LING 4250 Computation and Learnability in Linguistic Theory

Dr. Nick Danis, Washington University in St. Louis

Course number	LING 4250	*Instructor*	Nick Danis
Semester	Spring 2026	*Contact*	nsdanis@wustl.edu
Time	TR 4-5:20pm	*Office*	January 206
Location	Hillman 370	*Office hours*	TBD
Website	https://wustl.instructure.com/courses/168274		

This course introduces the advanced linguistics or computer science student to the fields of learnability and computation as they apply to the study of linguistic theories and natural language. Topics covered include the formal language hierarchy, including the subregular languages; issues in the learnability of phonology, morphology, and syntax; and algorithms specific to constraint-based linguistic grammars.

Goals

1. Explore the relationship between natural language and the formal language hierarchy
2. Critically examine the comparison of theories from a computational point of view
3. Implement and understand various algorithms defined for linguistic theories in a hands-on way

Required Materials

All readings are posted as PDFs on Canvas. Occasionally, the use of software on the students' own computers is necessary, but this software is free and cross-platform. More details will be given in class.

Attendance and delivery

In-person attendance is required for this course. However, be smart and put your health first. If you think you need to miss class for a health-related issue, please try to contact me **before** class time. Class sessions are not recorded by default, but if you have an extended, excused period of absence, arrangements can be made. Attendance is taken every session in some form. A single unexcused absence will not count against your grade, but anything more will require documentation.

Grade

The final grade is weighted as follows.

Category	Weight
Assignments	20%
Participation and Discussion	30%
Papers	50%

Assignments

There will be occasional short problem sets on the logic and formalisms discussed in class. Depending on your background, these might be review or they might be new. The purpose of these assignments is to make sure everyone is on the same page.

Participation and Discussions

There will be multiple student-led discussion days throughout the semester. Your discussion group will have to prepare a handout to guide the rest of the class through that day's reading. Further details are on Canvas. As this is a seminar-style course, active participation is always expected.

Papers

There is both a midterm squib (~5 pages) and a final paper (~10 pages). Both involve application of course concepts to natural language data, with the freedom to incorporate any additional expertise you may have.

As part of the final paper, there will also be a proposal stage midway through the semseter and a presentation (if time allows) during the last week of class. You should start thinking about topics now, and feel free to reach out with any ideas or questions.

Schedule

Please see Canvas for all readings and assignment due dates. The schedule is likely to change specific to how the course progresses, below is only a rough guide.

Date	Week	Topic	Comment
1/13/2026	01	No Class	Instructor Traveling
1/15/2026	01	Intro/Logic	Partee et al. 1990
1/20/2026	02	What is Learnability?	Gold 1967, Heinz 2016
1/22/2026	02		
1/27/2026	03	The Chomsky Hierarchy	Tesar 2012, Partee et al 1990, Heinz & Idsardi 2012
1/29/2026	03		
2/3/2026	04	The Subregular Hierarchy	Rogers & Pullum 2011, Rogers et al. 2013, Heinz 2010, Partee et al 1990
2/5/2026	04		
2/10/2026	05	The Subregular Hierarchy	
2/12/2026	05		
2/17/2026	06	Phonology and regular relations	Kaplan & Kay 1994, Karttunen & Beesley 2005, Gildea & Jurafsky 1996
2/19/2026	06		
2/24/2026	07	Phonology and regular relations	
2/26/2026	07		
3/3/2026	08	Formal characterization of natural language syntax	Shieber 1985, Pullum & Gazdar 1982, Karlsson 2007, Partee et al 1990, Chomsky 1957
3/5/2026	08		
3/10/2026	09	Formal characterization of natural language syntax	
3/12/2026	09		
3/17/2026	10	No Class	Spring Break
3/19/2026	10	No Class	Spring Break
3/24/2026	11	Learning syntactic patterns	Clark & Eyraud 2007, Clark 2017
3/26/2026	11		
3/31/2026	12	Beyond formal languages: parallel distributed processing	Rumelhart & McClelland 1985, Pinker & Prince 1988, Pater 2019
4/2/2026	12		

Date	Week	Topic	Comment
4/7/2026	13	Constraint-based parallelism	Tesar & Prince 2003, Prince & Tesar 2006, Tesar 1995, Zsiga 2013
4/9/2026	13		
4/14/2026	14	Constraint-based parallelism	
4/16/2026	14		
4/21/2026	15	Advanced learning algorithms for OT	Hayes & Wilson 2008, Boersma & Hayes 2001, Nyman & Tesar 2019
4/23/2026	15		
TBD	16		

Policy on the use of AI (sigh)

Large Language Model (LLM)-based artificial intelligence tools (ChatGPT, Copilot, Gemini, etc.) have become a ubiquitous, tempting, yet still often useful tool for a variety of tasks. As a university student, you should always know the following: never let LLMs be the final word. It is not an academic source, it hallucinates information, and it is not always true in even the most elementary sense. If you are using it as a brainstorm or study aid, *always* verify the output it gives you against trusted sources.

Further, as a student in this course, any and all work submitted by you must be original. Directly submitting the output of some LLM as your own constitutes a violation of the academic integrity policy. This includes blocks of code.

General policies

This course follows and takes seriously all policies on assault & harrassment, accommodations, academic integrity, and so on. In order to provide you with the most up to date material, I will link directly to the University guidelines below:

https://provost.wustl.edu/syllabi-resources-and-template-language-danforth-campus/

Please be familiar with these and don't hesitate to reach out if you ever have any related questions or concerns.

Academic Integrity

In all academic work, the ideas and contributions of others (including generative artificial intelligence) must be appropriately acknowledged and work that is presented as original must be, in fact, original. You should familiarize yourself with the appropriate academic integrity policies of your academic program(s).

Unauthorized Recording And Distribution Of Classroom Activities & Materials

Except as otherwise expressly authorized by the instructor or the university, students may not record, stream, reproduce, display, publish or further distribute any classroom activities or course materials. This includes lectures, class discussions, advising meetings, office hours, assessments, problems, answers, presentations, slides, screenshots or other materials presented as part of the course. If a student with a disability wishes to request the use of assistive technology as a reasonable accommodation, the student must first contact the Office of Disability Resources to seek approval. If recording is permitted, unauthorized use or distribution of recordings is also prohibited.

Disability Resources (DR)

WashU supports the right of all enrolled students to an equitable educational opportunity and strives to create an inclusive learning environment. In the event the physical or online environment results in barriers to your inclusion due to a disability, please contact WashU's Disability Resources (DR) as soon as possible and engage in a process for determining and communicating reasonable accommodations. As soon as possible after receiving an accommodation from DR, send me your WashU Accommodation Letter. Remember that accommodations cannot be applied retroactively.

https://disability.wustl.edu/

Sexual Harassment And Assault

If you are a victim of sexual discrimination, harassment or violence, we encourage you to speak with someone as soon as possible. Understand that if you choose to speak to me as an instructor, I must report your disclosure to my department chair, dean, or the Gender Equity and Title IX Compliance Officer, which may trigger an investigation into the incident. You may also reach out to the Relationship & Sexual Violence Prevention (RSVP) Center to discuss your rights and your options with individuals who are not mandatory reporters.

https://titleix.wustl.edu/students/confidentiality-resources-support/

Religious Holidays

To ensure that accommodations may be made for students who miss class, assignments, or exams to observe a religious holiday, you must inform me in writing before the end of the third week of class, or as soon as possible if the holiday occurs during the first three weeks of the semester. For more information, please see the university's Religious Holiday Class Absence Policy (https://bulletin.wustl.edu/washu/calendar/Religious-Holidays.pdf).

Emergency Preparedness

Before an emergency affects our class, students can take steps to be prepared by downloading the WashU SAFE App (https://emergency.washu.edu/washu-alert-system/washusafe-app/). In addition, each classroom contains a "Quick Guide for Emergencies" near the door.

Resources for Students

WashU provides a wealth of support services that address academic, personal, and professional needs. To start exploring resources that can help you along the way, please visit: https://provost.washu.edu/resources/instructor-resources/student-resources/