This course will cover a variety of modern topics in the field of signal processing with a focus on the hottest developments of the last decade. It is designed to bring the student up to the moment in order to work on research or development in the field of signal processing. Major topics include:

Modern Signal Representations:
Modern Deterministic and Statistical Models for Images including wavelets, curvelets, Hidden Markov models, bounded/total variation models and more.

Current State-of-the-Art in Signal Processing Applications
Course examples will be drawn from medical imaging, neurological signals, and more.

Compressive Sensing: The revolution in sampling and reconstruction that allows recovery of signals sampled at many times lower than the Nyquist rate.

The Use of Machine Learning Methods for Signal Detection, Classification, and Retrieval
Including problems of character/face recognition, learning of neural responses to specific objects, style/topic classification of articles, music, and artwork, and more.

Methods for Learning the Underlying Structure and Organization of Large Data Sets

The course will include hands-on projects involving processing and analysis of real data sets from neuroscience, medical imaging, art imaging, and more.

Prerequisites: ECEN 5632 or a previous course in linear systems, working knowledge of probability and linear algebra, some experience in MATLAB