# ABSTRACT

The field of gear design is an extremely broad and complex area, and a complete coverage in any research work is not possible. Gears have a wide variety of applications. Their applications vary from watches to very large mechanical units like the lifting devices and automotives. Gears generally fail when the working stress exceeds the maximum permissible stress. Gears have been analyzed for different points of contact on the tooth profile and the corresponding points of contact on the pinion. In this work, a review of relevant literature in the area of optimized design of spur/helical gears indicates that compact design of spur/helical gears involves a complicated algebraic analysis.

This report describes the development of a design methodology for determining the modes of failure for non-standard helical gears and also the causes of these failures have been studied. Various studies have been undertaken for the minimum volume design of gear reduction units. The speed chart has also been considered for finding out the minimum diameter and maximum transmission range. The focus has been on developing a design space which is based on the module and the pinion teeth, based on different modes of failures considering optimal minimized volume for each pinion-gear pair of the reduction unit consisting of non-standard helical gears.

**Keywords -** Gear, helical, non-standard, modes of failure, reduction unit