Universidad Autónoma de Madrid

6th Summer School on INtelligent signal processing for FrotIEr Research and Industry

Electronics for Portable Reflectance Pulse Oximetry

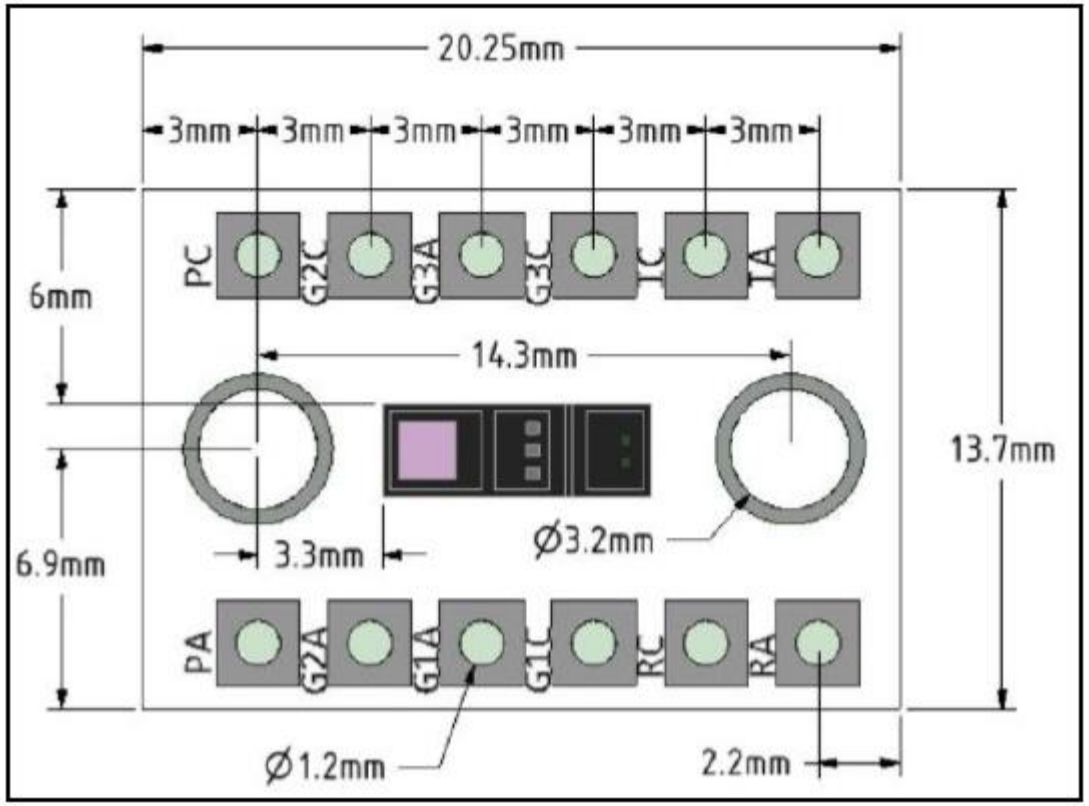
Lab Organizers: Jose Luis Pau / Andrés Redondo

Where?

(Presentation) Room 01.11.AU.101.2 **(Módulo 11, Main Building, 1st floor)**

(Work) Lab 01.12.LD.301 **(Módulo 12, Main Building, 3rd floor)**

ILE-BI01-GRIP-SC201

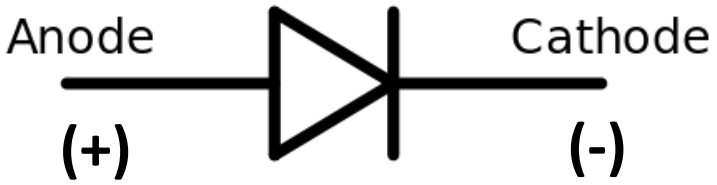


Integrated components:

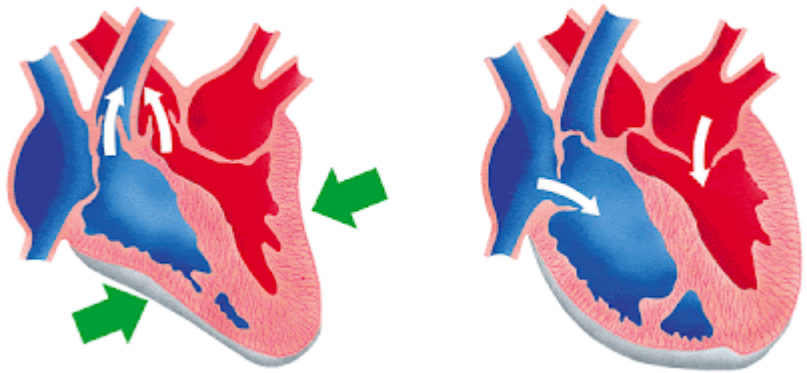
1 Infrared LED (I)
1 Red LED (R)
3 Green LEDs (G)
1 Photodiode (P)

SFH7060 BioMon
by OSRAM

The board identifies the Anode (A) and Cathode (C) of each diode:

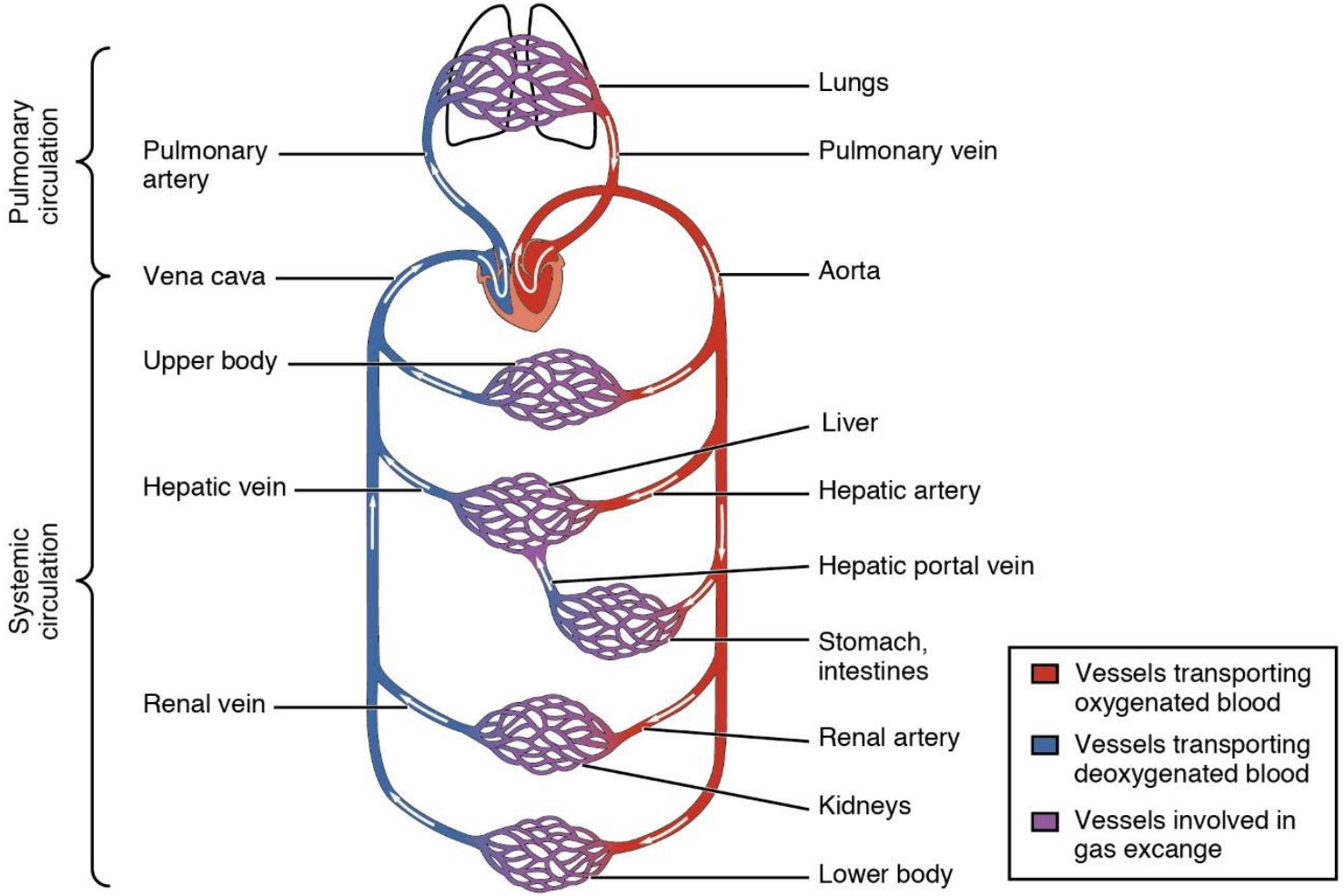


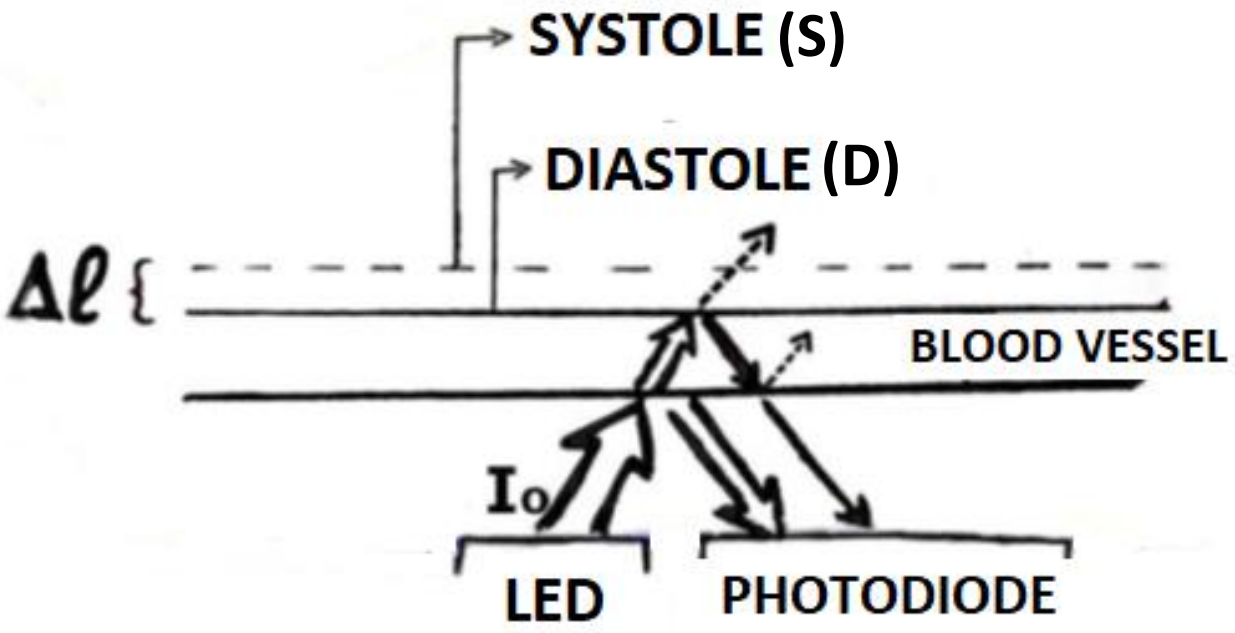
The geometrical setup enables operation in **reflection mode**

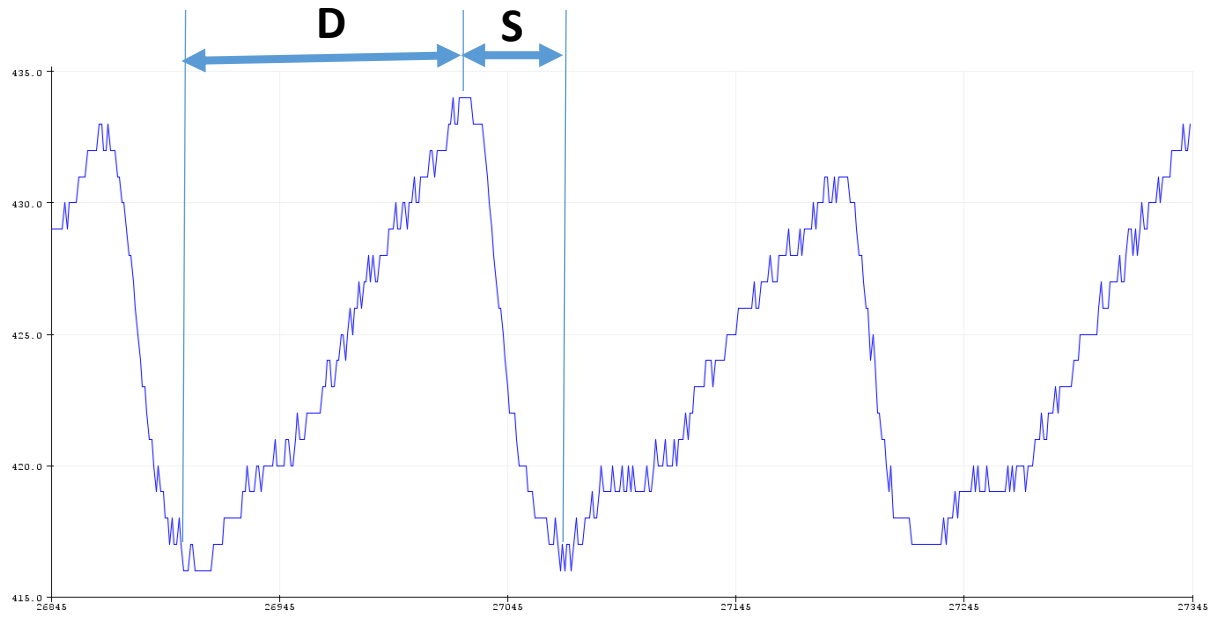


systole

diastole







Green-light reflected signal extracted from finger tip

Light Absorption in the blood vessels changes during the cardiac cycle

Due to their small diameter (5-10 μm), capillaries (small blood vessels that connect arterioles and venules) change their volume quite significantly exchanging substances with the surrounding fluid

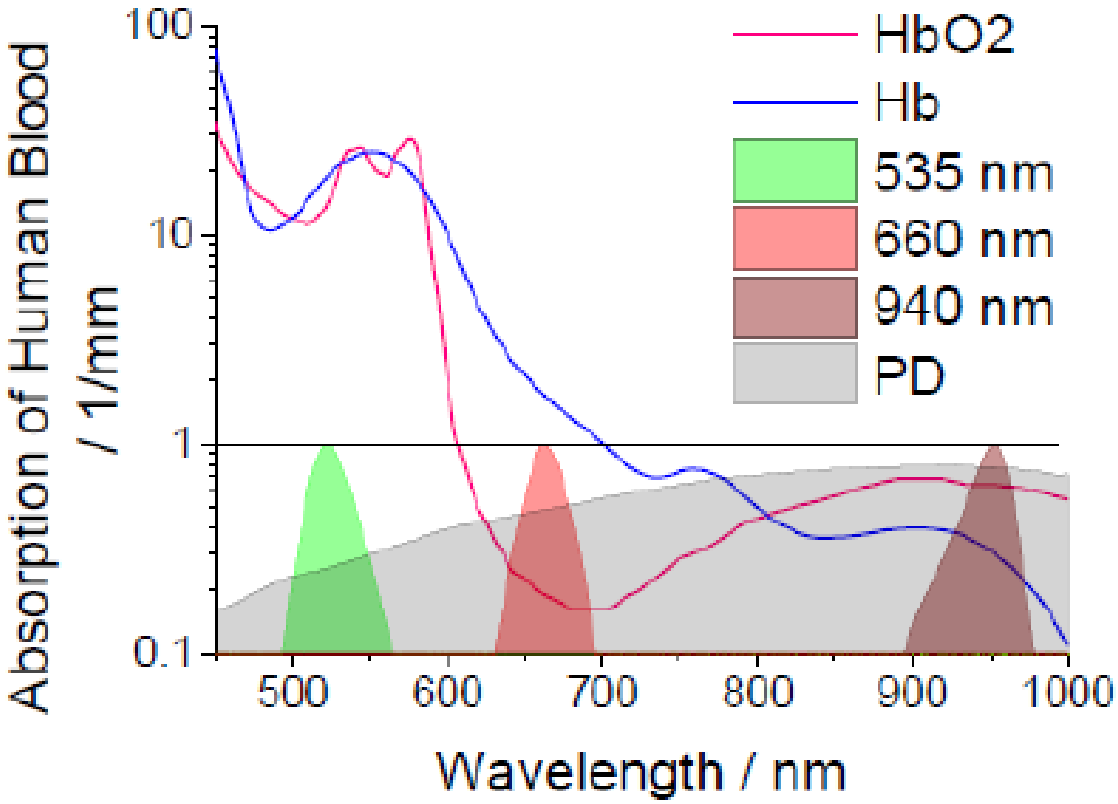
Peripheral Saturation of oxygen

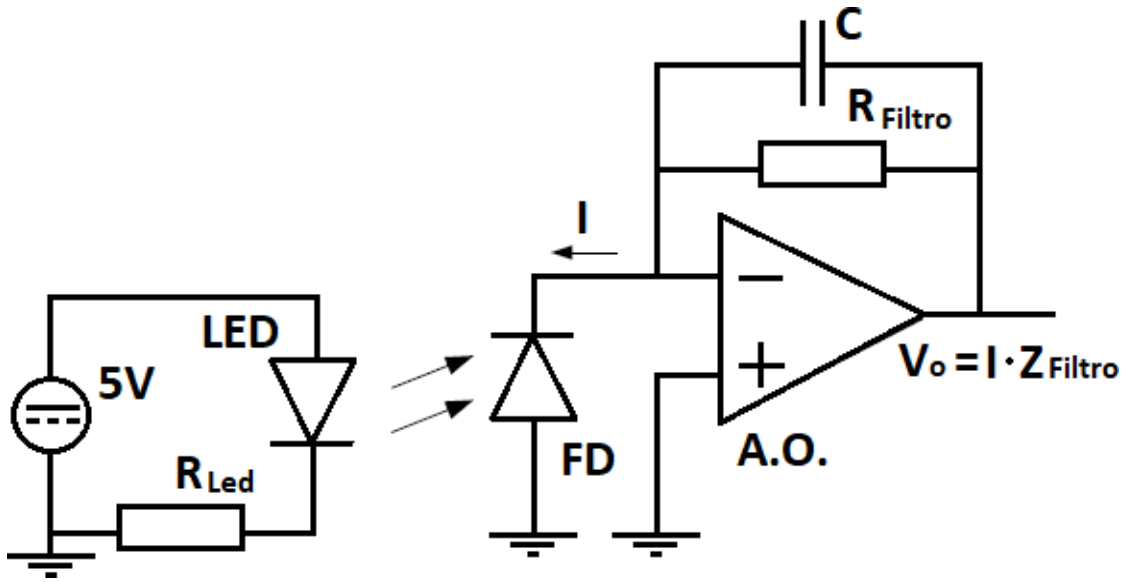
$$SpO_2 = \frac{c_O}{c_O + c_H} = \frac{1}{1 + \frac{c_H}{c_O}}$$

The difference in absorption between oxygenated and deoxygenated hemoglobin makes the calculation of SpO_2 possible.

$$R = \frac{\varepsilon_{R,O} \cdot c_O + \varepsilon_{R,H} \cdot c_H}{\varepsilon_{I,O} \cdot c_O + \varepsilon_{I,H} \cdot c_H} \approx \frac{\left(\frac{AC}{DC}\right)_R}{\left(\frac{AC}{DC}\right)_I}$$

$$\boxed{SpO_2(R)}$$





Lab tasks:

1. Build the basic circuits
2. Monitor signals using Arduino MEGA (**pre-installation of Arduino IDE or registration in Arduino Cloud required**)
3. Determination of the heart rate and peripheral oxygen saturation

Active High Pass Filter with Amplification