draft. Fall 2020 services are offered through two online options: 1) real-time synchronous appointments with a peer consultant (25- and 50-minute slots, available Sunday - Friday), and 2) written asynchronous consultations with a 24-hour turn-around response time (available Monday - Friday). Synchronous appointments are video-based, with audio, chat, document-sharing, and live captioning capabilities, to meet a range of accessibility needs. View the synchronous and asynchronous schedules and book online, visit uri.mywconline.com.

General URI Policies

Anti-Bias Statement:

We respect the rights and dignity of each individual and group. We reject prejudice and intolerance, and we work to understand differences. We believe that equity and inclusion are critical components for campus community members to thrive. If you are a target or a witness of a bias incident, you are encouraged to submit a report to the URI Bias Response Team at www.uri.edu/brt. There you will also find people and resources to help.

Disability Services for Students Statement:

Your access in this course is important. Please send me your Disability Services for Students (DSS) accommodation letter early in the semester so that we have adequate time to discuss and arrange your approved academic accommodations. If you have not yet established services through DSS, please contact them to engage in a confidential conversation about the process for requesting reasonable accommodations in the classroom. DSS can be reached by calling: 401-874-2098, visiting: web.uri.edu/disability, or emailing: dss@etal.uri.edu. We are available to meet with students enrolled in Kingston as well as Providence courses.

Academic Honesty

Students are expected to be honest in all academic work. A student's name on any written work, quiz or exam shall be regarded as assurance that the work is the result of the student's own independent thought and study. Work should be stated in the student's own words, properly attributed to its source. Students have an obligation to know how to quote, paraphrase, summarize, cite and reference the work of others with integrity. The following are examples of academic dishonesty.

- Using material, directly or paraphrasing, from published sources (print or electronic) without appropriate citation
- Claiming disproportionate credit for work not done independently
- Unauthorized possession or access to exams
- Unauthorized communication during exams
- Unauthorized use of another's work or preparing work for another student
- Taking an exam for another student
- Altering or attempting to alter grades
- The use of notes or electronic devices to gain an unauthorized advantage during exams
- Fabricating or falsifying facts, data or references
- Facilitating or aiding another's academic dishonesty
- Submitting the same paper for more than one course without prior approval from the instructors

URI COVID-19 Statement

The University is committed to delivering its educational mission while protecting the health and safety of our community. While the university has worked to create a healthy learning environment for all, it is up to all of us to ensure our campus stays that way.

As members of the URI community, students are required to comply with standards of conduct and take precautions to keep themselves and others safe. Visit web.uri.edu/coronavirus/ for the latest information about the URI COVID-19 response.

- Universal indoor masking is required by all community members, on all campuses, regardless of vaccination status. If the universal mask mandate is discontinued during the semester, students who have an approved exemption and are not fully vaccinated will need to continue to wear a mask indoors and maintain physical distance.
- Students who are experiencing symptoms of illness should not come to class. Please stay in your home/room and notify URI Health Services via phone at 401-874-2246.
- If you are already on campus and start to feel ill, go home/back to your room and self-isolate. Notify URI Health Services via phone immediately at 401-874-2246.

If you are unable to attend class, please notify me at brownsarahm@uri.edu. We will work together to ensure that course instruction and work is completed for the semester.

Office Hours & Comms

Help Hours

TBA

```
/tmp/ipykernel_1966/2146052215.py:1: FutureWarning: this method is deprecated in
favour of `Styler.hide(axis="index")`
  help_df.style.hide_index()
```

Day	Time	Location	Host
Tuesday	2:30-4:15pm	online	Mark
Wednesday	7-8:30pm	online	Dr. Brown
Thursday	2:30-4:15pm	online	Mark
Friday	3:30-4:30pm	in person	Dr. Brown

Tips

For assignment help

- **send in advance, leave time for a response** I check e-mail/github a small number of times per day, during work hours, almost exclusively. You might see me post to this site, post to BrightSpace, or comment on your assignments outside of my normal working hours, but I will not

reliably see emails that arrive during those hours. This means that it is important to start assignments early.

Using issues

- use issues for content directly related to assignments. If you push your code to the repository and then open an issue, I can see your code and your question at the same time and download it to run it if I need to debug it
- use issues for questions about this syllabus or class notes. At the top right there's a GitHub logo that allows you to open a issue (for a question) or suggest an edit (eg if you think there's a typo or you find an additional helpful resource related to something)

For E-mail

- use e-mail for general inquiries or notifications
- Please include `[CSC392]` in the subject line of your email along with the topic of your message. This is important, because your messages are important, but I also get a lot of e-mail. Consider these a cheat code to my inbox: I have setup a filter that will flag your e-mail if you include that in subject to ensure that I see it.

By Professor Sarah M Brown