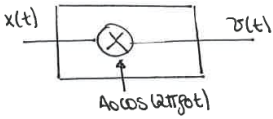
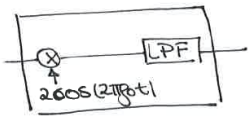
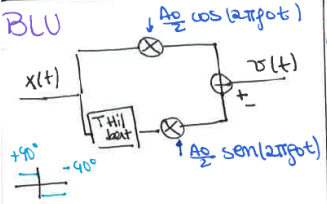
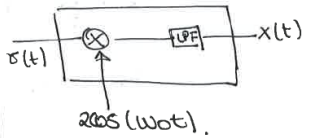
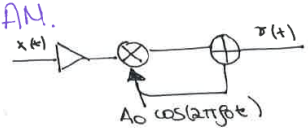
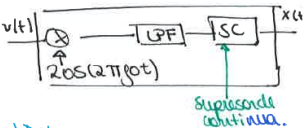
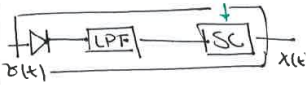
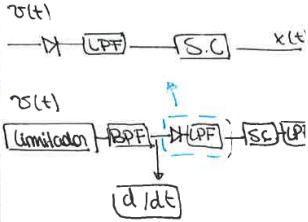
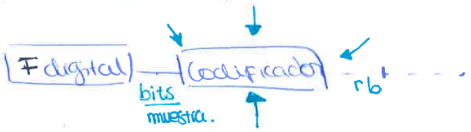
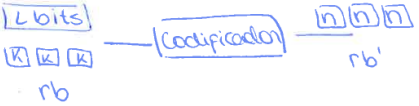
MODULACIÓN	SNRO	BT	DEMODULADOR.
DBL  $A_0 x(t)\cos(2\pi f_0 t) = v(t)$ R(t)	$SNR_O = 2SNR_i$ $SNR_i = \frac{\frac{A_0^2}{2}\cdot P_x}{N_0 B_T \cdot L}$ $SNR_O = \frac{A_0^2 P_x}{N_0 B_T}$	$B_T = 2B_x$ $P_{DBL} = \frac{A_0^2}{2} P_x$.	1) Demodulador coherente. 
BLU  $v(t) = \frac{A_0}{2}[x(t)\cdot\cos(\omega_0 t) \pm \hat{x}(t)\,\text{sen}(\omega_0 t)]$	$SNR_O = SNR_i$ $SNR_i = SNR_O = \frac{\frac{A_0^2}{4}\cdot P_x}{N_0 B_T}$	$B_T = B_x$ $P_{BLU} = \frac{A_0^2}{4} P_x$	demodulador coherente. 
AM.  $v(t) = A_0(1 + m\,x(t))\cos(\omega_0 t)$ $0 \le m \le 1$	$SNR_O = 2\eta SNR_i$ $\eta = \frac{m^2 P_x}{1 + m^2 P_x}$ $P_{AM} = \frac{A_0^2}{2}(1 + m^2 P_x)$	$B_T = 2B_x$.	1) coherente / sincrono.  2) Detector de envolvente. 
FM:  $v(t) = A_0\cos(\omega_0 t + 2\pi f_d \int x(\lambda)d\lambda)$ $f_i(t) = f_c + f_d \cdot x(t)$ fase.	$SNR_O = 3\beta^2 \frac{B_T}{B_x} P_x SNR_i$ $D = \frac{f_d \cdot x_{max}}{B_x}$ $SNR_i \ge 11dB$.	$D < 0'4$ $B_T = 2B_x$ $0'4 \le D \le 10$ $B_T = 2(D+a)B_x$ $10 < D$ $B_T = 2DB_x$ $P = \frac{A_0^2}{2}$	2) Detector de envolvente en AM. 

Codificación de Canal



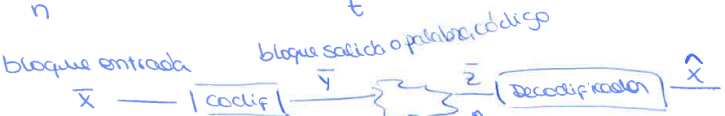
Codigos Bloque.



$n = K + r$ (bloques de entrada; bloques de salida; bits de redundancia)

Tasa de un código.

$t = \frac{K}{n} < 1 \qquad rb' = rb \frac{1}{t}$



Codificación:

$G = \underbrace{\quad}_{n} \updownarrow K$

$td = dmin - 1$

$tc = \frac{dmin - 1}{2}$

Decodificación:

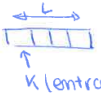
$H^T = n \updownarrow \underbrace{\quad}_{r}$

$x \to y \to z \to \hat{x}.$

Sindrome $= e\, H^T$

Codigos convolucionales:

memoria $= K(L-1)$



$I = K \cdot L$

Teorema de Shannon

$C = B_T \cdot \log\left(1 + \frac{S}{N}\right)$

↑ capacidad del canal

Comunicaciones Digitales.

A/D (conversor analógico digital)

Conversor A/D.

$T_m = \frac{1}{f_m}$ $\quad n = \frac{bits}{muestra}$

Nyquist.

$f_m \geq 2B_x$

SNRQ (de cuantificación)

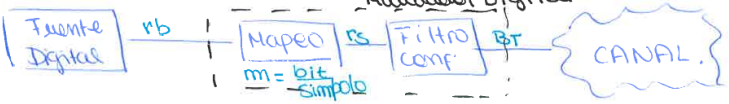
$$SNRQ\,(dB) = 6{,}02\,n - 1{,}76 - 10\log\frac{\sigma_{x^2}}{V^2_{max}}$$

Codificación de línea.

- Bipolar NRZ
- Bipolar RZ
- Unipolar NRZ
- Unipolar RZ

← + Ancho de banda

Modulador Digital



Receptor.

- Máxima verosimilitud
- Máximo a priori.

Probabilidad de error:

$P_e = P(x)\,Q\left(\frac{\text{distancia al umbral}}{\sigma}\right)$

$P_e = \frac{1}{2}\,erfc\left(\frac{\text{dist umbral}}{\sigma\sqrt{2}}\right)$

Coseno alzado:

$B_T = r_s\,(1+\beta)$

Banda base:
PAM

Paso banda:
M-PSK M-QAM