

# **LAB I**

## **WHAT IS IN IT AND WHY?**

### **I. Introduction**

Everybody is involved with materials on a daily basis. As a scientist and engineer you will start looking at the objects that surround you from a different perspective. You need to understand how an object performs its function, what properties are required for each component, and which materials are used to provide the required properties. Materials may be classified into several groups: metals, ceramics, polymers, semiconductors, and composites. Materials in each of these groups possess different structures and therefore properties.

The purpose of this laboratory is to get you thinking about How? What? and Why? In this laboratory, you will choose an object from your daily life and understand why particular materials were selected for its various components. Pick something you are curious about.

Examples of objects include but are not limited to: bicycles (parts), skateboards, snowboards, surfboards, skis, climbing gear, shoes, pans, cutlery, cars (parts), motorbikes (parts), boats (parts), kayaks, baseball bats, ipods, laptops, furniture, fishing lines....

Pick something that has enough materials to make it interesting (at least 3), but not too complicated (not more than 5) that you will not be able to understand in depth the reasons behind each material choice.

Since you will be examining the components of your object from an engineering standpoint, we will want to consider the materials employed as they relate to the design and function. No materials selection decisions can be made without thorough consideration of the particular application of the material. Therefore, you will want to understand the overall design of the object itself as well as the various materials used to make the object. Here, our aim is towards a more complete understanding of the engineering decisions that are part of the design process. It is with this in mind that you should approach your analysis during this laboratory.

## II. Laboratory

**You have to show up the first day of lab in your section, otherwise you will be dropped from the class.** You are encouraged to bring your chosen object to the lab and get assistance from the TAs to proceed with the write-up. The object needs to be small, a skateboard is probably ok (bearings and a wheel would be better), but a surfboard or snowboard are definitely too big.

**\*\*\* Do not bring toxic, explosive, or otherwise dangerous substances to the lab\*\*\***

**\*\*\* Do not bring anything that is not yours\*\*\***

**\*\*\*If you decide to take something apart, make sure that you can put it back together\*\*\***

**\*\*\* Do not bring anything valuable\*\*\***

**\*\*\* Make sure you take home anything you bring to the lab. Anything left behind will be disposed of at the beginning of the following week\*\*\***

**\*\*\*The MSE department, the TAs, the lab technician, or the instructor are not responsible for any damage or loss that might occur to the object you decide to bring to the lab\*\*\***

If you wish, you may also work independently on your own time at home or in another location. All the above rules and restrictions still apply.

Your write-up should be concise, clearly typed in 12-point font, and include the following:

1. On the front page, put your name, SUID number, section number, and a descriptive title.
2. Write a short (2 paragraphs- ~ 200 words) description of your object: explain what it is and what is its function. Describe if is of newer or older design, and if the design has evolved throughout the years. Describe in which environment is used and if there are any harsh conditions (temperature, corrosion, wear, etc.). Finally, explain why you picked this particular object. (20 points)
3. Paste a picture/photograph (recommended) or draw a detailed diagram. Use arrows to label the different components and write a clear caption. (10 points)
4. For each component, describe its function and its properties requirement (weight, stiffness, hardness, toughness, heat resistance, cost...). (~100 words) (20 points)
5. For each component, describe what material is made out of and how this material satisfies the required properties (do some research on the web) (~300 words). (25 points)
6. For each component, explain if any special processing was performed to impart the required properties to the chosen material. (~150 words). (15 points)
7. Finally, explain if there are any alternative materials used in your object and why these materials might be better or worse than the one you have (~ 150 words). (10 points)