

Wireless Communication

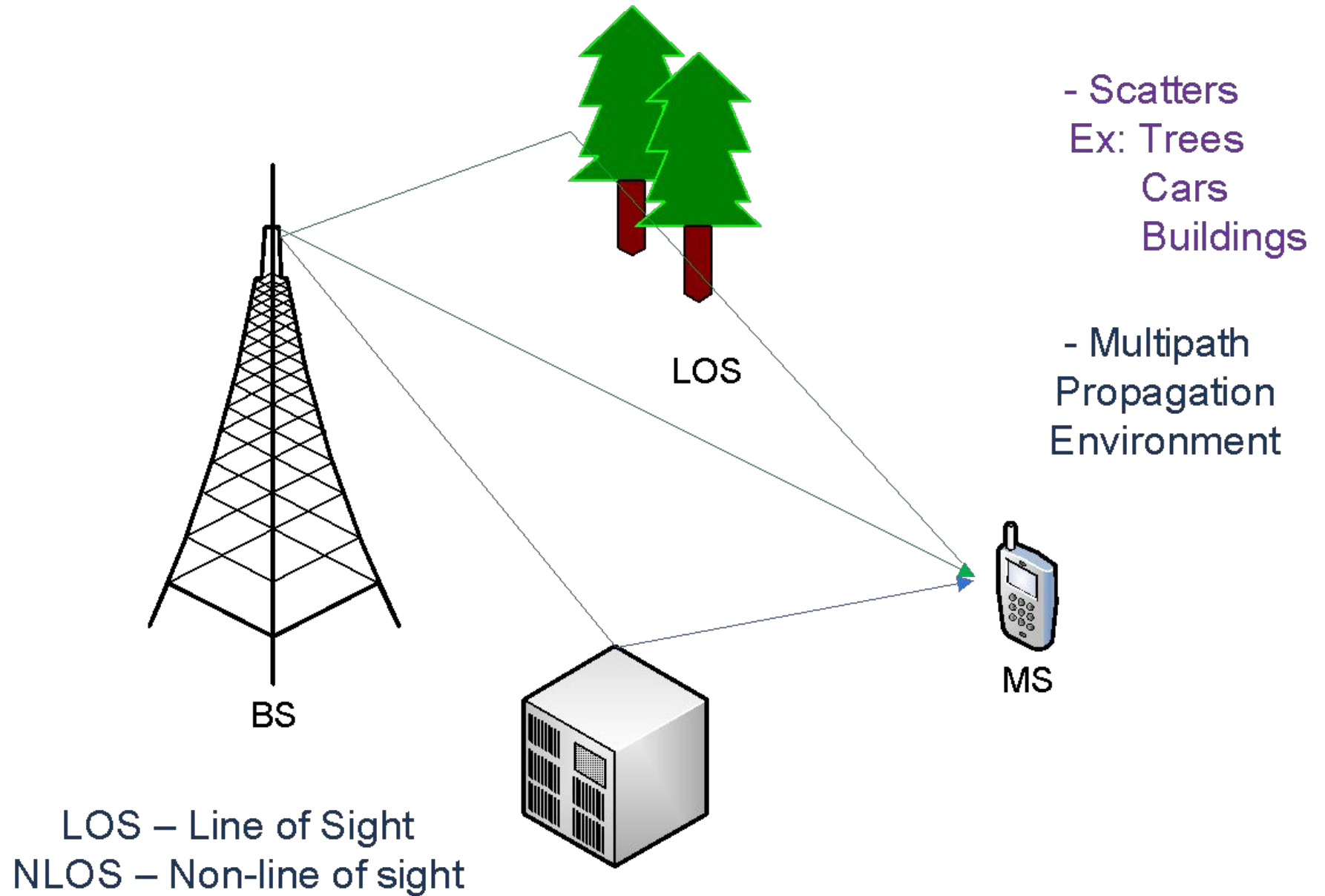
Outline:

1. Wireless Communication & Diversity
2. Broadband Wireless Communication Channel
3. CDMA – Code Division Multiple Access
4. OFDM – Orthogonal Frequency Division Multiplexing
5. MIMO – Multiple Input Multiple Output
Communication Systems
6. UWB – Ultra Wideband Systems
7. 3G/4G – WCDMA, HSDPA, LTE, WiMAX

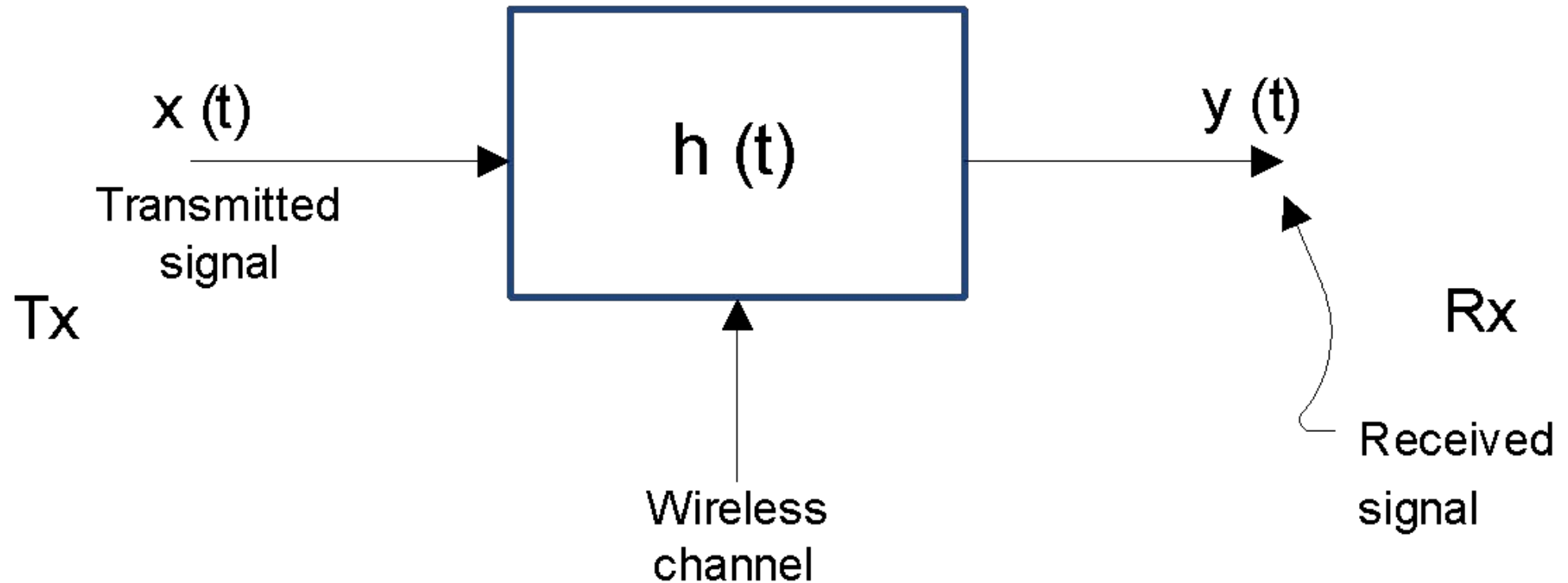
Prerequisites:

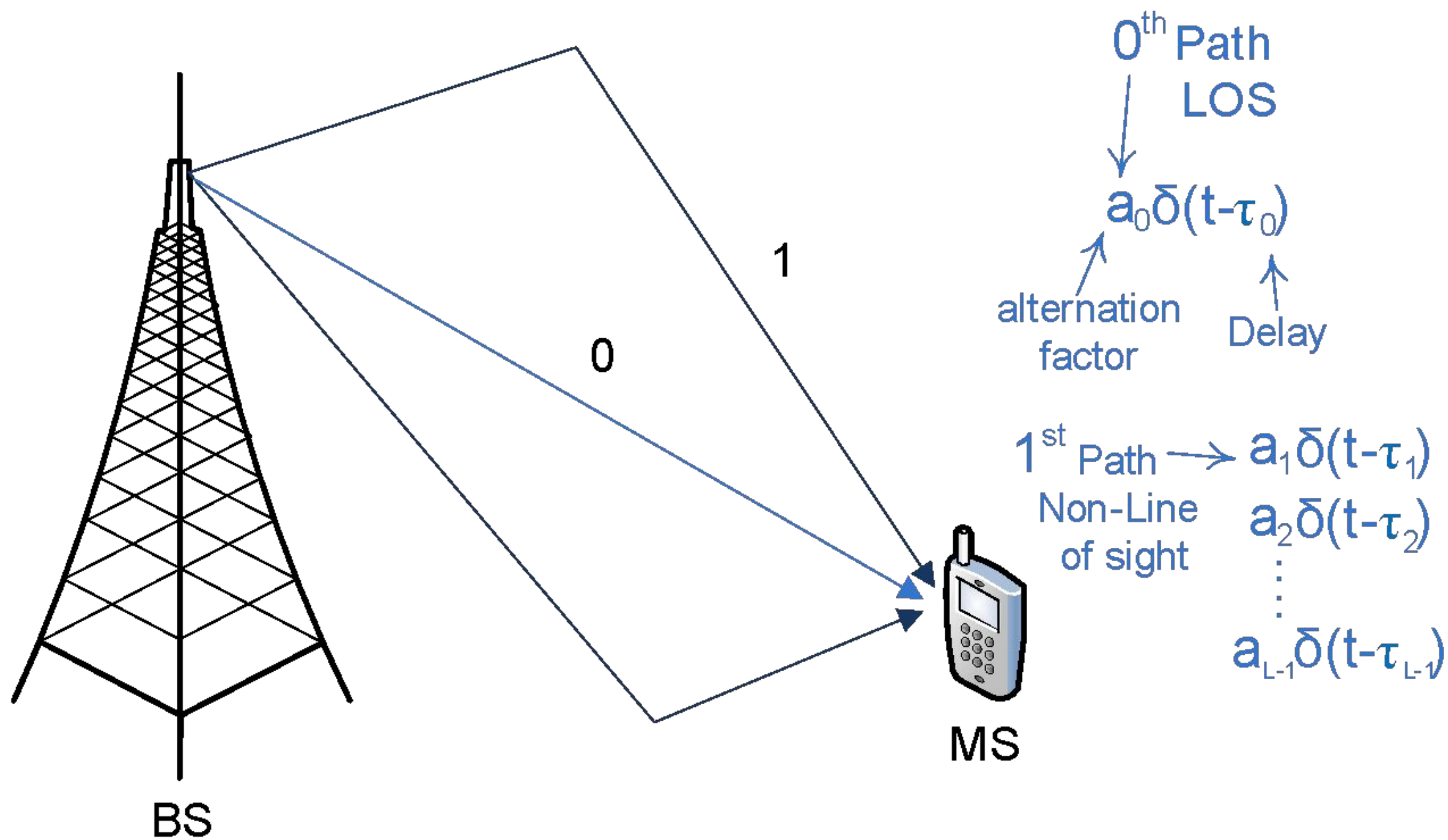
1. Probability and Random Processes
2. Digital Communication
3. Introduction to Wireless Systems
4. Linear Algebra

Wireless Communication:



Wireless Communication: Constructive or Destructive Interference





Multipath Component

$$h(t) = a_0\delta(t-\tau_0) + a_1\delta(t-\tau_1) + \dots + a_{L-1}\delta(t-\tau_{L-1}) =$$

impulse
Response
of
Wireless
Channel

$$= \sum_{i=0}^{L-1} a_i \delta(t-\tau_i)$$

Wireless Signal

$$S(t) = \text{Re}\{S_b(t)e^{j2\pi f_c t}\}$$

Baseband-
Passband
Representation

Complex Baseband
Equivalent of
the passband
signal $s(t)$

f_c is the carrier frequency

$$f_c \begin{cases} GSM - 900\ MHz & 900 \times 10^6 \\ & - 1800\ MHz \\ 3G/4G & - 2.3 \times 10^9\ Hz & 2.3\ GHz \\ to & & \\ & 2.4 \times 10^9\ Hz & 2.4\ GHz \end{cases}$$

$$S(t) = \text{Re}\{S_b(t)e^{j2\pi f_c t}\}$$

$$h(t) = \sum_{i=0}^{L-1} a_i \delta(t - \tau_i)$$

$$y(t) = s(t) * h(t)$$

$$a_0 \delta(t - \tau_0)$$

$$y_0(t) = \text{Re}\{a_0 S_b(t - \tau_0)e^{j2\pi f_c(t - \tau_0)}\}$$

$$y_1(t) = Re\{a_1 S_b(t - \tau_1) e^{j2\pi f_c(t - \tau_1)}\}$$