Lecture 1

Note Title 7/29/2008

EE419 (Digital Communications)

- Signals + Systems
- DSP
- Probability + Random Processes

} good familiarity

EE471 (Lab)

Quiz 1 + Quiz 2 + Finals

25% 25% 50%

(option)

Digital Communications by Barry, Lee + Messer...

→ Proakis, Madhow

A slot :

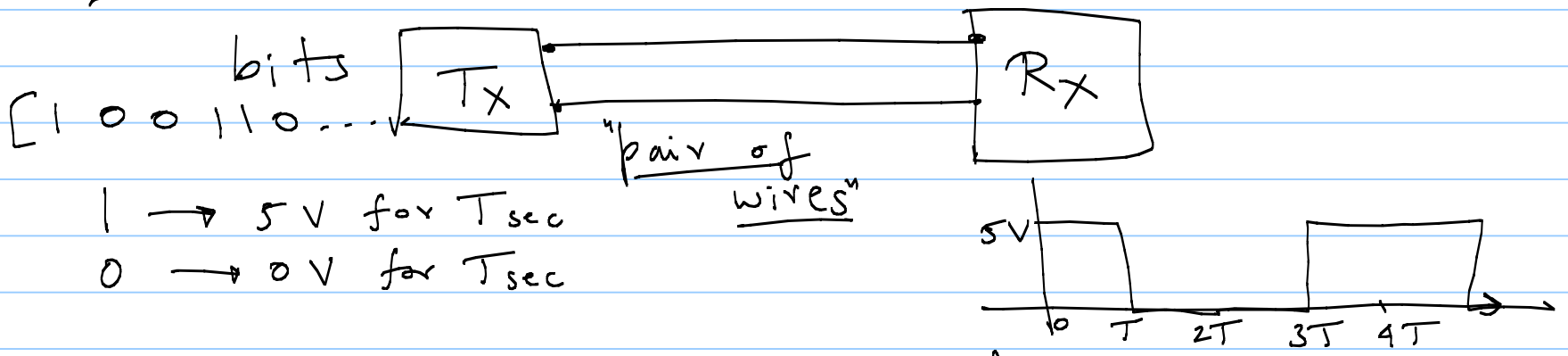
Mon 8 am

Tue 11 am

Wed 9 am

Thu 1 pm

Introduction



Step 1 : Convert bits to signal (Modulation)

bits → random

signal → - Power
- Rate = 1/T bits/sec
- Spectrum.

Step 2: Transmit signal to get a received signal.

"pair of wires": LTI system → impulse response $h(t)$

Freq. response $H(f)$.

"receiver noise": additive

"Linear Gaussian"

$$y(t) = x(t) * h(t) + n(t)$$

- $y(t)$: received signal
- $x(t)$: transmit signal
- $h(t)$: channel response – deterministic
- $n(t)$: additive noise "Gaussian random process"

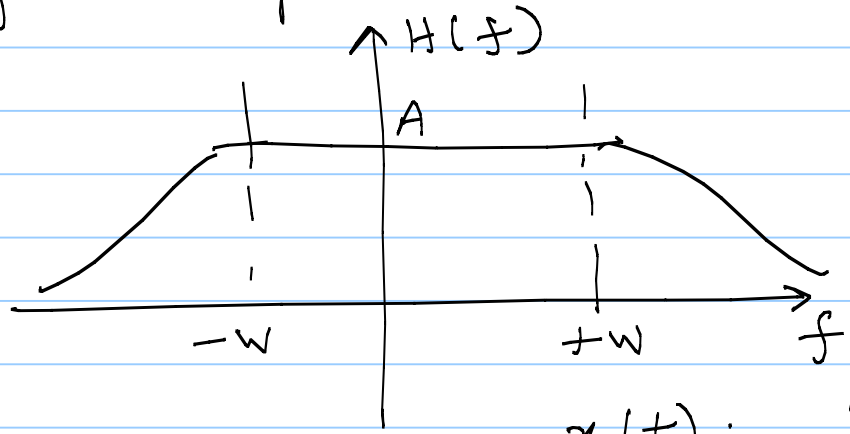
Problem: "Communicate" bits from Tx to Rx

(1) as fast as possible

(2) error-free

Ideal: $h(t) = \delta(t)$, $H(f)$: infinite BW.

Simplifying assumption:

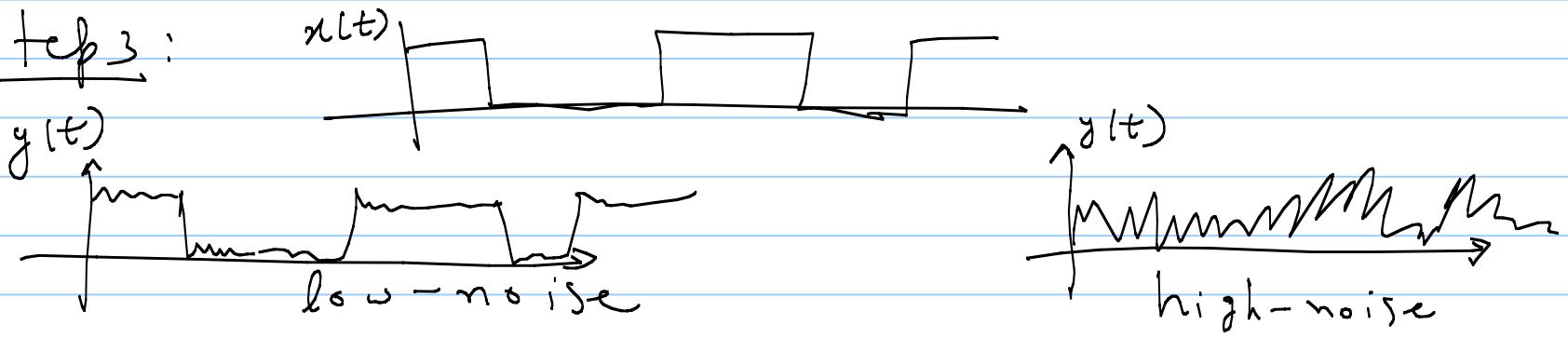


$A = 1$

$x(t)$: $X(f) = 0$, $|f| > W$

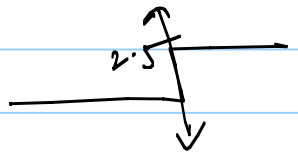
$$y(t) = x(t) + n(t)$$

Step 3:



Sample at $T/2$, $3T/2$, $5T/2$, ...

to get y_1 y_2 y_3 ....



$y_i > 2.5V$, $\hat{b}_i = 1$

$< 2.5V$, $\hat{b}_i = 0$

→ there can be errors $\hat{b}_i \neq b_i$

→ Power, rate, BW, error rate