Study Guide and Assignment 1

This study guide and others to follow is to assist you to guide your learning process and clearly specify the homework and assignments so that you can plan your time and better enjoy the learning process. The intent is to provide you with a highly structured and organized class in which you will know what is important to study and will help you make efficient use of your time and fulfill the learning objectives.

The study guide, the web page are not a substitute for your own class notes. They are tools to expand and help you understand the material, please make your own class notes. You should study both since not everything said in class will end up in a web page. The opposite will also happen, some of the things on this web page are additional materials to help you which not necessarily be discussed in class, but they will supplement other exercises done in homework or in class. Here you will find helpful suggestions, which in my view are the result of experiences I have seen with teaching this class in the past that also will save you time.

I Introduction

- **1. Introductions to Mechatronics Systems and Components** (Suggestion: Read and go over the slides. Make sure you understand the Free Body Diagram, how to write the differential equations using Newton’s law. Review the generation of the block diagram and the simulation done in class. Can you reproduce it on your own?. If you can, you have successfully started to learn the basics of modeling and simulation)
  - **1.1. Block Diagrams and Bond Graphs equivalence.** You must know this concept by heart. Redo on paper and understand exactly what the Block Diagram means and what the Bond Graph means for generating models. These are two techniques that allow engineers to generate models. The Block Diagram is a classical technique equations of motion and block diagrams must be done by hand. The Bond Graph modeling is an automated technique. Both of these use MATLAB and SIMULINK for the simulation of dynamic systems.

II Basic Elements

- **2. Basic elements and their equations. Single and multiports devices.** Read and go over the slides, which coincide with lecture and exercises done on the board. You must know what the laws are for the single port elements and for the multiport elements.

Homework 1 (Due Tuesday September 12 2017 at 11.59 p.m).

  1. Read Chapter 1.
2. Homework assigned in outline: 1.1, 1.4, 1.7, 1.9
Please scan and keep your originals.

**Computer Assignment 1** *(Due Tuesday, September 12, 2017 at 11:59 p.m.)*

2. - Use the procedure of the example simulation of the suspension system done in class.

3. - Generate differential equations, of the mechanical and the electrical circuit by hand using Newton’s law and the basic principle of Kirchoff's law.

4. Generate a block diagrams and simulation for both systems. Use the physical parameters discussed in class.

5. Enter the Block Diagrams in SIMULINK

6. Please turn in a directory by creating and transferring to Voyager your files that contain:

   - A document in Word or PowerPoint format with your answers, showing the steps you used to solve the problem.
   - Take screen shots of the work and paste them in your document and explain what you did.
   - The SIMULINK (.mdl) and Data files (.m).

Convention for naming your directory files:

**YourLastName_Introduction_Models_ME171F17**

Please be consistent. When everybody follows this naming convention, your assignments are organized and easy to find.

7. Please turn electronically to the path indicated on Voyager `//faculty/granda/me171`

Please do not send your assignments via email, except on emergencies (not just to make deadlines).