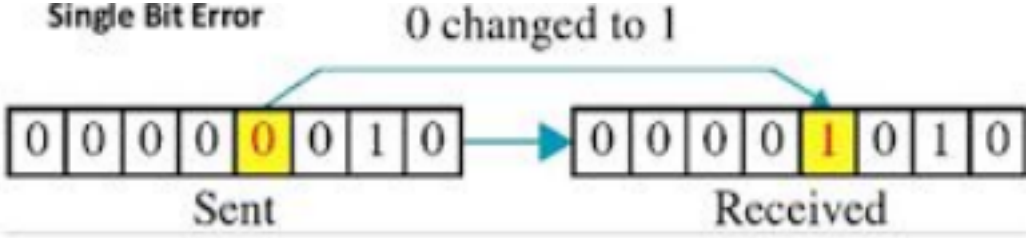
Coding Theory

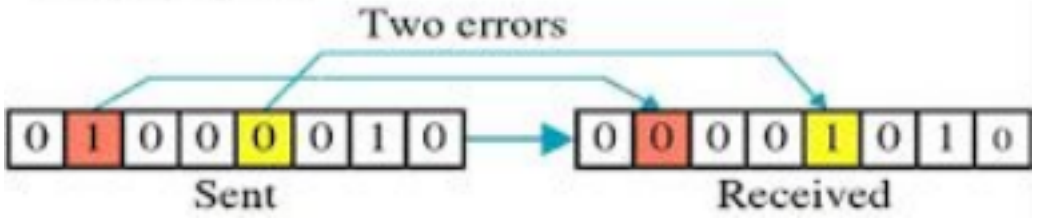
Hamming Code

We can’t avoid the interference of noise. But, we can get back the original data first by detecting whether any error present and then correcting those errors.

Single Bit Error



Multiple Bits Error



we can use the following codes.

- Error detection codes
- Error correction codes

Parity Code

Even Parity Code

Odd Parity Code

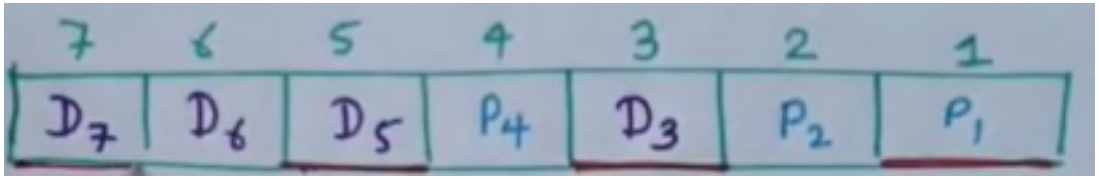
Even Parity Code

Binary Code	Even Parity bit	Even Parity Code
000	0	0000
001	1	0011
010	1	0101
011	0	0110
100	1	1001
101	0	1010
110	0	1100
111	1	1111

Odd Parity Code

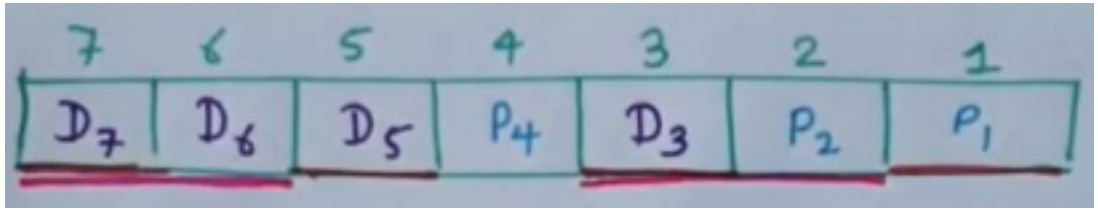
For P1, check 1 bit and skip 1 bit

$$P_1 = D_3 \oplus D_5 \oplus D_7$$



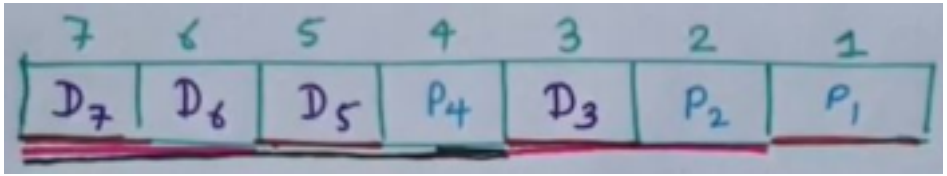
For P2, check 2 bits and skip 2 bits

$$P_2 = D_3 \oplus D_6 \oplus D_7$$



For P4, check 4 bits and skip 4 bits

$$P_4 = D_7 \oplus D_6 \oplus D_5$$



Example