

# Computers & Language (Tentative Syllabus)

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<b>Course Info</b>	
Course#	LING 3300
Semester	Fall 2022
Time	M/W: 1:25 PM - 2:45 PM
Location	BEH S 102
Website	Canvas/Github/Discord
Prerequisites	None!

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<b>Instructor Info</b>	
Instructor	Aniello De Santo
Pronouns	He/His/Him
Email	aniello.desanto@utah.edu
Department	Linguistics
Office	LNCO 2315/Zoom
Office hours	MW 11:00am-12.30pm (See the "Office hours" section for more info)

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## 1 Catalog description

An introduction to how computers process language and solve language-related tasks. This course discusses the language technologies of our daily life — spam filtering, machine translation, and many more — and the algorithmic concepts at their core. The course explores a variety of issues: Why do computers do well in some areas (spell checking) yet fail miserably in others (essay grading)? How useful is linguistic knowledge in building state-of-the-art language technologies? Will we ever have perfectly fluent AIs as depicted in science fiction? And how will these technological advances impact the role of language in our society? Students will also acquire basic programming skills in Python, and write scripts for simple language tasks.

No previous training in linguistics, mathematics, or computer science required.

## 2 Topics

- How do computers process language?
- Why do they succeed in some areas (spell checking), yet fail miserably in others (translation, poetry)?
- Will we ever have conversant AIs as depicted in science fiction?
- Can computers provide new answers to long-standing questions of linguistics and philosophy?
- How are language communities affected by modern language technologies?

## 3 Goals and Objectives

- Basic of Programming and Computer Science
  - understand the importance of algorithms and data structures
  - conceptualize linguistic problems in computational terms
  - basic programming skills in Python
- Cognitive Science
  - familiarity with notions of artificial intelligence
  - understand how and why humans and computers differ in their linguistic abilities
- Digital Humanities and Social Science
  - work with text corpora
  - use computational tools for humanities (e.g., stylistic analysis, tracking social trends with language corpora)
  - awareness of the dangers of computational linguistics (surveillance, language death, discrimination, profiling)
  - ability to critically evaluate “AI” related papers in popular media
  - ability to discuss concepts related to AI, NLP, and Language technologies with non experts

## 4 Prerequisites

None!

### What do you need?

- ability to operate a computer (use a browser, edit text files, send files via email)
- willingness to play around with open ended problems
- you will need a computer with an internet connection. If that is a problem, let me know and I can put you in touch with some University offices that can help!

### What you WON'T need

- programming experience
- math (except for addition, multiplication, and fractions)
- linguistics (although an intro helps!)

## 5 Two Types of Instruction

**Monday** - Traditional frontal lecture on language technology

**Wednesday** - Programming session in Python (if you have a laptop, bring it!)

### 5.1 Required Materials and Resources

All you need for this course is a device with a recent browser (Windows, OS X, or Linux computer, Chromebook, Android tablet), and an internet connection. Ensure you have these ahead of time as they will be required to complete assignments and activities throughout the course. If you anticipate tech-related issues, please get in touch with me early in the semester, I can **help you figure something** out/find the right resources!

For the coding sections, we will be using *Jupyter Notebook*, an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Notebooks will contain both study materials and homework for each week. I recommend you work on your notebooks remotely via *CoLab*, an online environment that allows you to write and execute Python in your browser, with no configuration required and free access to GPUs. This will also allow you to do homework from different machines (e.g., computers in the library), should you not have the right set up at home. However, executing Jupyter locally on your own machine is also possible. We will go over the details in the first week of classes.

All class materials will be distributed on Canvas (you can familiarize yourself with Canvas **here**), but will also be available on the course Github page (a brief Github tutorial can be found **here**).

No book is required for this course, as plenty of introductory programming resources are available online for free. However, if you feel the need for a more structured reference you can check out **Automate The Boring Stuff with Python** (the pdf is available for free).

### 5.2 Discord Channel

To facilitate remote discussion/collaboration among peers with limited in person contact, this course has an associated Discord channel. Discord is a collaborative chatroom environment extensively used for Team synchronization in the tech industry. You can create a free account and join the course server with the invite provided on Canvas during the first week of classes.

## 6 Grading

It is my belief that grades should be mostly an instrument for you to get feedback about how much I think you are internalizing the materials. Please try not to take assignments as a war between you and me, but as a way for you to take the best out of the course. Because of this, each assignment is going to include a self-reflection component, that I am going to take into account while grading.

Student grades are determined by the following components:

1. **Weekly homework: Coding and Mini-Quizzes (70%)**

Students have to solve weekly programming assignments in Python and answer short questions about the contents of Monday's lecture. Coding assignments may take the form of

- several minor practice exercises, or
- a single, more open ended coding task (e.g. implementing a simple chatbot for English)
- quizzes are usually open ended questions: I want you to learn skills and reasoning techniques, not to memorize definitions

Assignments are unlocked each Wednesday and, unless stated otherwise, are due the following Tuesday at 11:59pm. Details on the requirements for each assignment will be shared with the students in advance. **Assignments must be submitted via Canvas.** When computing the final grade, the lowest homework grade will be dropped.

**Late Submissions:** Life is messy (especially these days)! While I encourage you to do assignments on time due to the incremental nature of the materials, I generally adopt a flexible deadline approach: if you think you are going to be late on an assignment, just let me know and we can figure things out. I do not need doctor's notes or complicated reasons (in fact, I do not need to know why at all)! Just let me know you need an extension. I trust you to not abuse this policy.

2. **Beginning of Class Self-reflection (10%)**

As a way to foster self-assessment:

- I will distribute a survey about your background and expectations for this class during the first week. You get credits just for submitting this (as long as you wrote something, of course!)
- I will distribute a survey about what you think of your own development and what is/isn't working for you in the course towards the middle of the semester. You get credits just for submitting this (as long as you wrote something, of course!)
- I will distribute a survey about what you think of your own development and performance in this course during the last week of classes. You get credits just for submitting this (as long as you wrote something, of course!)

Self-assessment is not a rhetorical exercise, please take it seriously! It is meant for you to engage actively/critically with your learning experience, and for me to get a different/well-rounded view of your experience as a student beyond your quantitative performance.

3. **Class participation (15%)**

Class participation is highly encouraged and can take various forms:

- asking questions in class
- participating during in-class discussions
- participating in office hours

- pointing out problems with the lecture notes (e.g. typos, confusing wording, broken code)
- frequent use of the course Discord channel (this includes both asking questions of your own and answering fellow students' questions)
- suggesting topics for lectures
- posting links to relevant online material (e.g. tutorials or news paper articles)
- participating in the Linguistics Department research events (e.g. colloquia)

#### 4. Scholarly Engagement (5%)

Learning goes beyond simply memorizing notions from class. By taking courses at the University, you are a full-fledged scholar, which means it is important to engage with scholarly communities more broadly. Because of this, I require you attend at least one event outside of our scheduled class lectures, related to the contents of the course. This can be, for instance, a colloquium organized by the linguistics department, a talk at the Tanner Center, a movie screening by the SLC Film Society, etc. For information about the time and location of Linguistics talks by department faculty and visiting faculty from other institutions visit the Department webpage — but I will also post updates on events that counts towards these credits on Canvas. You are also very welcome to suggest your own event (and share them with the class). Events not listed by me must be approved beforehand, but I am generally flexible!

To receive credit you have to write a 1 page (typed double-spaced) summary of what the talk was about, including your general opinions on the presentation. Comments do not have to pertain to the scientific content of the talk (although that is obviously welcome), but can be about presentation style/clarity/etc. This report is officially due on the last day of class, but may be turned in on Canvas as soon as it is complete.

#### 5. Make-up Final (Extra 30%)

- If towards the end of the semester you are worried about your grades, I will offer a make-up final with questions about the content of all preceding homework (both python and theory).
- This is due to the fact that the learning curve for some of the content is incremental and steep, so it is normal that it takes some time to adjust
- This exam will be 100% optional and can only increase your final grade

#### 6. Extra-credits

It is possible for you to earn TWO extra credit for this course (up to 5% of your final grade). This can be accomplished by

- participating in one (or more) experimental Linguistic stud(ies), **and/or**
- attending a Department of Linguistics colloquium talk (but not the same you could be using for your Scholarly Engagement credits).

To sign up for a linguistic study, please visit: <http://speechlab.utah.edu/participate.php>. **Note that you are strongly encouraged to sign up early, rather than wait to the end of the semester to participate.** If for any reason you are not comfortable par-

icipating in Linguistics studies for credit in this course, an alternative assignment will be made available. If you need accommodation of any kind, have a question about accommodation, and/or prefer to complete an alternative assignment for any reason, please create a Sona account and then email at [speechacquisitionlab@gmail.com](mailto:speechacquisitionlab@gmail.com). Arrangements for alternative assignments must be made before the current semester's add/drop deadline. If no study appointments are available, check back later, as new appointments are added periodically. If you have any questions or concerns regarding the Linguistics Study Pool or the Sona sign-up system, please contact the Linguistic Study Pool coordinators at [speechacquisitionlab@gmail.com](mailto:speechacquisitionlab@gmail.com).

If you attend a colloquium talk, the rules to receive credit are the same as outlined in the Scholarly Engagement section.

## 6.1 University of Utah Grading Scale

Letter	Scoring
A	100% - 94%
A-	93.9% - 90%
B+	89.9%–87%
B	86.9%–84%
B-	83.9% - 80%
C+	79.9%–77%
C	76.9%–74%
C-	73.9% - 70%
D+	69.9%–67%
D	66.9%–64%
D-	63.9% - 60%
E	59.9%–0%

## 7 (Tentative) Schedule by week (Subject to change)

The weekly schedule consists of two lectures. As a coding introduction, this course relies heavily on active-learning strategies. Students are strongly encouraged to bring their own laptops to class, and will be prompted to take part to the lecture development. There is no final exam for this class.

Week	Monday	Wednesday	Coding HW # Due
1	Syllabus	Overview 1	
2	Overview 2	Notebook 1: Variables and Data Types	HW 0 Due
3	Labor day	Notebook 2: Control Flow	HW 1 Due
4	Dialogue Systems	Notebook 2: Control Flow	No HW Due

Week	Monday	Wednesday	Coding HW # Due
5	Dialogue Systems	Notebook 3: Lists and loops	HW 2 Due
6	Word based models	Notebook 3: Lists and loops	No HW Due
7	Word based models	Notebook 4: String Methods	HW 3 Due
8	Fall Break	Fall Break	No HW Due
9	N-gram models	Notebook 5: Dictionaries	HW 4 Due
10	N-gram models	Notebook 5: Dictionaries	No HW Due
11	Learning in Humans and Machines	Notebook 6: While loops	HW 5 Due
12	Towards Modern Approaches	Notebook 6/7: While loops and File IO	No HW Due
13	Neural Networks & Deep learning	Notebook 8: Function definition	HW 6 Due
14	Ethics in NLP	Notebook 8: Function definition	No HW Due
15	Buffer/Bonus Topics	Notebook 9: REG Expressions	HW 7 Due
16	Notebook 10: Advanced N-gram	Notebook 10: Sum up with Advanced N-gram	HW 8 Due
16	Finals week	Class Survey Due	No HW Due

Additional topics include good coding practices, design with flowcharts, debugging, and data visualization. **This class has no Final.** HW assignments are unlocked each Wednesday morning and, unless stated otherwise, are due the following **Tuesday at 11:59pm.**

## 7.1 Covid Policies

Unfortunately, COVID is still with us. I hope we can all collaborate to create an environment that is safe for everyone in our class and broader University community. I welcome suggestions that can help maximize what you get out of this course while minimizing risks to your (and your families!) mental and physical health. For my part, I make these commitments to you,

and encourage you to do the same:

### 7.1.1 Masks

- I will be masked in class and during in-person meetings. I strongly recommend that you wear a mask containing a melt-blown elastomeric membrane (N95, KN95, KF94, etc).
- I will test weekly and follow the U's guidance in case of an exposure or a positive test.

### 7.1.2 Staying home and Testing

- I will not come to class sick (this should be true independently of COVID! Please take care of yourselves!). I will work with you to arrange ways to attend the class virtually and catch up on missed materials.
- Look over this list of common COVID symptoms if you are unsure, and stay home if you have any of these in a way that is uncommon for you.
- Students must self-report if they test positive for COVID-19 via this website: <https://coronavirus.utah.edu/>
  - What to do if you experience symptoms of COVID
  - What to do if you have had a known exposure to COVID
- UofU offers free, asymptomatic testing, you can find information about that and vaccine availability here: <https://healthcare.utah.edu/coronavirus/reserve-test/>

### 7.1.3 Zoom Meetings

- If class technology allows, I will try to record class meetings and post them on Canvas. Note that in my experience these are never a good substitute for in person attendance, but should help you catch up in case of missed classes, and I will do my best to maximize what you get out of them.

## 8 General Policies

### 8.1 Contacting me

- Emails should be sent to [aniello.desanto@utah.edu](mailto:aniello.desanto@utah.edu)
- Please put LING 3300 into the subject of the email, and *never* leave the subject empty!
- Reply time < 24h in simple cases, possibly more if meddling with bureaucracy is involved.
- We will discuss the format for office hours the first day of classes.

### 8.2 Office Hours

- Office hours will take place twice per week either in my office in LNCO, or in a dedicated Zoom room (link available on Canvas).
- You do not need to schedule an appointment for these, you can just show up (but an heads up is welcome if you anticipate a long discussion).
- Extra office hours are also always available by appointment.



### 8.2.1 A Note on Office hours

You might feel like you need to have a specific question (e.g., about a homework) in order to come to office hours. This is *not* true. **Office hours are a space for us to discuss any issue/concern you might be having with the class, and you are always welcome regardless of whether you have a precise question or not.** Thus, you also do not need an appointment to show up to office hours. However, if you anticipate a longer meeting, it might be helpful for you to email me in advance so that we can set apart enough time and avoid collisions with other students.

### 8.3 Laptop policy

This course requires laptops use during class (if you have tech problems, please contact me in advance). I recommend that you avoid using your laptop in class for activities that are not directly related to the lecture (e.g., following a Jupyter notebook in Python sessions). However, I do not enforce restrictions on how to use laptops. Note that cognitive scientists are still debating how/whether laptop use in the classroom is related to test scores:

- Raviza, S. M., Uitvlugt, M. G., & Fenn, K. M. (2016). *Logged in and zoned out: How laptop Internet use relates to classroom learning*. *Psychological Science*, 28(2), 171–180.
- Urry Heather L. et al (2020). *Don't Ditch the Laptop Just Yet: A Direct Replication of Mueller and Oppenheimer's (2014) Study 1 Plus Mini-Meta-Analyses Across Similar Studies*

Since we all have different needs, these are just recommendations. You can do as you please, as long as you are not disruptive to the class.

### 8.4 Attendance

Attendance is not required. Students may elect not to attend class in-person with no penalty. However, in order to get the best out of the course, I strongly recommend consistent attendance. Please get in touch with me if you have any problems you feel I can help with. Accommodations to participate online, rather than in-person, can be discussed.

### 8.5 Names/Pronouns.

Class rosters are provided to the instructor with the student's legal name as well as *Preferred first name* (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center: [https://lgbt.utah.edu/campus/faculty\\_resources.php](https://lgbt.utah.edu/campus/faculty_resources.php)

## **9 Accommodations**

Accommodations will be considered on an individual basis and may require documentation.

### **9.1 Americans with Disabilities Act (ADA)**

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access. The website for the Center for Disability and Access: <https://disability.utah.edu>

#### **9.1.1 Extreme personal circumstances**

Please contact your instructor as soon as possible if an extreme personal circumstance (hospitalization, death of a close relative, natural disaster, etc.) is interfering with your ability to complete your work.

#### **9.1.2 Religious Practice**

To request an accommodation for religious practices, contact your instructor at the beginning of the semester.

#### **9.1.3 Active Duty Military**

If you are student on active duty with the military and experience issues that prevent you from participating in the course because of deployment or service responsibilities, contact your instructor as soon as possible to discuss appropriate accommodations.

#### **9.1.4 A personal note on diversity and accessibility**

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, age, socioeconomic status, ethnicity, race, and culture.

I also aim to maximize accessibility for all my lecture materials. However, it is probable that I miss or underestimate some issues. Your suggestions are encouraged and appreciated.

Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

## **10 University Policies**

### **10.1 Drop/Withdraw Policies**

Students may drop a course within the first two weeks of a given semester without any penalties.

Students may officially withdraw (W) from a class or all classes after the drop deadline through the midpoint of a course. A “W” grade is recorded on the transcript and appropriate tuition/fees are assessed. The grade “W” is not used in calculating the student’s GPA.

For deadlines to withdraw from full-term, first, and second session classes, see the U’s Academic Calendar.

## **11 Plagiarism and Cheating**

It is assumed that all work submitted to your instructor is your own work. When you have used ideas of others, you must properly indicate that you have done so.

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code,

“...Includes, but is not limited to, cheating, misrepresenting one’s work, inappropriately collaborating, plagiarism, and fabrication or falsification of information... It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”

For details on plagiarism and other important course conduct issues, see the U’s Code of Student Rights and Responsibilities.

## **12 Course Materials Copyright**

The Content is made available only for your personal, noncommercial educational and scholarly use. You may not use the Content for any other purpose, or distribute, post or make the Content available to others, unless you obtain any required permission from the copyright holder. Some Content may be provided via streaming or other means that restrict copying; you may not circumvent those restrictions. You may not alter or remove any copyright or other proprietary notices included in the Content.

Please see the Code of Student Rights and Responsibilities, Section III.A.5 regarding use and distribution of class Content and materials. <https://regulations.utah.edu/academics/6-400.php> Section III.A.5. prohibits the following: Sale or distribution of information representing the work product of a faculty member to a commercial entity for financial gain without the express written permission of the faculty member responsible for the course. (“Work product” means original works of authorship that have been fixed in a tangible medium and any works based upon and derived from the original work of authorship.)

## **12.1 Safety at the U**

The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message.

For more information regarding safety and to view available training resources, including helpful videos, visit [safeu.utah.edu](http://safeu.utah.edu).

To report suspicious activity or to request a courtesy escort, contact: Campus Police & Department of Public Safety, 801-585-COPS (801-585-2677), [dps.utah.edu](http://dps.utah.edu)

## **12.2 Wellness at the U**

Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student's ability to succeed and thrive in this course and at the University of Utah.

Please feel welcome to reach out to your instructor or TA's to handle issues regarding your coursework.

For helpful resources to manage your personal wellness and counseling options, contact: [wellness.utah.edu](http://wellness.utah.edu) or [womenscenter.utah.edu](http://womenscenter.utah.edu)

## **12.3 Addressing Sexual Misconduct**

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

## **12.4 Campus Safety**

The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit [safeu.utah.edu](http://safeu.utah.edu).

## **13 Changes to the Syllabus**

This syllabus is not a contract. It is meant to serve as an outline and guide for your course. Please note that your instructor may modify it to accommodate the needs of your class.

You will be notified of any changes to the Syllabus.