EE 4501 - Class 10 Summary and Reading Guide
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- We found, experimentally, that FM had a very large bandwidth. This is justified mathematically in pages 259 and 260. These pages also also provide an approximation for FM when bandwidth is very small (in fact, very close to the bandwidth of AM). This is called Narrowband FM (NBFM). We will study the characteristics of Wideband FM (WBFM) next class.

- In practice, we use Carson’s rule to estimate the bandwidth of FM or PM, where the bandwidth estimate is given by $2(\Delta f + B)$, where $\Delta f$ is the peak frequency deviation, which is the difference between the maximum (or minimum) frequency of the FM waveform, and the center frequency. $B$ is the bandwidth of the message signal $m(t)$. If a message signal has a certain maximum/minimum value, $\Delta f$ for FM and PM can be computed using the equations given on pages 262-263 (at the bottom of each of these pages).

- The ratio of the frequency deviation to $B$ is often called the “modulation index”, $\beta$. The larger $\beta$ is, the more is the bandwidth used by FM/PM, relative to the message signal bandwidth.

- If two message signals were modulated by exactly the same carrier, in AM, the demodulator will demodulate the sum of the two message signals. In other words, the message signals will interfere. However, we saw experimentally (and mathematically) in class, that FM does not work this way: instead the stronger of the two signals is demodulated, and only one message signal is heard at the output of the demodulator. The other message signal is “suppressed”, in a sense. This is called the “Capture Effect” or “Interference Effect”, and the math that explains this is on page 285.

- Commercial broadcast FM actually uses a combination of AM and FM, in order to maintain computability with both mono and stereo FM receivers. The details of how this is accomplished are described in Section 5.7.

- There is an interesting note on the history of FM on page 270 (you will not be responsible for this material, it is optional).