

# FINAL PROJECT

Zhejiang University-University of Illinois at Urbana-Champaign (ZJU-UIUC) Institute  
Zhejiang University, Haining, Zhejiang, China

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<b>Instructor:</b>	Said Mikki	<b>Due:</b>	January 11, 10:00AM
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1. **The performance of amplitude modulation with noise.** Build an AM system using Python (or any other language). Please simulate the envelop modulation by a sinusoidal wave with a modulation index of 0.3, include AWGN noise, and then envelop-detect the message. Choose a suitable baseband signal for AM communications. Plot its time domain and frequency domain forms.

- (1) Plot the envelop modulated signal (with and without noise).
- (2) Plot its spectrum (with and without noise).
- (3) Plot the envelope-detected signal before low-pass filtering (with and without noise).
- (4) Estimate numerically the post-detection SNR.
- (5) Compare the post-detection SNR to theory for both low and high pre-detection SNR.

2. **The performance of frequency modulation with noise.** Choose a suitable baseband signal for FM communications. Plot its time domain and frequency domain forms. Build an FM system using Python (or any other language). Apply AWGN noise to the system.

- (1) Plot the spectrum of the passband FM signal (with and without noise).
- (2) Plot the spectrum of the band-pass FM (with and without noise).
- (3) Plot the spectrum of the detected signal prior to low-pass filtering (with and without noise).
- (4) Plot the spectrum of the detected signal after low-pass filtering (with and without noise).
- (5) Estimate numerically the post-detection SNR.
- (6) Compare pre-detection and post-detection SNRs for the FM receiver for both low and high pre-detection SNR.

Provide ample comments and figures to support your results.