This thesis is a result of my investigations regarding design considerations of a laser based scanning optical microscope (SOM) and its application to semiconductor device characterization, topographic study of material as well as thickness measurement of thin film.

Though SOM have been reported earlier, this is an attempt to adapt it to investigate characteristics of semiconductor materials and thin film specimen under laser microscopic probe. Considering all possible parameters including flexibility, user friendliness and cost effectiveness, various experiments have been conducted for an accurate and modest design is done in conformity with the present technology.

The general introduction and the history of the development of the scanning optical microscope (SOM) have been discussed in chapter (I) of this thesis.

In chapter (II), the detail of the design considerations of the SOM geometry have been discussed.

The results and the analysis of semiconductor device characterization under the SOM set-up have been incorporated in chapter (III).

Chapter (IV) describes the technique of measuring thin film thickness of certain material within certain range as well as the technique of topographic study under the designed SOM geometry.

The possibility and plan for the future modification of the SOM set-up have been discussed in chapter (V).