

# **ECE4271 Course Syllabus**

## **ECE4271**

### **Applications of Digital Signal Processing (3-0-3-4)**

#### **CMPE Degree**

This course is Elective for the CMPE degree.

#### **EE Degree**

This course is Elective for the EE degree.

#### **Lab Hours**

3 supervised lab hours and 0 unsupervised lab hours

#### **Course Coordinator**

Ma,Xiaoli

#### **Prerequisites**

(ECE 3077, ISYE 3770, or MATH 3670) and ECE2026

#### **Corequisites**

None

#### **Catalog Description**

Applications of DSP in speech, image processing, radar, pattern recognition, and adaptive filtering requiring working software implementations applied to the analysis of real signals.

#### **Textbook(s)**

No Textbook Specified.

#### **Course Outcomes**

Upon successful completion of this course, students should be able to:

1. Apply Digital Signal Processing Theories to real life signals and data.
2. Apply Machine Learning Methodologies to real life signals and data.
3. Express signal processing systems in mathematical form.
4. Write code describing a signal processing and machine learning system.
5. Describe how signal processing and machine learning are used in applications (e.g., audio and digital image processing).

#### **Student Outcomes**

In the parentheses for each Student Outcome:

"P" for primary indicates the outcome is a major focus of the entire course.

"M" for moderate indicates the outcome is the focus of at least one component of the course, but not majority of course material.

"LN" for "little to none" indicates that the course does not contribute significantly to this outcome.

1. ( P ) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. ( M ) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. ( LN ) An ability to communicate effectively with a range of audiences
4. ( LN ) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. ( LN ) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. ( LN ) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. ( LN ) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### **Topical Outline**

Review of Basic DSP and Machine Learning Methods

Pattern Recognition

Regression

Classification, Segmentation, and Clustering

Convolutional Neural Networks (CNNs)

Sequence Modeling and Recurrent Neural Networks (RNNs)

Various types of signals including: Speech, Image, Video, Medical,