

Principles of Communications

EES 351

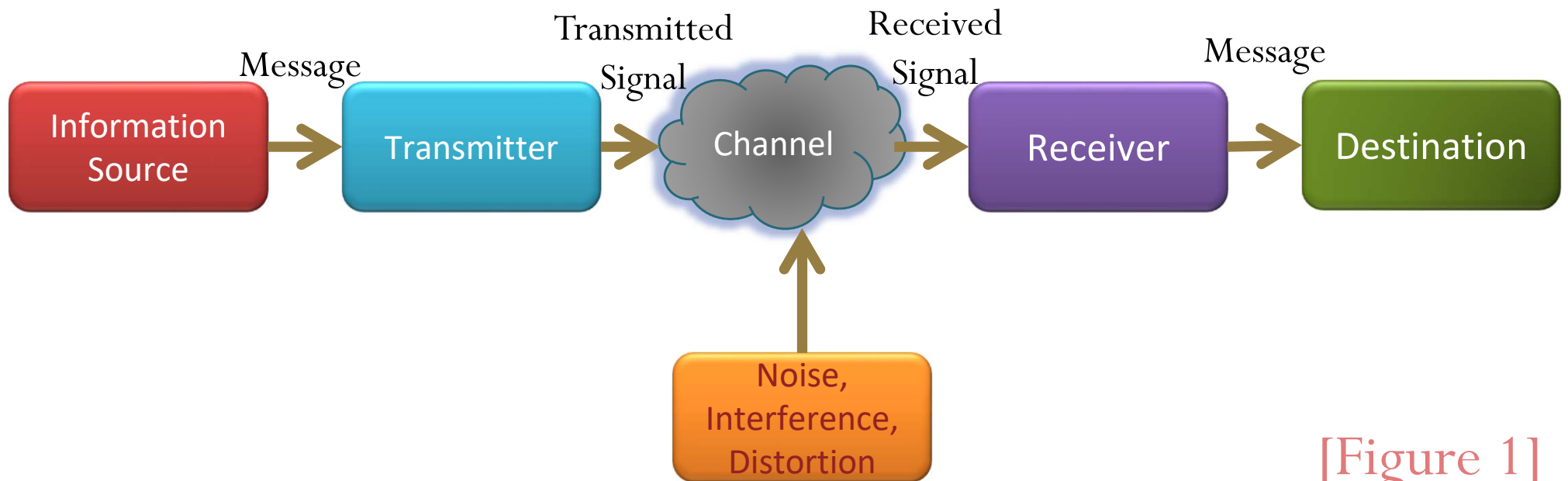
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Summary of Chapters 7 and 8

[Definition 1.2]

Basic elements of communication



[Figure 1]

CH 3-5


- Chapters 3-5



AM (4.3-4.5)
 QAM (4.6)
 FM, PM (CH5)

Sinusoidal Carrier: $A\cos(2\pi f_c t + \phi)$

Band-limited to B
 Bounded by $\pm m_p$

Analog $m(t)$ 

AM: $x_{AM}(t) = (A + m(t)) \cos(2\pi f_c t + \phi)$

PM: $x_{PM}(t) = A \cos\left(2\pi f_c t + \phi + k_p m(t)\right)$

Useful for plotting $x_{PM}(t)$ over the time intervals where $m(t)$ is differentiable. $f(t) = f_c + \frac{k_p}{2\pi} \frac{d}{dt} m(t)$

FM: $x_{FM}(t) = A \cos\left(2\pi f_c t + \phi + 2\pi k_f \int_{-\infty}^t m(\tau) d\tau\right)$

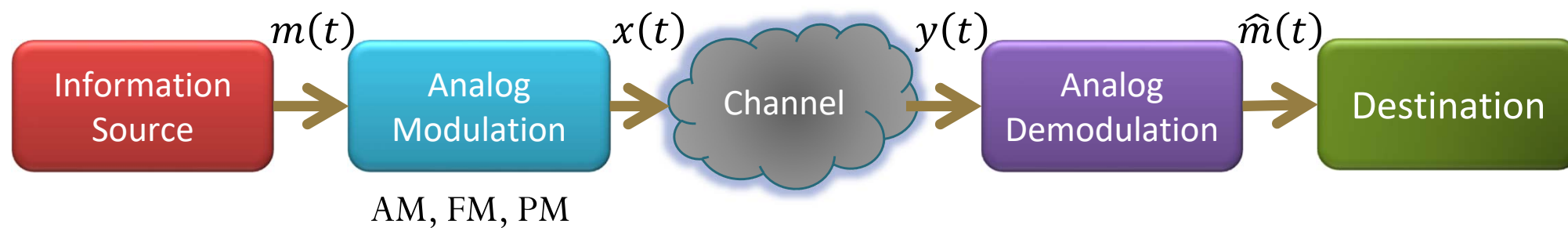
$f(t) = f_c + k_f m(t)$

$$\begin{aligned}
 x_{QAM}(t) &= m_1(t)\sqrt{2} \cos(2\pi f_c t) + m_2(t)\sqrt{2} \sin(2\pi f_c t) \\
 &= \sqrt{2}E(t) \cos(2\pi f_c t + \phi(t)) \\
 &= \sqrt{2}\{(m_1(t) - jm_2(t))e^{j2\pi f_c t}\}
 \end{aligned}$$

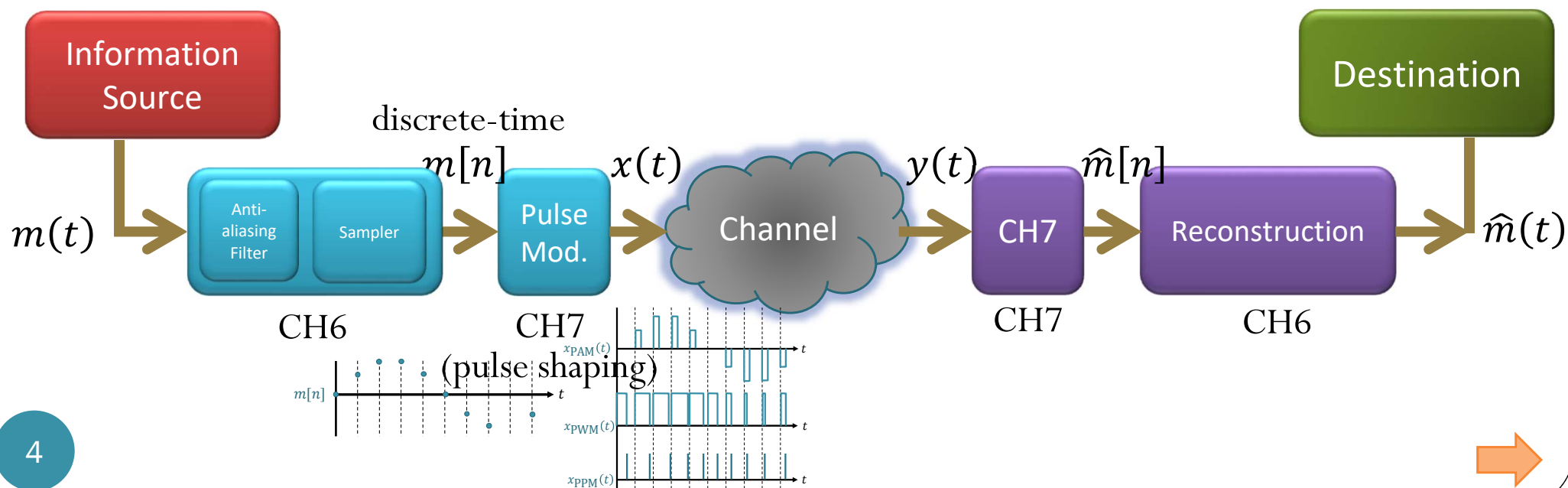


CH 3-5 vs. CH 6-7

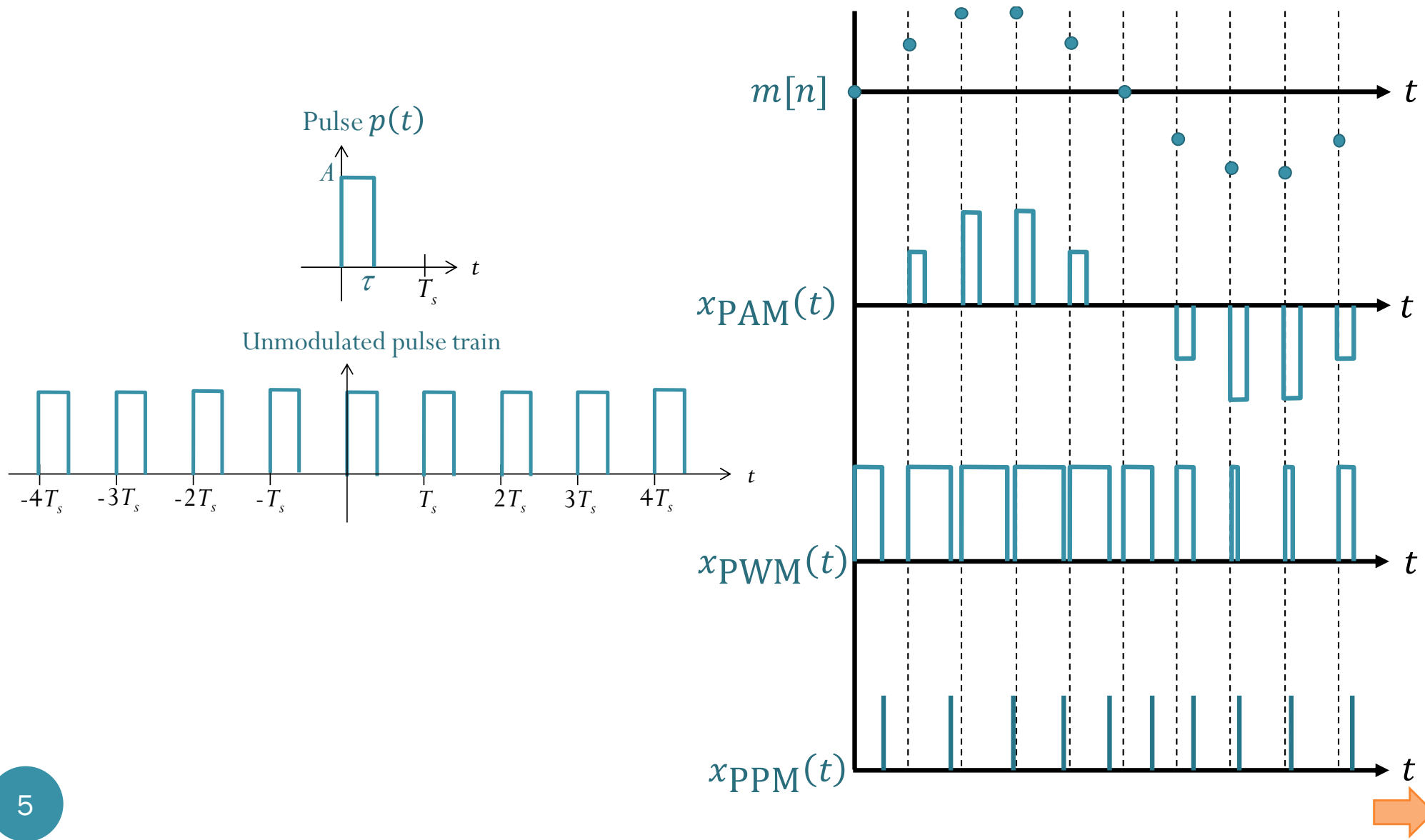
- Chapters 3-5



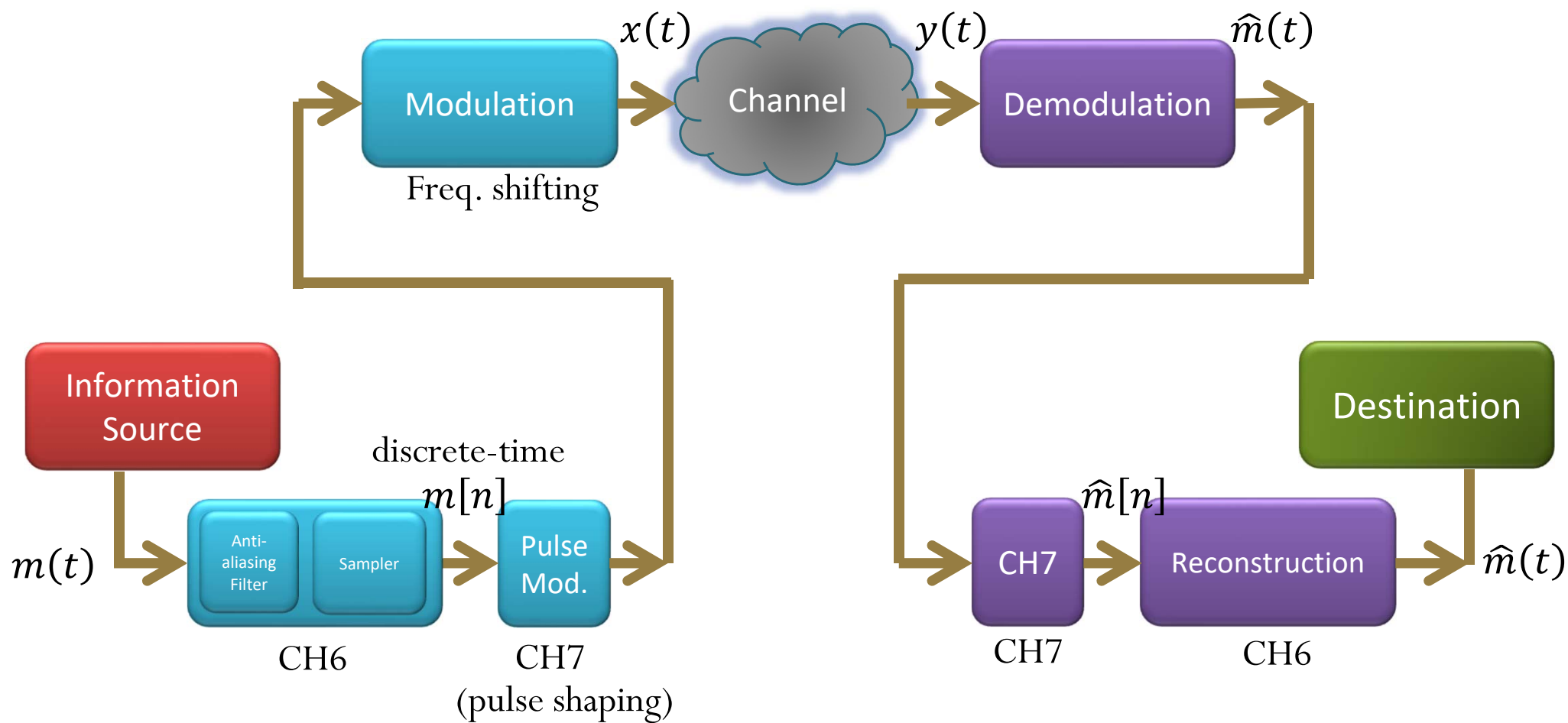
- Chapters 6-7



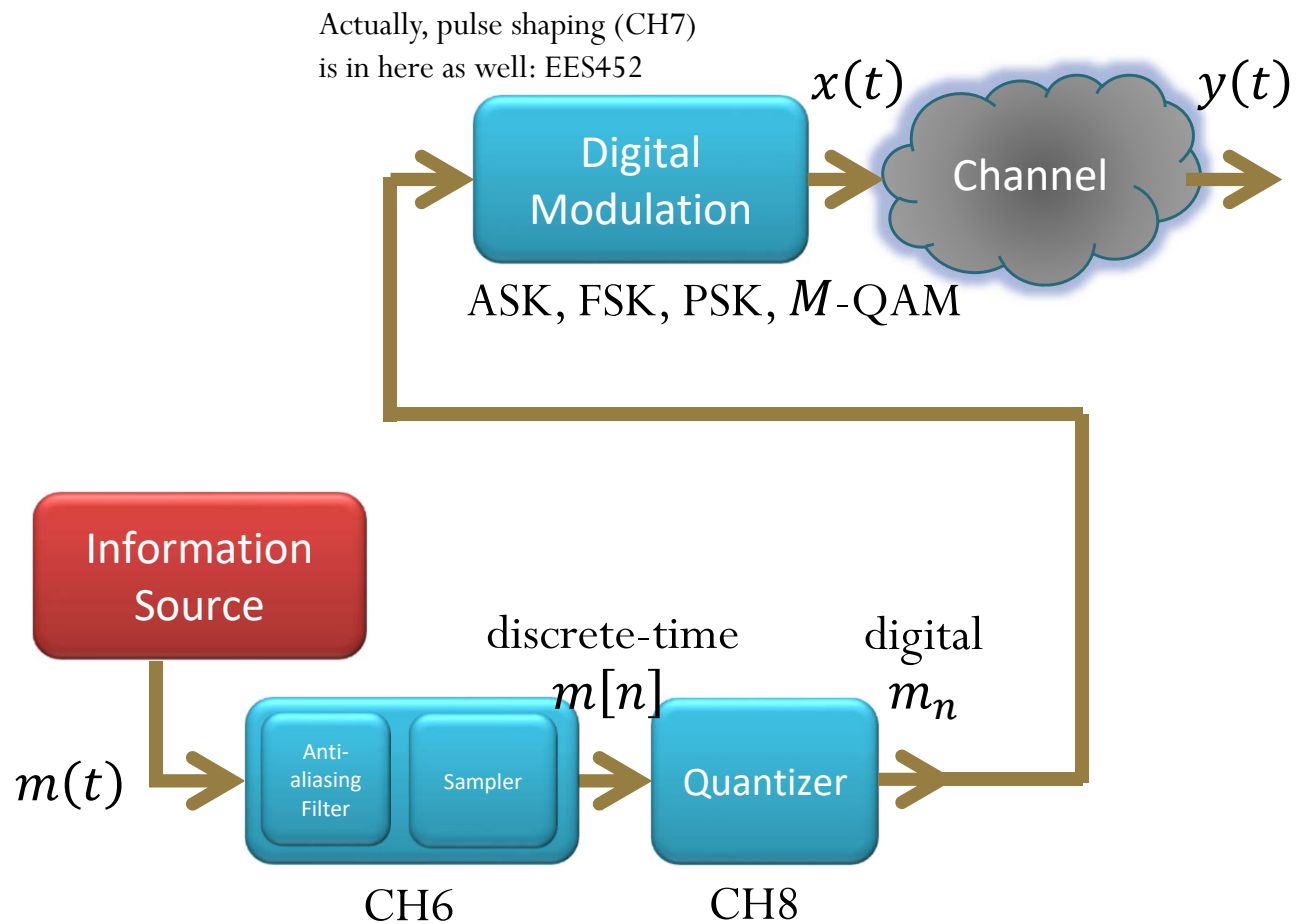
Analog Pulse Modulation



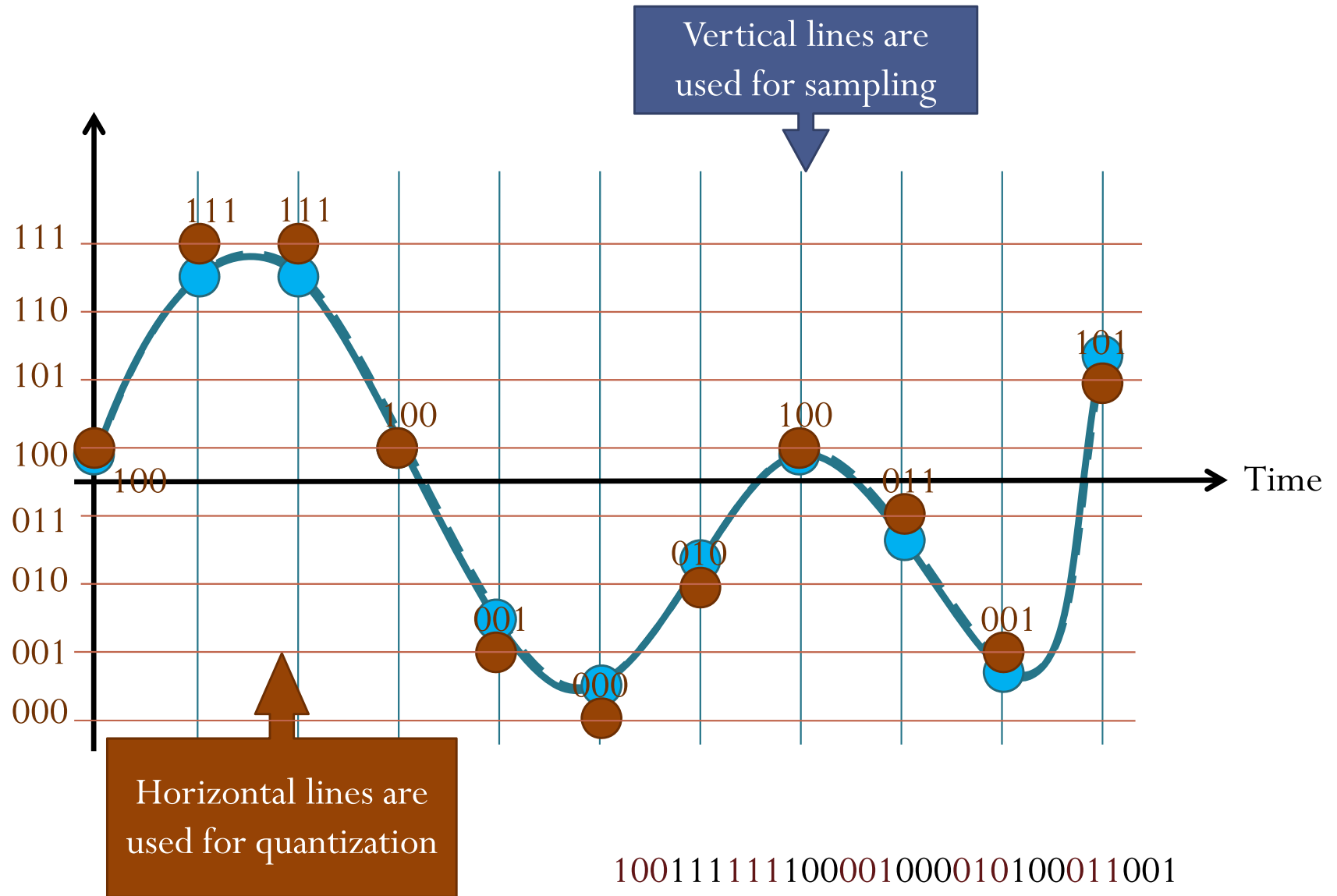
CH 3-5 + CH 6-7



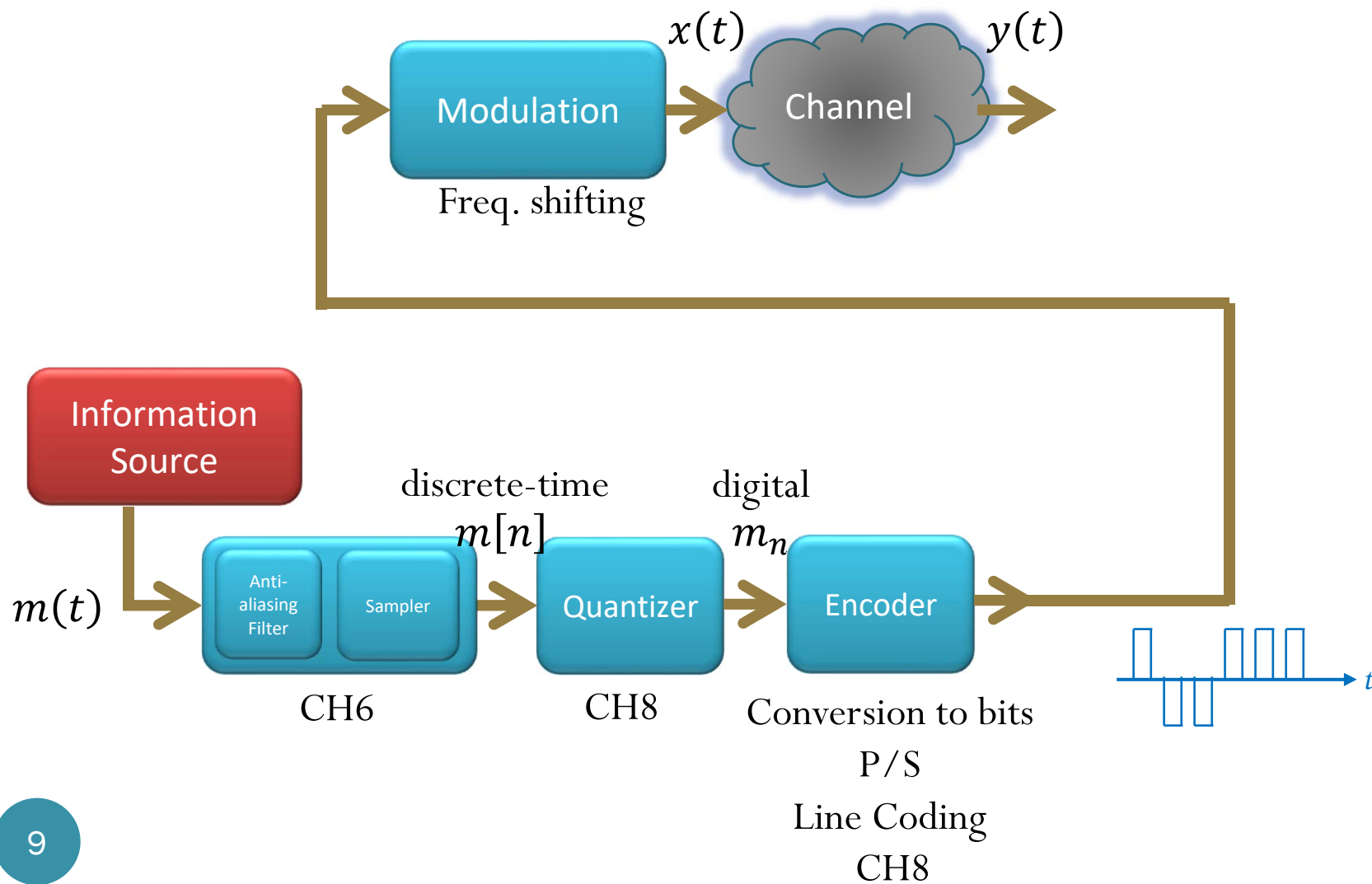
CH 3-5 + CH 6 + CH 8



PCM: Pulse Code Modulation

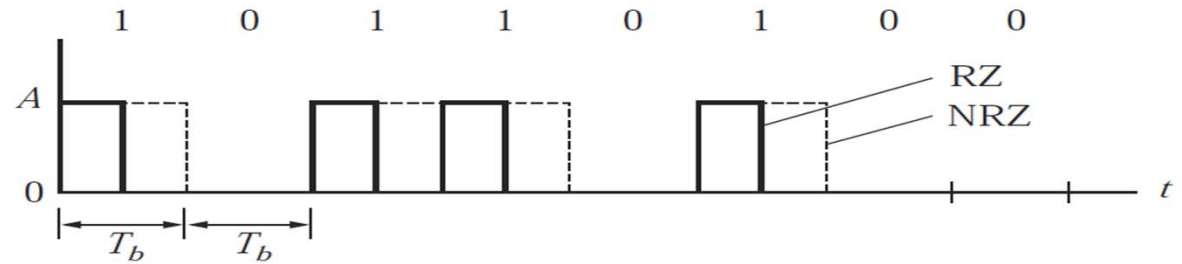


CH 3-5 + CH 6 + CH 8

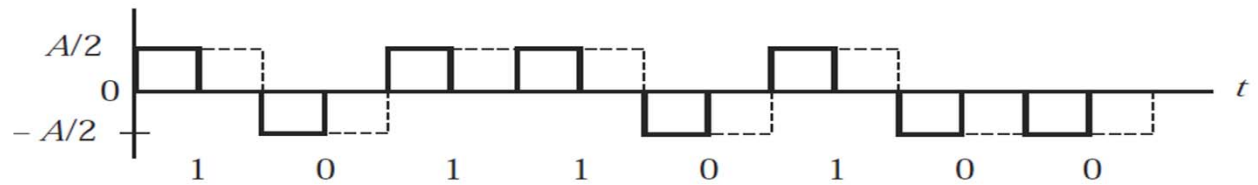


Line Codes

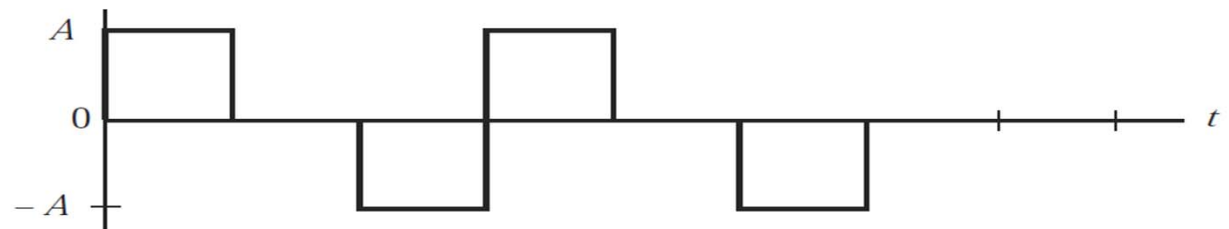
Unipolar



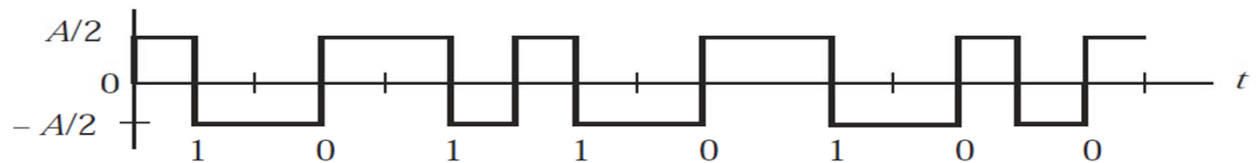
Polar



Bipolar



Manchester



4-PAM

