Due to the efforts of solar cells for space applications, research and development got huge support in the fifties, leading to more and more efficient solar cells. Nowadays, the need and use as a renewable energy supplier is most important.
In this lab exercise, chances and limits of solar cell applications should be determined. Therefore, fundamental concepts of semiconductor physics have to be worked out, like band gap, band structure, Fermi level, doping, carrier transport, pn-junction. These properties are investigated in different solar cell materials (amorphous and crystalline silicon and copper indium gallium diselenid).
The experimental part of this exercise consists of up to date optical and electrical characterization methods. First, reflection measurements are carried out with a commercial spectrometer to determine the index of refraction and reflective losses for different surface structures. From IV curves in the dark and under illumination, the efficiency and other relevant properties (series and parallel resistance) can be examined. The last part, concerns the spectral photoconductivity from which the energy resolved quantum efficiency can be concluded (experimental setup in fig. 1)
All measurements are supported by computer programs and integrated analysis techniques, usually needed in modern semiconductor research labs. Also more complex methods like lock-in technique is presented and used.

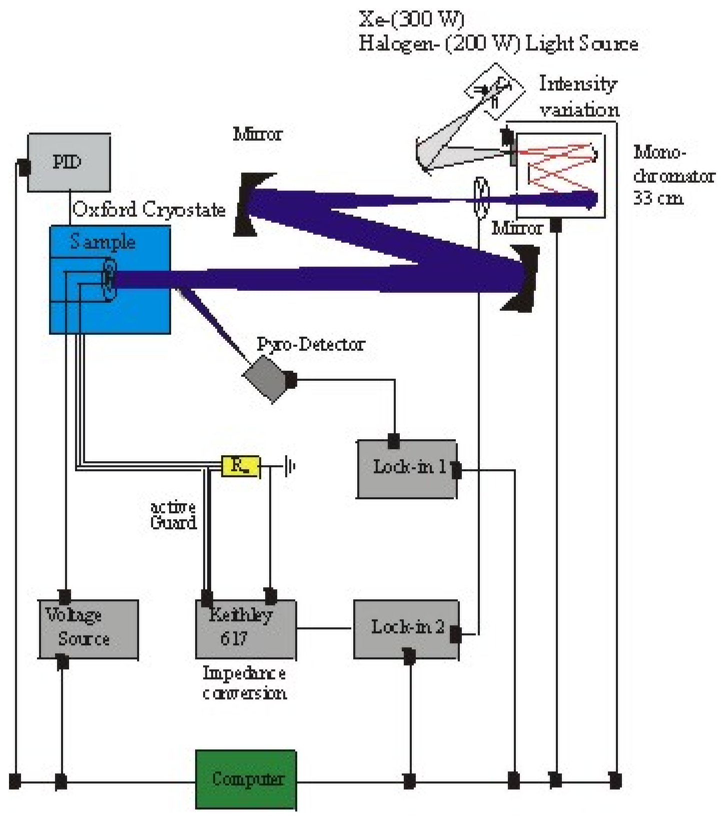

Fig. 1: *Setup of the spectral photoconductivity measurement.*