Electrical and Computer Engineering
MSE Concentration in Language and Speech Processing

Introduction
As part of its educational mission, The Center for Language and Speech Processing (CLSP), a joint center between Electrical and Computer Engineering and Computer Science, coordinates a full complement of courses dealing with a diverse array of topics in language and speech. It also offers a weekly seminar featuring prominent speakers in speech and language processing. Finally, it is the host of the widely-known CLSP summer research workshop, an event drawing researchers at all levels (faculty to undergraduate) from around the world to conduct intensive research on fundamental problems.

General Requirements
Students are expected to satisfy all the requirements of the ECE Master’s program. In addition, they are expected to satisfy the following requirements:

- Completion of eight one-semester graduate courses (400-799 level), and
- Completion of (1) two additional graduate courses, or (2) a master’s essay, or (3) a special research project approved by an ECE faculty member.

Track 1: Speech Processing Systems

ECE Courses Relevant to the Concentration
Courses in the ECE Department (not all courses are offered every year):

EN.520.419 Theory and Design of Iterative Algorithms (G. Meyer)
EN.520.435 Digital Signal Processing (H. Weinert)
EN.520.445 Audio Signal Processing (M. Elhilali)
EN.520.447 Information Theory
EN.520.646 Wavelets and Filter Banks (T. Tran)
EN.520.648 Compressed Sensing and Sparse Recovery (T. Tran)
EN.520.651 Random Signal Analysis (S. Khudanpur)
EN.520.652 Filtering and Smoothing (H. Weinert)
EN.520.666 Information Extraction from Speech and Text (S. Khudanpur)
EN.520.674 Information Theoretic Methods in Statistics (S. Khudanpur)
EN.520.701/702 Current Topics in Language and Speech Processing (S. Khudanpur)

Relevant Courses in Other Departments

Computer Science
EN.600.405 Applications of Probabilistic Graphical Models in Language and Speech
EN.600.475 Machine Learning
EN.600.735 Selected Topics in Machine Learning
EN.600.765 Selected Topics in Natural Language Processing
EN.600.775 Current Topics in Machine Learning
Applied Mathematics and Statistics
EN.550.630  Statistical Theory I
EN.550.631  Statistical Inference
EN.550.661  Foundations of Optimization
EN.550.723  Markov Chains
EN.550.735  Topics in Statistical Pattern Recognition

Biomedical Engineering
580.691  Learning Theory

Track 2: Biomimetic Sensory Systems

ECE Courses Relevant to the Concentration
Courses in the ECE Department (not all courses are offered every year):

EN.520.435  Digital Signal Processing (H. Weinert)
EN.520.445  Audio Signal Processing (M. Elhilali)
EN.520.515  Introduction to Information Processing of Sensory Systems (H. Hermansky)
EN.520.646  Wavelets and Filter Banks (T. Tran)
EN.520.648  Compressed Sensing and Sparse Recovery (T. Tran)
EN.520.652  Filtering and Smoothing (H. Weinert)
EN.520.671  Brain Computer Interfaces
EN.520.680  Speech and Auditory Processing in Humans and Machines (H. Hermansky)
EN.520.682  Computational and Systems Neuroscience (M. Elhilali)
EN.520.735  Sensory Information Processing (A. Andreou)

Relevant Courses in Other Departments

Computer Science
EN.600.475  Machine Learning
EN.600.775  Current Topics in Machine Learning

Biomedical Engineering
EN.580.422  Systems Bioengineering II
EN.580.625/626  Structure and Function of the Auditory and Vestibular Systems
EN.580.630  Theoretical Neuroscience
EN.580.639  Models of the Neuron
EN.580.691  Learning Theory

Applied Mathematics and Statistics
EN.550.630  Statistical Theory
EN.550.631  Statistical Inference

Neuroscience
AS.080.620  Theoretical and Computational Neuroscience


**Track 3: Human Language Technologies**

**ECE Courses Relevant to the Concentration**

*Courses in the ECE Department (not all courses are offered every year):*

EN.520.419 Theory and Design of Iterative Algorithms (G. Meyer)
EN.520.435 Digital Signal Processing (H. Weinert)
EN.520.445 Audio Signal Processing (M. Elhilali)
EN.520.447 Information Theory (S. Khudanpur)
EN.520.651 Random Signal Analysis (S. Khudanpur)
EN.520.666 Information Extraction from Speech and Text (S. Khudanpur)
EN.520.674 Information Theoretic Methods in Statistics (S. Khudanpur)
EN.520.680 Speech and Auditory Processing in Humans and Machines (H. Hermansky)
EN.520.701/702 Current Topics in Language and Speech Processing (S. Khudanpur)

**Relevant Courses in Other Departments**

**Computer Science**
EN.600.405 Applications of Probabilistic Graphical Models in Language and Speech
EN.600.465 Introduction to Natural Language Processing
EN.600.466 Information Retrieval and Web Agents
EN.600.475 Machine Learning
EN.600.735 Selected Topics in Machine Learning
EN.600.765 Selected Topics in Natural Language Processing
EN.600.766 Selected Topics in Meaning, Translation and Generation of Text
EN.600.775 Current Topics in Machine Learning

**Cognitive Science**
AS.050.607 Phonetics
AS.050.617 Semantics I
AS.050.620 Syntax I
AS.050.625 Phonology I

**ECE Activity in Communications**

**Core Faculty**
- Professor Andreas G. Andreou
- Associate Professor Mounya Elhilali
- Professor Hynek Hermansky
- Associate Professor Sanjeev Khudanpur

**Research Activity**
- Towards Robust Speech Processing Systems
Contact Information

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