



# Systems & Signals Introduction

- Basic comments
- Examples of Signals and Signal Processing
- Telecommunications system

# Basic comments



Signal – variation of some physical quantity over time  $t$ .

Input signal – signal  $x(t)$  exciting (driving) the system.

Output signal – response  $y(t)$  of the system to input signal.

„Signals & Systems” are related to mathematical modeling:

- signal properties,  $x(t)$ ?,  $y(t)$ ?
- signal processing in systems,  $x(t) \rightarrow y(t)$ ?

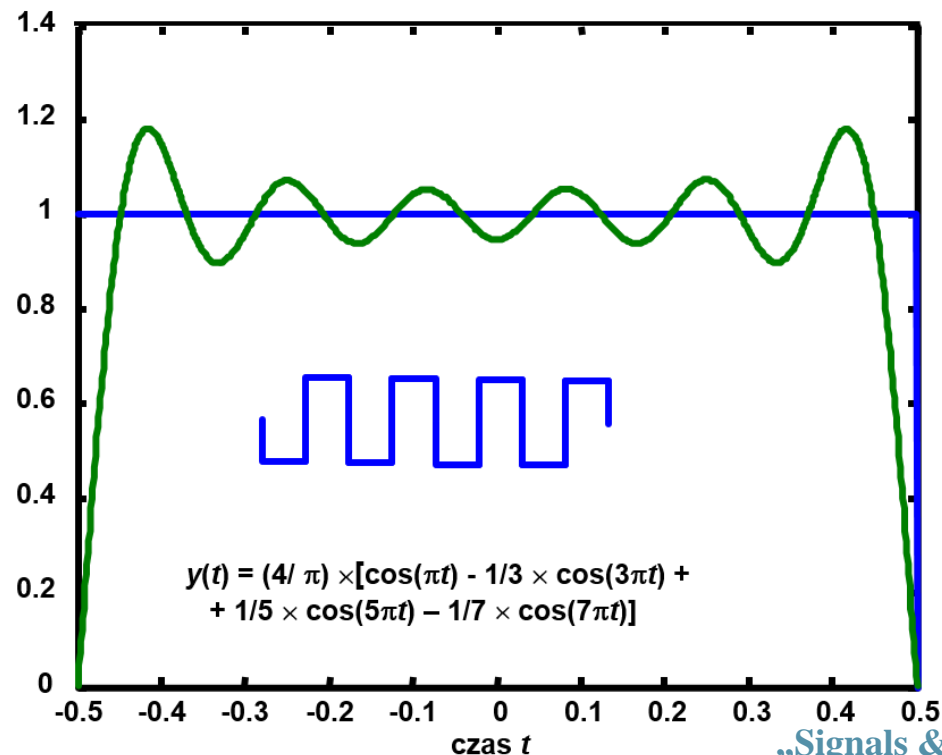
Mathematical modeling – analysis of behaviour of any system (biological, economical, electrical, mechanical, telecommunication) using mathematical tools and approaches.

# Basic comments

Signal properties – many different tools  
(frequency analysis, random processes)

Signal processing – many different tools  
(differential equations = frequency analysis)

Frequency analysis of a signal – representation of a signal by spectra (harmonic) components (fluctuations).





# Examples of signals & signal processing systems

## **TELECOMMUNICATION SYSTEMS:**

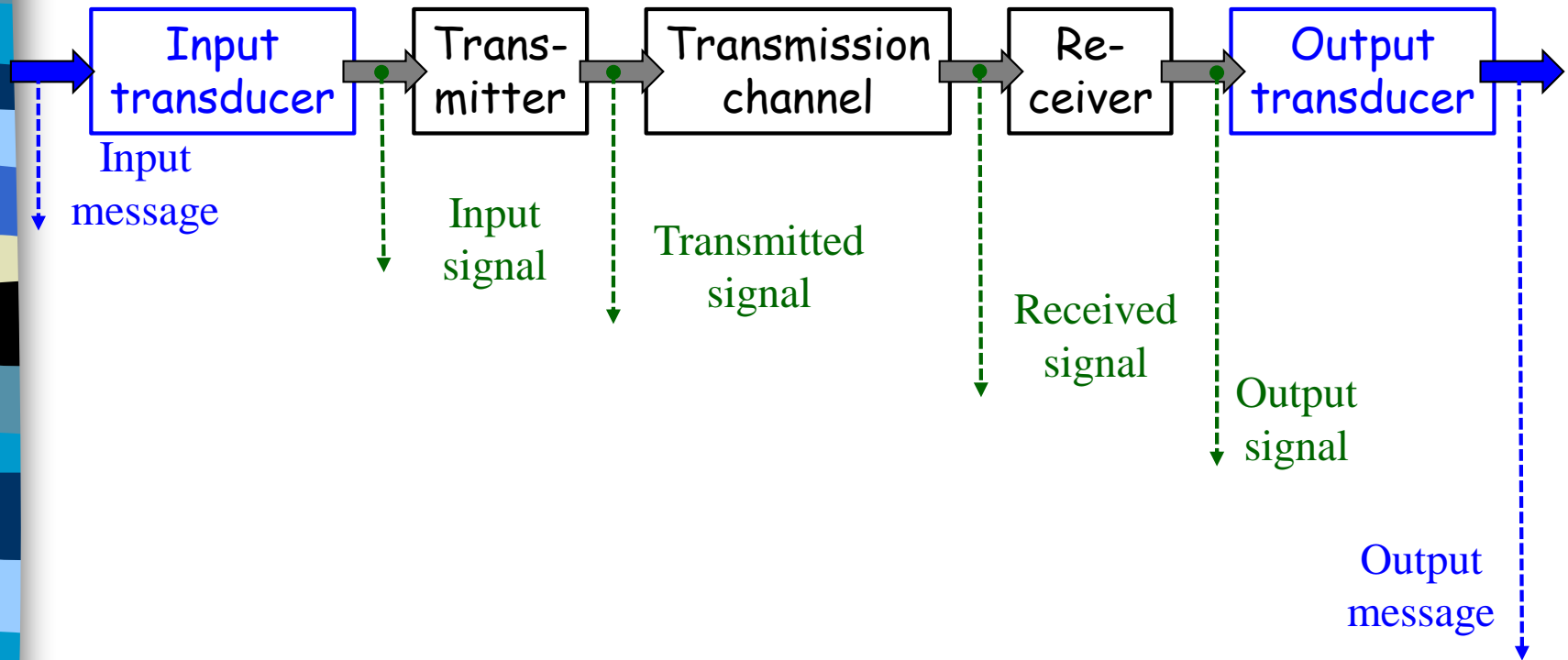
**(Information transmission)**

- radio and television signals,
- mobile and fixed telephony
- data transmission (data networks)

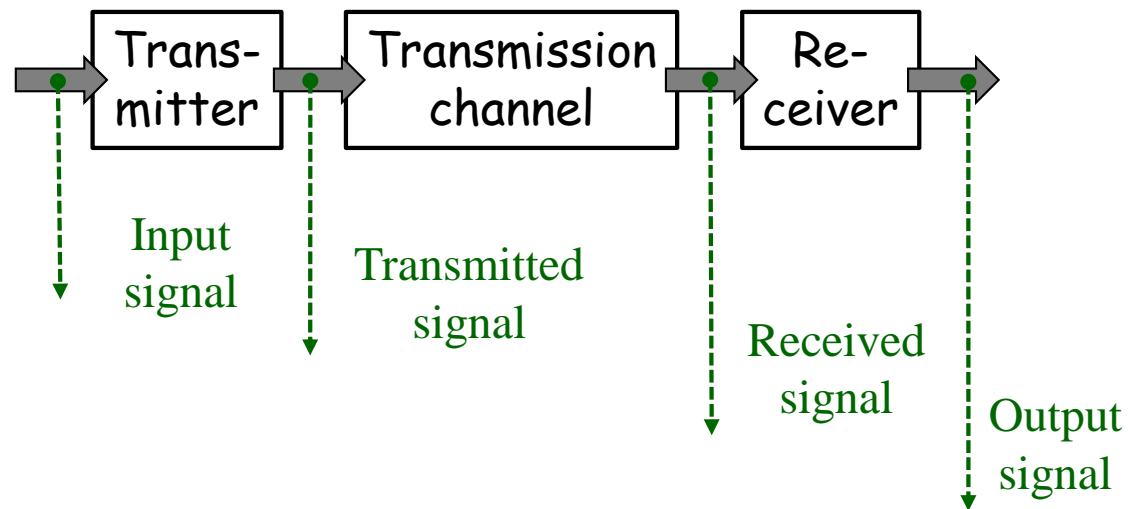
## **SIGNAL ACQUISITION (transducers):**

- digital image sensors,
- stereo microphones,
- radar detection techniques,
- medical imaging (USG, CT, MR),

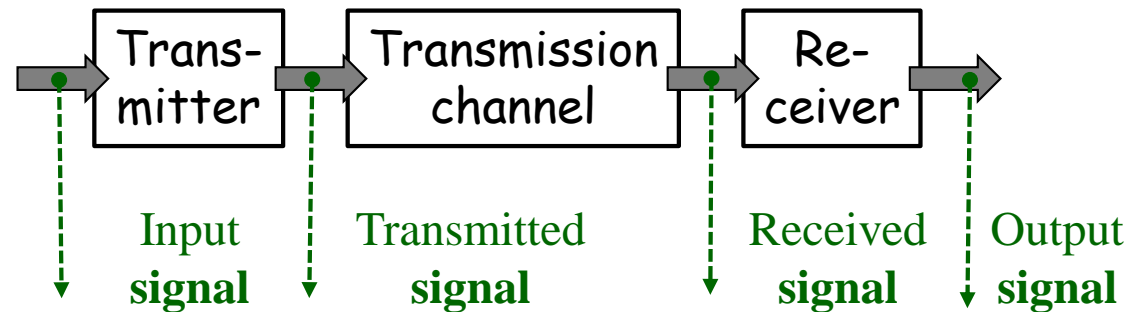
# Telecommunication system



# Telecommunication system



# Telecommunication system



Transmitter



Receiver

The lecture is aimed at frequency analysis of:

- signals,
- filtration,
- modulation & demodulation.