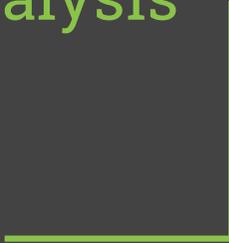# Lecture 1
# Introduction

## Digital Signal Processing and Analysis in Biomedical Systems

# Contents

- definition and types of biomedical systems,

- examples of BS

- aim and tasks of DSPABS course

# Biomedical Engineering

Biomedical Engineering is an area of science and engineering which develops the **technical** means (devices, technologies, methods) to interact with **living** objects.It acts at the edge between technology and life.

BE uses the methods and technologies from engineering, and applies them to the tasks set by medicine: diagnostics and therapy.

Aim of BE is to help to achieve or support healthy state of human patient.

3

# Biomedical Systems

Biomedical System (BS) is a technical mean for solving the problems and achieving the goals set by medicine.

Digital Biomedical System -- BS that uses the benefits of digital processing and analysis of information in the achieving the goals. Mainly they rely on the digital processing of biosignals which accompany the functioning of the patient.

# Example of BS

5

# Main types of Biomedical Systems

- diagnosis (defining the state of patient)
- monitoring (observing the state)
- visualization (introscopy)
- therapy and rehabilitation (influence)
- life support
- bionics
- fitness

# Other types of Biomedical Systems

- "information systems"

  - distributed hospital systems for management, exchange, control and visualization of information about patients. Provide administrative support for medical establishments. Operates under the standards for medical information exchange.

- laboratory equipment

  - various devices used to perform testing of laboratory samples. Does not interacts with patient directly (e.g. blood samples)

- testing equipment and calibration modules

  - used during manufacturing and calibrating of medical measurement equipment, in standardisation procedures, for biomedical analyzers, and biomedical repair services. FLUKE

7

# Diagnosis - 1

BS for **functional diagnosis** are analysing the signals coming from the patient (different organs and systems):
  - ECG
  - EEG
  - EMG
  - GSR
  - PPG etc.

# Diagnosis - 2

BS for **laboratory diagnosis** are doing the testing of tissues and/or liquids from human body:
- microbiology (viruses, bacteria, parasites etc.)
- clinical chemistry (enzymes, toxins)
- hematology
- genetics
- reproductive biology

These systems can be:
- implantable (Lab on Chip) or external.

# Monitoring

BS for monitoring are used for continuously measure, record and observe the state of patient. They are used for keeping under