

## Lab 3: Simulink Libraries and Amplitude Modulation

### Objectives:

- 1) To learn to build libraries in Simulink.
- 2) To simulate Amplitude Modulation (AM) and demodulation.

### Introduction:

A useful feature in Simulink is the ability to create user-made libraries. For example, if you implement a certain modulation scheme using various blocks and wish to use this scheme in several different models down the road, you can create a library with all of the blocks you need, then open it later and pull out the blocks you need just as you do with the built-in Simulink libraries.

Modulation, by definition, is a process by which a certain characteristic of a fixed carrier wave is varied in accordance with an information-bearing signal. The primary motivation for modulation is to facilitate transmission of the information-bearing signal over a communication channel with a specific frequency range. For example, a human voice may have frequencies between 100 and 3000 Hz, but if this signal were to be transmitted via RF directly at those frequencies, only one voice could be transmitted at a time without interference (and it would require an antenna the length of the United States). By modulating and transmitting the signal at a much higher frequency, we can communicate over a much wider variety of channels, and also share these channels with other signals.

Amplitude modulation refers to the manipulation of the amplitude of a carrier wave in some manner to transmit the required information. In the simplest case, the information signal is multiplied by the carrier wave, creating a new signal that has frequencies above and below the carrier wave, but none at the original frequencies of the message signal. This is very useful for a wide array of applications, since we can effectively choose which frequency range our message gets transmitted over.

**Preliminary:** Assume your message is a sine wave and AM modulation index is  $\alpha = 0.5$ . Find the modulation efficiency of the AM scheme.