# Final project

Zhejiang University-University of Illinois at Urbana-Champaign (ZJU-UIUC) Institute
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| **Instructor:** | Said Mikki | **Due:** | TBD, 10:00AM |
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1. **The performance of amplitude modulation in 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.
(1) Plot the envelop modulated signal.
(2) Plot its spectrum.
(3) Plot the envelope-detected signal before low-pass filtering.
(4) Compare the post-detection SNR to theory for both low and high pre-detection SNR.

2. **The performance of a FM in noise**. Build an FM system using Python (or any other language). Apply AWGN noise to the system.
(1) Plot the spectrum of the baseband FM signal.
(2) Plot the spectrum of the band-pass FM plus noise.
(3) Plot the spectrum of the detected signal prior to low-pass filtering.
(4) Plot the spectrum of the detected signal after low-pass filtering.
(5) Compare pre-detection and post-detection SNRs for the FM receiver for both low and high pre-detection SNR.

Provide ample comments on your results.