

# The PhD program in Linguistics

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# The PhD program in Linguistics

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## The PhD program in Linguistics

The Department of Linguistics at the University of Rochester offers a fully-funded five year PhD program in Linguistics, focusing on cross-disciplinary training and collaboration. Students in this program have a primary affiliation in Linguistics, with secondary affiliation in an allied department.

At Rochester, cross-disciplinary, collaborative work is the norm. The Linguistics faculty are grounded in the traditional fields of formal linguistics, employing empirical methodologies to examine data and topics in experimental syntax, semantics, pragmatics, phonetics, laboratory phonology, and morphology in collaboration with faculty and students in allied fields. Our work incorporates contemporary issues and practices in these areas.

Our principal allied fields are *Brain and Cognitive Sciences* and *Computer Science*, but we also have strong connections in related departments, such as Biomedical Engineering and departments at the Eastman School of Music. We are also a core member of Rochester's Center for Language Sciences (CLS), which provides research, training and collaboration opportunities for students and faculty involved in language research.

**Linguistics PhD students** are housed in the Department of Linguistics as their primary affiliation. Linguistics students will be provided with office space in the Department in Lattimore Hall, and they have access to lab space there. The Department houses a phonetics lab, an eye-tracking lab, a quantitative semantics lab, and a language documentation lab. These labs provide space for student and faculty research.

## Graduate work in the Department of Linguistics

**Graduate students** work closely with Linguistics faculty to shape their program of course work and research depending on their individual backgrounds and research interests. Our goal is to give our students a strong foundation in contemporary linguistic methodology and research while providing the opportunity to do cross-disciplinary training in an allied field. Our PhD program facilitates this interdisciplinary work through a student's formal affiliation to a department in allied fields such as cognitive science, neuroscience and computer science, to name three principal allied fields. Ours is a flexible program,

adaptable to student's interests and backgrounds, and connected to the ongoing research interests of students and faculty.

## Graduate Courses in Linguistics

Our graduate students are required to fulfill core course work in the subfields of contemporary linguistics as described below.

The Department of Linguistics offers three types of graduate level courses, and a proseminar LIN501

- *Introductory Courses*, which provide a background in the core areas of linguistics and are required of those students without this background
- *Core Area Courses*, a series of advanced courses in the separate core disciplines
- *Advanced Graduate Courses*, research based seminar courses
- *LIN501* a proseminar. This is offered as an overview of the methods of linguistic analysis co-taught by the faculty, as an introduction to research questions in the subfields and constructed to facilitate cross disciplinary work for graduate students in linguistics and allied fields.

### Graduate Introductory courses (400-level)

A series of 400-level core courses are offered every term that provide an introduction to the central subdisciplines of contemporary linguistics. These courses are required of graduate students who lack the background in those areas.

- LIN 410 (phonetics/phonology) Introduction to Language Sound Systems
- LIN 420 (syntax) Introduction to Grammatical Systems
- LIN 425 (semantics) Introduction to Semantic Analysis
- LIN 426 (morphology) Morphology

We also have several other 400-level linguistics courses, some offered approximately every other year. These provide additional breadth to the program and include courses in historical and sociolinguistics, and in the areas of language documentation and analysis.

### Graduate Core courses (400-level)

Building on the 400-level subdiscipline core courses is a series of advanced courses. These courses are offered yearly or every other year.

- 427 Topics in Phonetics & Phonology
- 460, 461, 462 Syntactic Theory, PS Grammars, Experimental Syntax
- 450, 468 Data Science for Linguistics, Computational Semantics
- 465, 466 Formal Semantics, Pragmatics

### Advanced Graduate Courses (500-level)

500-level courses are advanced courses in the core subdisciplines of linguistics, offered approximately every other year.

- LIN510 Phonetics/Phonology
- LIN520 Syntax
- LIN525 Formal Semantics
- LIN526 Morphology
- LIN528 Lexical Semantics
- LIN535 Pragmatics

These courses are taught as seminar courses around topics relevant to ongoing research of faculty and students.

In addition the Department of Linguistics and our allied departments all hold regularly scheduled reading groups and talks around topics of interest to the larger community. Listserve subscriptions announce these and other activities in the broad and very active language science community at Rochester.

## Linguistics Requirements for PhD students

Graduate students in our PhD program are required to take six Linguistics courses and write one Qualifying paper in a topic of their choice related to the student's interests. Linguistics requirements for degree include Core Courses in three areas, Advanced Courses in two areas, a Qualifying paper at the end of the third year and a Methods Course. In addition to fulfilling these requirements, students will fulfill coursework and requirements in the allied department. In total 90 credits of coursework and research credits are required for the PhD. In this section we lay out this program of study. For sample schedules for PhD students in Linguistics see section below.

### Planning the PhD degree program of study

Once admitted, and no later than the end of the first semester, Linguistics PhD students, in consultation with their advisor in Linguistics and co-advisor in an allied field department, will construct a program of study outlining the courses the student plans to take, following the appropriate criteria. Because this is an interdepartmental degree, particular care will need to be taken to coordinate and time the student's relevant coursework.

The program is comprised of two main parts,

- Coursework and the qualifying paper, completed by the end of third year
- Advancement to Candidacy, the dissertation period

### Pre-Qualifying

Each student will form a Pre-qualifying committee during their fourth semester made up of at least three faculty specialists in the area of their Qualifying paper research, including at least the student's primary and secondary advisers. This committee will monitor the student's progress and provide yearly evaluations during the pre-Qualifying period; it will also oversee the Qualifying paper.

### Qualifying for *Advancement to Candidacy* for PhD students

A Qualifying research paper of publishable, or near-publishable, quality must be submitted during year 3 of the program in order to advance to candidacy.

### Advancing to Candidacy

*Dissertation:* After advancing to candidacy each student will form a Dissertation committee made up of at least two faculty from Linguistics (including adviser), at least one from the relevant allied field department (including co-adviser), and one outside member (from a third department). This committee will take over the role of monitoring the student's

progress with yearly evaluations and it will oversee the Dissertation. Students will orally defend a written dissertation proposal no later than the end of their fourth year.

### Timing

Students in the PhD program in Linguistics are funded for five years. Because students are taking courses in two departments, it is important to keep on a schedule. The following is a schedule for the program.

- *Years 1-2*
  - Methods, Core courses and one Advanced course completed.
  - Research program developing.
  - Qualifying paper proposal
- *Year 3*
  - Coursework completed
  - Qualifying paper completed by the end of third year
- *Year 4*
  - Dissertation committee formed
  - Dissertation Proposal defended.
- *Year 5*
  - Complete and defend Dissertation.

### Teaching Assistantships

Each PhD student is expected to be a *Teaching Assistant* (TA) for three courses total, with at least two of them in Linguistics and (optionally) one in the relevant allied field department. The purpose of the TA-ship is to expose students to teaching methods in both Linguistics and their allied field.

## Sample Schedules for a Linguistics PhD

Students are accepted into the **Department of Linguistics** as their primary affiliation. Students have a secondary affiliation in an allied department of their choice; they will also fulfill requirements in those departments.

The following are sample schedules for degrees in **Linguistics and Brain and Cognitive Sciences** (LIN/BCS) and **Linguistics and Computer Science** (LIN/CS). They are meant to provide an idea of what the course of study is like for these degrees.

### Sample Linguistics and Brain and Cognitive Sciences schedule

- **Linguistics requirements:** LIN Methods, three Core courses, two Advanced courses, a Qualifying paper
- **BCS requirements:** three Core courses, BCS Methods, Stats (or two Core and one Advanced), BCS comprehensive exam

#### Year 1

<i>Fall</i>	<i>Spring</i>
LIN 501 Methods	LIN Core 2
LIN Core 1	LIN Core 3 or Elective
BCS Core 1	BCS Methods

#### Year 2

<i>Fall</i>	<i>Spring</i>
LIN Advanced 1	LIN Advanced 2
BCS Core 2	Stats
TA	BCS Core 3

#### Year 3

<i>Fall</i>	<i>Spring</i>
LIN Qualifying paper	BCS Comps
Elective	
TA	

### Sample Linguistics and Computer Science (LIN/CS) schedule.

- **Linguistics requirements:** LIN Methods, three Core courses, two Advanced courses, one Qualifying paper
- **CS requirements:** three Core courses, one Advanced, CS AI Area Exam

#### Year 1

<i>Fall</i>	<i>Spring</i>
LIN 501 Methods	LIN Core 2
LIN Core 1	LIN Core 3 or Elective
CS Core 1 (447/448)	CS Core 2 (446)

#### Year 2

<i>Fall</i>	<i>Spring</i>
LIN Advanced 1	LIN Advanced 2
CS Core 3 (447/447) or CS Advanced (444)	CS Advanced (460)
TA	Elective

#### Year 3

<i>Fall</i>	<i>Spring</i>
LIN Qualifying paper	CS AI Area Exam
Elective	
TA	

## Course Descriptions

The following is a list of course descriptions of graduate level courses in Linguistics and our two primary allied fields: Brain & Cognitive Sciences and Computer Science (Spring 2017).

For the Linguistics courses, please note that these courses are not taught every term or every year.

### Linguistics

#### **LIN 410 INTRODUCTION TO LANGUAGE SOUND SYSTEMS**

Introduces students to the principles underlying sound systems in human language. Attention will be given to articulatory phonetics, with some discussion of acoustic phonetics; practice in the production, recognition, and transcription of sounds in various languages of the world, and to the fundamentals of phonological analysis and argumentation through hands-on investigation of language sound systems.

PREREQUISITES: LIN110 or equivalent. CREDITS: 4.

#### **LIN 420 INTRO TO GRAMMATICAL SYSTEMS**

This introductory course examines the grammatical structure of words and sentences from the standpoint of modern linguistic theory. The course develops the basic techniques and concepts of morphological and syntactic analysis placing particular emphasis on the ways in which semantic, morphological and lexical information interacts with the syntax. No syntax background is assumed. This course is intended for majors and non-majors alike.

PREREQUISITES: LIN110 or equivalent. CREDITS: 4.

#### **LIN 425 INTRODUCTION TO SEMANTIC ANALYSIS**

This course introduces students to the basics of the analysis of meaning in natural language. The first section focuses on devices that motivate certain forms to take on the meanings they have. The second section of the course moves on to discuss how meanings combine to form meanings for larger units—how words and phrases combine to form sentence meanings. Using logical notation we illustrate the formal analysis of natural language meaning in terms of truth-conditions. We will discuss the basics of set theory, and investigate how meanings represented in these terms correlate with the syntactic and lexical structures of sentences of natural language. Students of graduate standing or those with strong formal backgrounds may consider starting with LIN 265/465 instead, for which this course is ordinarily a prerequisite. This course counts towards satisfying the core course requirement for majors. PREREQUISITES: LIN110 or equivalent. CREDITS: 4.

**LIN 426 MORPHOLOGY**

The course examines the structure and definition of the linguistic unit "word" its typology and the relationship of the morphological component to other levels in the grammar. The course includes an introduction to analytical techniques with emphasis placed on an examination of data from a range of languages. The building blocks of words will be analyzed and topics such as affixation, reduplication and inflectional and derivational morphology will be covered. We will examine the properties of words and how they fit into the larger structure of linguistic knowledge, including the relationship between words and syntactic structure (ex., phrases and sentences) and the relationship between words and phonological structure (ex., phonological rules and prosodic structure). PREREQUISITES: LIN110 or equivalent. CREDITS: 4.

**LIN 427 TOPICS IN PHONETICS & PHONOLOGY**

This is a laboratory course intended to provide participants with an overview of research in laboratory phonology. Issues vary from term to term but cover areas in segmental, metrical and intonational phonology and the phonology/phonetics interface. PREREQUISITES: LIN 410. CREDITS: 4.

**LIN 428 LEXICAL SEMANTICS**

In this course we investigate the study of word-meaning in current linguistics and cognitive science. We examine the meanings of lexical items such as verbs, nouns, adjectives, and prepositions, and also other categories of words, including various function words and discourse particles. We examine theories of word-meaning, and examine how words and vocabulary may vary between languages. PREREQUISITES: LIN 410, LIN 420 or LIN 425 or permission of instructor. CREDITS: 4.

**LIN 450 DATA SCIENCE FOR LINGUISTICS**

This course addresses linguistic research questions through data science techniques. The course will focus on developing skills to (i) acquire and process a variety of language data, from using established corpora to capturing Twitter feeds, and (ii) to investigate language use, particularly syntactic and semantic phenomena, through descriptive and inferential statistical techniques. A significant part of the course will be devoted to hands-on projects and will include developing familiarity with using the programming languages Python and R to acquire and explore linguistic data. Familiarity with statistics and/or computational linguistics is advantageous, but not necessary. PREREQUISITES: Either LIN 410, LIN 420 or LIN 425. CREDITS: 4.

**LIN 460 SYNTACTIC THEORY**

This course picks up where LIN 420 leaves off, exploring topics in natural language syntax from a cross-linguistic perspective. The goal of the course is an approach to syntax that accounts for both language-particular as well as universal constraints on language. Among the topics studied are head and phrase movement, constraints on co-reference (anaphora), ellipsis, and agreement (phi features). PREREQUISITES: LIN 420 or permission of instructor. CREDITS: 4.

**LIN 461 PHRASE STRUCTURE GRAMMARS**

This syntactic theory course examines syntactic phenomena from the perspective of phrase structure and lexicalist grammar as opposed to transformational grammar. The course will examine and develop phrase structure grammar (specifically Head-driven Phrase Structure Grammar) approaches to standard syntactic problems, contrasting them where appropriate with transformational approaches. No background in non-transformational approaches will be assumed. PREREQUISITES: LIN 420 or permission of instructor. CREDITS: 4.

**LIN 462 TOPICS IN EXPERIMENTAL SYNTAX**

This course provides an introduction to experimental methods that can be used to investigate questions that are relevant for syntactic theory. We will discuss a range of methodologies, including self-paced reading, visual world eye-tracking, magnitude estimation and questionnaires. The course will be organized around several topics that have been central to syntactic research, such as anaphor resolution, ellipsis and quantifier scope in order to examine how experimental methods can complement existing work; for example, by shedding light on areas where stable judgments have traditionally been difficult to obtain, and by allowing us to investigate the time course of real-time language processing. By the end of this course students will be able to understand and critically evaluate research that uses various experimental methods, and be able to design and run their own experiments. PREREQUISITES: LIN 420 or permission of instructor. CREDITS: 4.

**LIN 465 FORMAL SEMANTICS**

This course is an in-depth introduction to the formal analysis of natural language meaning, employing techniques that have been developed in language and formal philosophy over the last century. Issues include intensionality, quantification, tense, presupposition, plurality, the analysis of discourse, and other current issues. Familiarity with syntax, logic, and/or computation are helpful but not necessary. PREREQUISITES: LIN 425. CREDITS: 4.

**LIN 466 INTRODUCTION TO PRAGMATICS**

Within theoretical linguistics, pragmatics is (broadly speaking) the study of how language users convey meaning. This course covers three general areas: (1) How meaning carried by

linguistic elements (such as sentences) interacts with meaning that arises from inferences about speakers' intentions; (2) Ways of characterizing meaning, especially with respect to linguistic elements not easily handled in traditional semantic (i.e., truth-conditional) terms; (3) The role of context in determining meaning. Topics to be discussed include the relation between semantics and pragmatics, representations of context, truth-conditional and other types of meaning, presupposition; implicature and Grice's Cooperative Principle.

PREREQUISITES: LIN 425. CREDITS: 4.

### **LIN 468 COMPUTATIONAL SEMANTICS**

This course is a hands-on exploration of recent advances in computational models of meaning. Topics include implementing traditional rule-based compositional semantics, estimating meaning from large-scale corpus resources, and extracting meaning patterns through data science techniques. PREREQUISITES: LIN 425 or permission of instructor. CREDITS: 4.

### **LIN 470 TOOLS FOR LANGUAGE DOCUMENTATION**

This is a hands-on class that introduces you to major techniques and tools in language documentation and description. You will learn how to collect and record a variety of language data through elicitation and text collection. The emphasis is then on organizing, managing, and processing these data sets for various purposes, such as building up a dictionary, annotating natural speech, and time-aligning media of different formats with computational tools such as Praat, Toolbox, and ELAN. Further, we will discuss crucial topics in language documentation such as fieldwork, ethics, and language revitalization. PREREQUISITES: LIN110 or permission of instructor. CREDITS: 4.

### **LIN471 FIELD METHODS IN LINGUISTIC DESCRIPTION 1**

In the LIN471 (spring term) course, students will both start investigating the basics of the language under discussion and develop a workflow for their language description. Investigation of language basics includes collecting word lists as well as simple constructions, for instance noun + modifier. Students will learn how to organize a fieldwork project: from systematically preparing elicitation sessions and organizing their data to learning how to write up short sketches of their findings. PREREQUISITE: LIN470 (Tools for Language Documentation) or instructor's permission. CREDITS: 4.

### **LIN 472 FIELD METHODS IN LINGUISTIC DESCRIPTION 2**

The LIN472 (fall term) course will permit students to investigate grammatical phenomena in more depth and tackle more complex phenomena. In addition to elicitations known from LIN471, students will now use extensive questionnaires on, for instance, tense/aspect/mood distinctions or information structure. Students will also be introduced

to transcribing texts (e.g. folk tales, autobiographic narratives, or dialogues) which will then serve at complementing the grammatical analysis. This course emphasizes the writing skills needed for a grammatical description which differ significantly from, for instance, essay writing. Students will get training in write-ups and revisions of these to fully prepare them for their final grammar sketch. PREREQUISITE: LIN471 or instructor's permission.

CREDITS: 4

### **LIN 501 METHODS IN LINGUISTIC RESEARCH**

An introduction to the field of linguistics and natural language emphasizing a theoretical perspective. Topics will cover subfields of linguistics, including phonetics, phonology, morphology, syntax, semantics and pragmatics. PREREQUISITE: Graduate standing or instructor's permission. CREDITS: 4.

### **LIN 510 TOPICS PHONETICS & PHONOLOGY**

This seminar explores current topics in experimental phonetics and laboratory phonology. These may include speech production, speech perception and their interaction with the phonological grammar, prosody (tone, intonation), metrics and metrical phonology. Including discussion of different phonological theories such as Articulatory Phonology, Intonational Phonology, prosodic morphology, feature theory, segmental theories (vowel harmony systems), as well as user-based approaches to phonology. PREREQUISITE: LIN 427, or instructor's permission. CREDITS: 4.

### **LIN 520 SYNTAX**

This is a graduate class on syntactic theory, focusing mainly on modern transformational approaches (minimalism) to cross-linguistic language structure phenomena. In addition to reading original research leading up to the current state of the art, the course will focus on several case studies (such as pronoun/reflexive reference resolution and ellipsis phenomena) comparing transformational and non-transformational approaches. PREREQUISITE: LIN 460, 461 or 462; or instructor's permission. CREDITS: 4.

### **LIN 525 GRADUATE SEMANTICS**

This course examines a current issue in semantic theory, within the context of a broader theoretical approach to how natural languages meanings are to be analyzed. PREREQUISITE: LIN 465, 465 or 468; or instructor's permission. CREDITS: 4.

### **LIN 526 MORPHOLOGY**

The seminar examines the structure and definition of the linguistic unit "word" its typology and the relationship of the morphological component to other levels in the grammar. The course includes an introduction to analytical techniques with emphasis placed on an

examination of data from a range of languages. The building blocks of words will be analyzed and topics such as affixation, reduplication and inflectional and derivational morphology will be covered. We will examine the properties of words and how they fit into the larger structure of linguistic knowledge, including the relationship between words and syntactic structure (ex., phrases and sentences) and the relationship between words and phonological structure (ex., phonological rules and prosodic structure). PREREQUISITES: LIN110 or equivalent. CREDITS: 4.

### **LIN 528 LEXICAL SEMANTICS**

In this seminar we investigate the study of word-meaning in current linguistics and cognitive science. We examine the meanings of lexical items such as verbs, nouns, adjectives, and prepositions, and also other categories of words, including various function words and discourse particles. We examine theories of word-meaning, and examine how words and vocabulary may vary between languages. PREREQUISITES: LIN 410, LIN 420 or LIN 425 or permission of instructor. CREDITS: 4.

### **LIN 535 FORMAL PRAGMATICS**

This seminar explores current topics in pragmatics and its interfaces with other areas including prosody, syntax, semantics. Topics may include implicature, presupposition, at-issueness, speech act theory, information structure, the dynamics of discourse, and the structure of discourse contexts. In addition to discussing recent and classical theoretical works, the seminar aims to incorporate data and theoretical insights from various perspectives including fieldwork on non-English languages, psycholinguistics, and corpus methodologies. PREREQUISITE: LIN 465, 466 or 468; or instructor's permission. CREDITS: 4.

## **Relevant Brain and Cognitive Science Graduate Courses**

### **BCS 501 Language Sciences Core Course**

An interdisciplinary introduction to the field of natural language, emphasizing behavioral, linguistic, and computational perspectives. Topics include language structure, production, comprehension, and acquisition.

### **BCS 502 Cognition**

An interdisciplinary introduction to cognition. Topics covered include learning, memory, attention, concepts and categories, cognitive development, and reasoning, each considered from the perspectives of behavioral study, computational processes, and neural mechanisms.

**BCS 510 General Linear Approaches to Data Analysis**

Issues of data analysis in experimental research. The course focuses on parametric techniques, especially analysis of variance. Topics covered include simple and complex designs for between and within subjects factors, including mixed designs; analysis of covariance and trend and contrasts. The course includes a lab in which students are taught to use a popular statistical package for data analysis.

**BCS 511 Behavioral Methods in Cognitive Sciences**

This course reviews the leading methods used to investigate cognitive skills and/or their neural substrate in humans. The course is divided into several sections: accuracy and psychophysics; RT and processing states; interference, neighborhood effects and system dynamics; investigations of natural data; brain imaging methods as applied to the cognitive sciences; and issues when studying special populations such as infants, patients, animals or any non-compliant subject. Technical articles on each technique are discussed in combination with specific illustrations of how each has been used to investigate research questions.

**BCS 512 Computational Methods in Cognitive Science**

This course focuses on: (a) statistical tools that are useful for revealing structure in experimental data; and (b) representation and learning in statistical systems and the implications of these systems for the study of cognitive processes. Examples of the applications of computational methods from the cognitive neuroscience literature are examined throughout the course. Topics covered include: principal component analysis, multi-dimensional scaling, hierarchical and non-hierarchical clustering, regression, classification, time series modeling via hidden Markov models and Kalman filters, Hebbian learning, competitive learning, maximum likelihood estimation, and Bayesian estimation.

**BCS 555 Language Acquisition**

The course covers a broad range of topics on the child's acquisition of a native language, including literature on the acquisition of spoken and signed languages, as well as theories of the language learning process. Focus is on the acquisition of syntax and morphology.

**BCS 558 Music and the Mind**

Introduction to the discipline of music cognition. Topics include empirical methods, psycho-acoustic principles, Gestalt psychology, music and language, metric and tonal hierarchies, music and the brain, musical development, and research on memory, expectation, and emotion. Students are responsible for readings, discussion, midterm exam, and a major research paper.

**BCS 561 Speech Perception and Recognition**

Provides an overview of the theories and empirical findings on human speech perception and recognition. Topics include an overview of phonetics, categorical perception, speech perception by nonhumans and by human infants, perception of nonnative speech sounds, intermodal perception of speech, and the interaction between speech perception and production. Additional topics include talker, rate, and dialect variability, perception of sine-wave and noise-vocoded speech, gradient effects in consonant perception, cochlear implants and plasticity, brain correlates of speech perception (fMRI, MEG, ERP), and automatic speech recognition.

**BCS 562 Language Production**

Covers current and classic topics in the field of language production. Topics include speech error models, computational models of lexical/phonological encoding, issues in syntactic encoding, the incrementality of speech production, comprehension vs. production, and hearer vs. speaker-oriented accounts of production processes.

**BCS 563 Topics in Language Production and Comprehension**

This seminar offers an in-depth examination of selected topics in language comprehension, including lexical processing, parsing, and anaphora resolution. Theoretical ideas from linguistics and artificial intelligence are integrated with experimental studies of language processing.

**BCS 565 Language and the Brain**

This course will examine how the comprehension and production of language is implemented in the human brain. It will focus on spoken language (not written or signed language) and fMRI (not ERPs and other imaging modalities). We will consider a number of questions about brain activation to: speech vs non-speech/music, native vs non-native phonetics/phonology, effects of learning/expertise, lexical organization (neighborhood structure) and development, form-class and semantic category constraints on processing, and the role of perceptual brain regions in semantic processing. We will also explore new fMRI analysis methods and experimental designs that could be suitable for addressing these questions.

**Relevant Computer Science Graduate Courses****CSC 444 Logical Foundations of Artificial Intelligence**

An introduction to the logical foundations of AI, including first-order logic, search, knowledge representation, planning. Students taking this course at the 400 level will be

required to complete additional readings and/or assignments, including a significant project or essay

**CSC 446 Mathematical Foundations of Artificial Intelligence**

This course presents the mathematical foundations of artificial intelligence, including probability, decision theory and machine learning.

**CSC/LIN 447 Natural Language Processing**

An introduction to natural language processing: constructing computer programs that understand natural language. Topics include parsing, semantic analysis, and knowledge representation. CSC 447, a graduate-level course, requires additional readings and assignments.

**CSC/LIN 448 Statistical Speech and Language Processing**

An introduction to statistical natural language processing and automatic speech recognition techniques. This course presents the theory and practice behind the recently developed language processing technologies that enable applications such as speech-driven dictation systems, document search engines (e.g., finding web pages) and automatic machine translation. Students taking this course at the 400 level will be required to complete additional readings and/or assignments.

**CSC 460 Topics in Language Understanding**

This course will examine recent research in computational linguistics and artificial intelligence on natural language dialog systems. Students will take turns leading the discussion of current research papers. Undergraduates taking the course for credit will also be required to prepare a written review of one of the papers. Graduates taking the course may have additional readings or assignments. It may be repeated for credit with permission of the instructor.

Department of Linguistics  
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