

Silicon Photonics

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This short course discusses both fundamentals and applications of silicon photonics. Silicon photonics is rapidly emerging as an attractive platform for realizing cheaper photonic integrated circuits. Active optical cables based on silicon photonics are now already being employed in some of the highest performance supercomputers and several major semiconductor companies have announced activities in this domain.

The course explains the reasons for this sudden interest and the possible advantages of the platform. Next the fundamentals of the waveguide platform and its performance are discussed (straight and bend waveguides, filters, fiber-chip coupling ...). Subsequently also more advanced devices such as detectors, high speed modulators and lasers are discussed. In each case we also touch upon the problems that still need to be resolved and give a comprehensive overview of the current state-of-the-art.

In a second part we discuss on the integration in a standard CMOS processing environment and on different approaches to integrate silicon photonics circuits with optical circuits.

Finally we give a review of current and future applications, in optical communications, optical interconnect and optical sensing.

The course targets members from academia and industry who want to get a comprehensive review of current state of the art in silicon photonics and get insight in its advantages and challenges. It is intended for researchers with little or no background in silicon photonics as well as those with a more specialist view who want to get a broader understanding of the emerging developments in the field. The course in particular could benefit those wanting to get insight in the question "is silicon photonics the solution for my problem?"

The tutorial contains extensive references for further study.