THE DESIGN SPECIFICATION

For the better part of a semester you have been gathering information and you are now roughly half way through your project. You will have made key decisions and choices between various options to implement the requirements you put forward in your Requirements Analysis.

The design document specification encompasses the conclusions you have made, the design choices and sets out exactly how you will go about achieving the end goals specified in your Requirements Analysis. Depending on your project type, this may include schematics, required parts, calculations on power consumption etc, as well as a carefully considered time line detailing your expected progress. For a research project, this may include experimental methodology, supporting theory or developed programming code.

When your supervisor and second examiner look at your design document, they need to be convinced that you understand your project, that you have done a significant amount of work on your project and that you are capable of completing the project in a timely manner by the end of Project B.

It's important that you review the management and design lecture material from ECE3091 as much of what you need to do was covered there.

WHAT WOULD YOU INCLUDE IN YOUR DESIGN SPECIFICATION?

While many attributes of a project specification are common to all things you could possibly find yourself doing in an undergraduate project, there will be obvious differences. But a design specification details how you are going to implement the Requirements Analysis, with what materials, which suppliers and when.

It will incorporate drawings of your design, schematic diagrams, experiment designs, equipment lists, costings and a detailed timing chart. Since your project has probably changed or been modified during the last 12 weeks, it would be a good idea to include a revised Risk Analysis, encompassing any changes that have occurred, showing you have considered the safety of your project.

You might consider some or all of the following and where necessary use them as approximate headings:

- What will the power supply be? 240V, 12V DC, mains powered or standalone?
- What will the power consumption be? If your device is battery powered how long will you need it to operate? And if so is your power supply appropriate. You will no doubt be asked to justify your decision…
- What computing power will you need? Will a desktop PC running matlab suffice? If so, what version of Matlab, what toolboxes do you need? How long will it take to run a simulation and therefore will you have enough time to complete the requirements?
- If you are using a microprocessor what kind will you be using? How much memory will you need to implement your software and all of the data? Have you accounted for all of the I/O requirements? Have you allowed for future expansion or modification of your design? Do you have the programming tools necessary? What diagnostic tools will you be using?
- Does your project have any ethical requirements? Will you be using living subjects? Your experiment specification needs to consider ethical and legal considerations.
- What sensors will your project be using? What are their specifications? You will no doubt be asked if they are suitable for the purpose you intend and you should know the answer.
- Will you be using motors? What sort? Stepper DC? Some exotic variant? Why did you select the motors you did? Will they be suitable for the purpose? How will you drive these motors? Have you done a costing of the drive chain? Will you need a gearbox? Will your drive system be capable of performing the necessary motions described in your requirements analysis? Why?

- What mechanical parts will need to be fabricated? What materials will you use? Where will they come from? Who will do the manufacturing? When? What steps have you taken to ensure you don't have to stand at the end of the year and explain why nothing was made in time and it was all someone else's fault?

- What 'exotic' components will you be using? Do you have a supplier? What are the lead times for difficult to obtain components? Do you have an alternative supplier in case the first one is out of stock or lead times change? (This point is so critical for many projects, research or otherwise! It could really spoil your day if you haven't considered it!)

- What space requirements will you need? Will you be interacting with others in a common area? Will you need to transport and store your project? How will you carry it safely and without damage? From previous experience with ECE3091 you would be aware of the fragility of prototype systems. A "wire fell out" wasn't a good excuse then, it surely won't be now.

- What are the major subsections of your project, e.g. motor drive, sensor input, amplifiers, AtoD. How will the major sections of your project interface with each other?

- Speaking of reliability what consideration have you given to making your system reliable? Will you be constructing a printed circuit board? Have you done a PCB layout yet? How many layers? What size? What supplier? How much will it cost? What is the lead time? You will no doubt have diagrams. (Hint, with any luck you will be so suitably advanced in your thesis project that while you are sitting doing your mid year exams, you will be happy in the knowledge that your PCB is off being manufactured and will be waiting for you when you get back!)

- How will your software work? What language will you use? Deliver Data Flow Diagrams, flow charts and other diagrams which describe your software and its functionality. Software specification will be a large part of many projects.

- What will your system look like? If you are designing a biomedical sensor how comfortable will it be? How will it be worn? How will it survive impact or constant movement? How heavy will it be? How will you attach it reliably? If you are designing a robot how will you make it stand out? Will it look like a mobile birds nest, or something which will attract attention for all the right reasons? Do you have a concept diagram of a case? How will you make it? How will it impact cooling, battery changing and the finished weight? You may need to consider in regards to your drive system.

In short, have you considered every aspect of your thesis project? After an entire semester you should know many of the answers to these questions. You can expect in your thesis presentation to be asked many of these points.

And for the record, **"because my supervisor told me so" is not a good answer**. There must be a reason why you have made the choices you have made.