

## ABSTRACT

This thesis is directed towards investigating and substantiating the involvement of Variable Structure Systems in order to stabilize control systems of second and higher order systems.

The objective behind this work is to find a general program by proposing two design parameters named " $r$ " and " $h$ " which are the bases to find the parameters of the variable Structure controller that could be used to control systems that are linear, and time - invariant. The Variable Structure with sliding mode controller forces the system to reach its steady state value in a sub-optimal time. The results obtained are satisfactorily encouraging.

In this work, the controller does not identify the plant parameter values, but instead identifies a switching surface using certain design parameters named  $c$ ,  $\alpha$ , and  $\beta$ , which will result in stabilizing the system in a sub-optimal time.

In order to make a comparison between this strategy and other control strategies, for example :- " Optimal Control strategy ", the later leads to an open - loop bang - bang controller, with the control law altering its sign at predetermined switching time. This method is sensitive to parameter variations, errors in the measurement of initial conditions, and any external disturbance, since the controller is open - loop, it is very important also to have knowledge about the initial and final constraints such as time and state of the system under study.