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
**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 Language and Speech Processing**

**Core Faculty**

- Andreas G. Andreou
- Mounya Elhilali
- Hynek Hermansky
- Sanjeev Khudanpur

**Research Activity**

- Towards Robust Speech Processing Systems
- Zero-Resource Speech Retrieval
Contact Information

Debbie Race, Academic Program Administrator
Johns Hopkins University
Dept. of Electrical and Computer Engineering
3400 N. Charles St., Barton Hall 105
Baltimore, MD 21218

Phone: 410-516-4808
Fax: 410-516-5566