LING 160: Mathematical Methods in Linguistics
Syllabus for Fall 2019

Contact Details

Instructor:
Sophia A. Malamud
Office location: Volen 215
Telephone: (781) 736-2225
Email: smalamud AT brandeis DOT edu
Office hours: TBA. To make an appointment outside office hours, please email me.

TA:
Jonne Saleva
Email: jonnesaleva AT brandeis DOT edu

Course logistics

Class meeting times
Tuesday, Thursday 2-3:20 PM

Location
Volen Center for Complex Systems, Room 106

Textbook (recommended, not required):

Reader:
Additional readings will be distributed through LATTE (see below). Please check LATTE often, as all changes in schedule, assignments, deadlines, and materials will be broadcast through LATTE.

Course Description

Skills and knowledge
This is an undergraduate and introductory-graduate course presenting the key mathematical concepts which belong to the basic repertoire of computational linguistic methods. The course is recommended for students considering computational linguistics, and is also applicable to students intending to continue on to graduate programs in linguistics, computational linguistics, computer science, and related fields. It is an approved elective for the undergraduate major and minor in Linguistics, as well
as a required background course for the MA in Computational Linguistics. In addition, the course fulfills the University Quantitative Reasoning requirement.

The course has two goals: first, to strengthen the students' math background in the areas most widely relevant to computational linguistics, and second, to provide a broad overview of CL applications for various mathematical tools that would be of interest to students in linguistics, computation, philosophy, and the cognitive and social sciences.

The course has no pre-requisites.

Class preparation time
Success in this four-credit course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, preparation for exams, etc.).

Course Requirements and Grading

Academic Integrity
Every member of the University community is expected to maintain the highest standards of academic integrity. A student shall not submit work that is falsified or is not the result of the student's own effort. Infringement of academic honesty by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University or other sanctions (see section 20 of R&R). Please consult Brandeis University Rights and Responsibilities for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. A student who is in doubt regarding standards of academic honesty as they apply to a specific course or assignment should consult the faculty member responsible for that course or assignment before submitting the work. Allegations of alleged academic dishonesty will be forwarded to the Department of Student Rights and Community Standards.

Assignments
Students are required to complete two types of assignments: problem sets and exams. In addition, students must attend, and are expected to come prepared to fully participate in discussion and in-class “workshops”. Details of these requirements are below:

Problem sets
- Problem sets will be generally assigned on a Thursday, and will be due the following Thursday at the beginning of class.
- They will be graded on a 10 point scale and the lowest grade will be dropped.
- You're encouraged to discuss the problems with your colleagues and work together, provided you indicate the name(s) of the person(s) you're working with. However, after you are done talking to your group, you should go away and write up the answers on your own, and in your own words.
- Homework on multiple pieces of paper needs to be stapled together! Write neatly. Think about what it must be like to read your own writing!
• Electronic submissions should be in pdf format, with your name included at the beginning of the problem set pdf.

**Exams**
- Two exams - a mid-term and final - will be cumulative.
- Both exams will be take-home.
- You’re not supposed to discuss the exams with anyone other than me and the TA. It always shows, and we will know.

**Participation**
Participation requirement includes attending class, coming for office hours as soon as you have any questions for me and the TA or any help with the material, completing the readings and practice problems before coming to class, raising questions as soon as ideas become unclear (either in class, in office hours, or via emails), listening actively and attentively, responding thoughtfully to in-class questions, and (very importantly) reading and responding to course-related e-mails.

**Practice problems**
Some class sessions will be dedicated to discussion of the material and its application to various areas of linguistics. I will assign practice problems and questions beforehand, and you should come to class with written attempted solutions to the problems and prepared questions. While you won’t be penalised for being quiet in class, I hope that you will feel welcome to ask questions, and that you will want to participate in class discussions.

**Attendance**
Attendance will be checked starting from the first class meeting. You can skip any three classes for any reason. Any further skipped classes will incur a penalty of half a point from the final course grade, up to a total of the 10% attendance/participation grade.

**Late assignments, extensions, and communication**
Being on time and communicating with me is part of your grade for all course requirements.
- If you feel that you are failing to make a deadline, you should communicate with me immediately, and ask for an extension before the assignment is due.
  - I’m usually generous with extensions, but you will incur a late penalty (see below) if you just skip a deadline without prior communication with me.
  - I cannot accept late exams if you skip a deadline without prior communication with me.
  - If a family or medical emergency intervenes, you should communicate with me as soon as you can.
- Late problem set policies:
  - Late problem sets will incur a 10% penalty for every day late
  - Assignments submitted on the due date but after the beginning of class will be considered one day late.
I cannot accept problem sets after the graded assignments are returned or after answers are posted.

Evaluation
I will assign final course grades according to the following weights.

<table>
<thead>
<tr>
<th>Class Element</th>
<th>Grade Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance and participation, including communication with me, discussion of practice problems, etc.</td>
<td>10% - obligatory to qualify for a grade</td>
</tr>
<tr>
<td>Problem Sets</td>
<td>60%</td>
</tr>
<tr>
<td>Midterm</td>
<td>15%</td>
</tr>
<tr>
<td>Final</td>
<td>15%</td>
</tr>
</tbody>
</table>

Essential Resources

Accommodations
Brandeis seeks to welcome and include all students. If you are a student who needs accommodations as outlined in an accommodations letter, I want to support you. In order to provide test accommodations, I need the letter more than 48 hours in advance. I want to provide your accommodations, but cannot do so retroactively. If you have questions about documenting a disability of requesting accommodations, please contact Student Accessibility Support (SAS) at 781.736.3470 or access@brandeis.edu.

LATTE
LATTE is the Brandeis learning management system: http://latte.brandeis.edu. Login using your UNET ID and password.

Student Support
Brandeis University is committed to supporting all our students so they can thrive. The following resources are available to help with the many academic and non-academic factors that contribute to student success (finances, health, food supply, housing, mental health counseling, academic advising, physical and social activities, etc.). Please explore the many links on this Support at Brandeis page (https://www.brandeis.edu/support/undergraduate-students/browse.html) to find out more about the resources that Brandeis provides to help you and your classmates to achieve success.

Preliminary schedule

- Schedule is subject to change, so check LATTE
- All chapter references are for Rosen “Discrete Mathematics”, 7th edition, except where noted.
<table>
<thead>
<tr>
<th>Week/day</th>
<th>Topic</th>
<th>Readings, assignments</th>
</tr>
</thead>
</table>
| Week 1: 1 class | Sets | Chapter 2  

*Practice 1  

*HW1* |
| Week 2: 2 classes | Functions, relations | |
| Week 3 –4: 3 classes | Properties of relations, orders, equivalences, order-preserving transformations | Chapters 2 & 9  

*Practice 2  

*HW2* |
| Week 5 - 6: 3 classes | Counting | Chapters 6 & 8  

*Practice 3  

*HW3* |
| Week 7 - 9: 7 classes | Discrete probability and information theory | Chapter 7  

*Practice 4  

*Midterm  

*Practice 5  

*HW 4* |

*Practice 6  

*HW5* |
| 2-3 classes Weeks 10-11 | Basics of differential calculus, if time, vector calculus |  

*Practice 7  

*Final* |