

# CHAPTER I

## INTRODUCTION

### 1.1 Introduction

The trend of automotive especially to developing in the structural of materials. Composite consists of materials that are made of mixture of two or more materials and has physical properties and mix with different chemicals either in the review in terms of the microscopic and strength of materials. This is very different from the hybrid material. A hybrid material is a mixture or a compound of some materials that are made of metal and then can also be coated with composite or vice versa. Normally this material has a physical and strength of properties materials superior to composite.

Composite materials have been developed several decades ago. In general these composite materials consisting of a merge of the structural fibers and plastic or usually called Fiber Reinforced Plastic (FRP) and typically use fiber such as carbon fiber, fiber glass, basalt fiber, boron fiber or fiber comes from plant result such as flax, wood, banana fiber, coir fiber etc. as for composite produced for commercial purpose, usually using the resin solution, that ingredients of composite the best known is usually epoxy, polyamide, polyester, polypropylene, vinyl ester, etc. Now composite is used in the aerospace industry, automotive industry, household industry, which can be ensuring safety, safe for five to fifteen years or more, because the performance of the composites are excellent with high specific of strength and specific stiffness, method that is for solving problem mathematic and engineering physic. In the typical problem areas in engineering finite element method included structural analysis heat transfer, fluid flow, and potential of electromagnetic. Finite

Element Analysis of metal, composite and hybrid materials using software ANSYS WORKBENCH deals with the analysis structure of materials made from metal, composite and hybrid materials. The analysis of the material itself, at the micro level and the analysis of the structure made of composite materials. The simulation on the software ANSYS can be showed the performance of stress-strain curve engineering in Metal, Composite and Hybrid specimens.

## **1.2 Problem Statement**

In this case the problem statement is to find out the magnitude of deformation and stress – strain of Metal specimen, Composite specimens, and Hybrid steel coated composite.

## **1.3 Objective**

Based on the practice of engineering systems, while the goal of this studies is to ;

1. To study the impact of dimension and structures on all specimens by using model ASTM E8 towards the to magnitude of deformation and stress – strain materials.
2. To observe the ply orientation angle and performance on each that specimens.
3. To discover what the portray accurately characteristic of a particular individual, situation in the all of specimens by temperature 125°C and 250°C.
4. To understand the phenomenon or to acheive new insight of the Force that work on the work piece.

## **1.4 Problem Limitation**

In this studies researches just want to know the effect of materials of Hybrid steel coated composite, which have the limitation as follows :

1. To analysis comparisson between three of model specimens using ASTM E8 on Metal specimens , Composite with 2 ply orientation, 4 ply orientation, 6 ply orientation and Hybrid Steel coated composite material and prediction of changes in the structure of material occurs on the all of specimens.
2. To investigate the deformation on the all of specimens.
3. To analysis ply-orientation angel between all of composite specimens and Hybrid specimens.
4. To analysis the stress-strain curved on all specimens.
5. To investigation the effect of Metal Specimens, all of Composite Specimens and all of Hybrid specimens by force and thermal work on the body of specimens.

### **1.5 Scope of study**

In condition of this experiment the Finite Element Methods (FEM) by used software Ansys Workbench for modelling , developing and simulation. There are three variable concerned , is to get the data of ;

1. To Comparison magnitude of stress and strain of Metal specimen, Composite specimens, Hybrid Specimens.
2. The effect of angle orientation, on Composite specimens , Hybrid Steel specimen. Where in each tube have 2,4,6 Ply orientation Angle.
3. The comparison between all specimens on the effect of materials and Ply Orientation Angle and Temperature work on the specimens.

### **1.6 Benefit**

The advantages of studying the Structure Materials is to upgrade knowledge and understanding the phenomenon and Stress-strain curve engineering on the all of specimens. This research can be used in automotive or mechanical application in structural of materials. It can be developed and modified by the author. It can also contribute the research that can be applied in the future education.