

Lecture 5 — Introduction to Random Processes

Michael Brodskiy

Professor: I. Salama

April 7, 2025

- Ergodic Wide Sense Stationary Process

- The time average of each sample function is defined as:

$$\overline{x(t)} = \lim_{T \rightarrow \infty} \frac{1}{T} \int_{-T/2}^{T/2} x(t) dt$$

- The time autocorrelation function is defined as:

$$\mathcal{R}_{XX}(\tau) = \overline{x(t)x(t+\tau)} = \lim_{T \rightarrow \infty} \frac{1}{T} \int_{-T/2}^{T/2} x(t)x(t+\tau) dt$$

- For an ergodic wide sense stationary process, the time averages are equal to the corresponding ensemble averages