

## ABSTRACT

Within the context of the present thesis, several optical filters are studied for the processing of microwave signals in the optical domain. A brief introduction to the transmission characteristics of optical fibers is presented, followed by a summary of filter theory characteristics and the basic properties of the analog and digital filters. There is also a detailed reference to the principles of filter operation and the performance characteristics and the constraints in the design of optical filters at microwave frequencies.

At the second stage of the present assignment there is an extensive description of the practical applications and operating principles of the optical filters, as well as the modeling and comparison of the results of different categories of optical filters using Matlab software. The following systems were studied: Incoherent optical filters, Coherent optical filters, Fabry-Perot interferometers (single/double crossing) and the Mach-Zehnder interferometers as optical filters of simple form and with the use of two semiconductor amplifiers with the same characteristics.

The use of the Matlab software for modeling the characteristics and the behavior of the optical filters at microwave frequencies, offers a better understanding of their behavior, leading to the development of reliable models for the interpretation and prediction of future experimental results.

**Keywords:** fiber optics, analog filters, digital filters, FIR optical filters, IIR optical filter, incoherent term, coherent term, microwave frequencies, Fabry-Perot interferometer, Mach Zehnder interferometer, transfer function, semiconductor optical amplifier.