

LAB IV
WHAT IS IN IT AND WHY (part II)?
DUE FOR EVERYBODY ON DEC 11th

I. Introduction

During the first laboratory you were asked to pick an object from your everyday lives and describe its function, design, and materials in engineering terms. In know this lab left some of you wondering what you were required to do, but it was designed to do so. The plan was to encourage you to start thinking like a materials scientist and gather all the materials related knowledge that you have learnt throughout the years. I hope that you have realized how close the material presented in class is to objects that you use on a daily basis.

The purpose of rewriting this laboratory is to link all the materials knowledge that you have learnt in class to your everyday experience. By doing so, you will understand how you now look at materials from a different perspective and how you are now able to explain in more detail materials properties, structure, and how processes affects the formers.

First, you will take your old lab report, if you have not done so already, you should ask your TAs where and why you lost grades so you can improve this time around. Because of time constrains, you will focus on only one component of your chosen object, this will allow you to go into more depth and fully understand all the design choices that were made. Following you will find the instructions from lab I with the additions required for Lab VI. You should write your report in such a way all the parts from LAB I are included (they will not be graded again) as part of a coherent manuscript. You should also hand in LAB I with LAB VI to help grading. You should consult with your TA regarding your component choice, even just with a short email.

Instructions and Point Breakdown.

Lab VI parts in blue. All word counts and points are in addition to what you already have done. Lab VI and Lab I will be graded separately.

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. Paste a picture/photograph (recommended) or draw a detailed diagram. Use arrows to label the different components and write a clear caption.
3. For each component, describe its function and its properties requirement (weight, stiffness, hardness, toughness, heat resistance, cost...). (~100 words) *Expand on this paragraph describing in more detail the properties required from your chosen component. Examples include but are not limited to resilience, toughness, ductility, will it be subject to repetitive stress, thermal cycling, does it need to light, corrosion resistance, thermal resistance, electrical insulator, etc..... (30 points). (400 words). This is a good opportunity to start revising for the final by going through all the fundamental concepts in the book chapters.*
4. 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). *In light of your new findings, pinpoint the main properties that dictated the material choice and clearly explain the material choice in detail. (~300 words) (30 points) Examples include why stainless steel rather than Al, why low carbon steel rather than cast iron, etc.... Do go into detail.*
5. For each component, explain if any special processing was performed to impart the required properties to the chosen material. (~150 words). *With what you now know go into detail and explain any processing such as cold working, thermal treatment, precipitation hardening, etc.. and explain how such processing affected the materials microstructure. If you find a microstructure picture of your material use it to help your explanation (~ 300 words) (30 points).*
6. 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). *A any of your conclusions different? Explain (~ 150 words) (10 points).*