ECE 447 Fall 2025

Lesson 08
Amplitude Modulation, Part 1

Life/Leadership Lesson of the Day

- **Proofread everything!**
  - Emails
  - Letters
  - Memos
  - Text messages
  - ...
- **and signs?**

Schedule and Admin

- Schedule
- Admin
  - **HW problems**... or problems with HW?
  - **Lab 2 Assignment**. The assignment associated with Lab 2 is due Lesson 10 - specifically 3 Sep by 2359 via Gradescope upload.

  - When are you going to get things graded??? Working on it...

Did You Do the Reading?

What was the video *baseband* for the old analog TV signals?

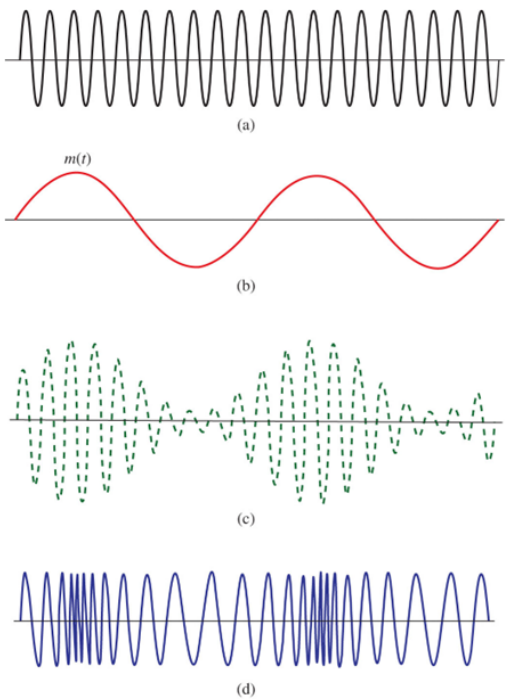
Where do we see *baseband communications*?

Where do we see *carrier communications*?

Modulation means *changing* something about a signal - and not always just shifting the signal's frequencies

Modulation

- Message signal: $m(t)$
- General carrier modulated signal: $s(t) = A(t)\cos\left[2\pi f_c t + \phi(t)\right]$
- Amplitude (linear) modulation, $A(t)$
  - $s_1(t) = m(t) \cdot \cos\left(2\pi f_c t\right)$
  - $S_1(f) = \frac{1}{2}M(f - f_c) + \frac{1}{2}M(f + f_c)$
- Angular modulation, f_c or $\phi(t)$
  - Message modulates frequency or phase
  - Notice the general equation doesn't have $f_c(t)$ - frequency modulation is a little different - more in future!



Double-Sideband, Suppresed-Carrier (DSB-SC)

- Simplest form of AM
- Learned this in ECE 215
- $\varphi_{DSB-SC}(t) = A_c m(t)\cos(\omega_c t)$
- Over-, under-, or 100%-modulated?

- Demodulation
  - Same as modulation with LPF
  - What if $f_c < B$?

  - Reality, $f_c/B \gg 1$ to avoid distortion
  - Difficult to achieve synchronized carrier signals for receiver