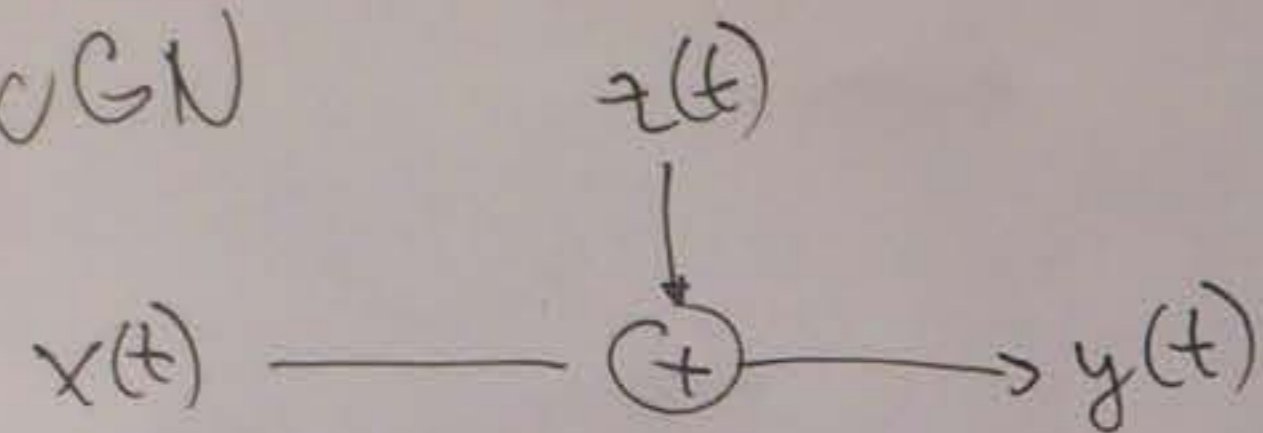
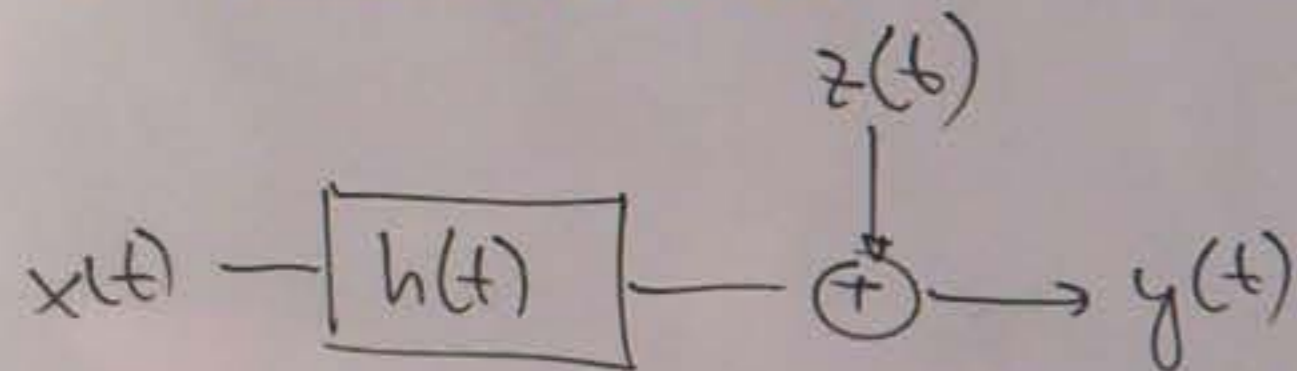


AWGN



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

→ linear Gaussian channel



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

- wired

- wireless (only for direct line-of-sight transmitter & receiver static)

CHANNEL ENCODING

- encoded signal is stream of 0s and 1s

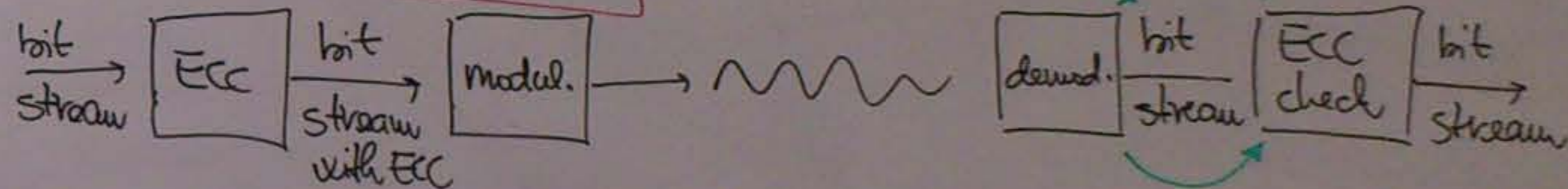
→ modulation (PSK, QPSK, QAM, ...)

→ convert signal to complex number → waveform ⊕ noise

→ different waveform at the receiver

→ demodulation main task: detect the correct transmitted waveform
↳ ERRORS !!

ERROR CORRECTING CODES



Shannon: A more sophisticated encoding scheme can achieve arbitrarily low error rates at any data rate below channel capacity

$$C = W \cdot \log_2 \left(1 + \frac{P}{N_0 W} \right) \text{ [bps]}$$

W [Hz] ... bandwidth of the channel

P [W] ... input power

N_0 [W/Hz] ... noise per unit bandwidth

only for AWGN
problem

Digital interfaces - complicating factors

- unequal data rates: rate of the source encoder \neq input rate of channel encoder
- errors: source decoder needs an exact replica of the encoded data, but not always the channel decoder is able to provide it
- networks: different paths to destination shared medium