1 Introduction

1.1 General

The labs and tutorials are the main parts of the course. They have been designed to engage you with the material discussed in lectures so that you learn it thoroughly by doing calculations, computer simulations and hardware experiments. The labs and tutorials are organised as follows:

- *Computer Labs/Tutorials.* Software packages for electronics analysis and design provide powerful tools for you to learn about electronics. You can easily experiment with circuits and learn how they work. You can put theory into practice without spending the time to do a hardware experiment. You can check your theoretical calculations against the simulation results.

  The tutorials will be held in the PC labs and each two hour session will have a sequence of exercises for you to complete. A tutor will be available to help you. You may need to complete the exercises in your own time. Additional exercises from the textbooks will also be given.

  Assessment is described in section 1.4.

- *Hardware Labs.* Practicing engineers need to be able to build things and get them working. Calculations and simulations reduce the need for time consuming hardware experimentation, but ultimately the final design needs to be implemented and tested in hardware. As always, lab work can be something of an art, and there are numerous tricks of the trade to learn.

  A sequence of hardware lab sessions will be held in the Engineering Electronics Labs. Each two and a half hour session will have a sequence of exercises for you to complete. A tutor will be available to help you.

  Assessment is described in section 1.4.

A web version of these Lab and Tutorial Notes is available from the ENGN2211 home pages, with links to PSpice files.

Enjoy and learn!

1.2 Notebooks

Every item in every CLAB and HLAB must be properly documented in your notebook.

The following material is based on what you were taught in first year (e.g. ENGN1221).

The purpose of a lab notebook is to provide a record of sufficient detail to enable anyone "skilled in the art" to figure out what was done. While the student generally

keeps a notebook for his or her own use, this is not necessarily the case with the practicing engineer. If the engineer gets run over by a bus, his/her boss may well be interested in what he/she has been up to for the past six months.

The following is a list of benefits to be derived from keeping a lab notebook:

For the **student**:

- Forces organized thought and logical progress
- Greatly simplifies writing Lab Reports
- Instills the habit of recording results
- Provides a good learning tool and study aid
- Is a useful piece of evidence if the provenence of experimental results is challenged.

For the **engineer**:

- Forms the basis of the Engineering Report
- Useful in writing "monthly progress reports" for management
- Often needed to support decisions
- Essential in patent law for demonstrating "diligence"
- Only effective way of keeping track of long design projects
- Saves "re-inventing the wheel" in later design work
- Helps prevent repetition of mistakes

This brings us to what constitutes a good lab notebook. Put simply, it should enable someone of equivalent background to understand clearly what you did. It need not be fancy or verbose, but it should be comprehensive and unambiguous.

Each entry in the lab notebook must contain the following (as appropriate):

- Title of experiment
- Name(s) of participants and date performed
- Purpose
- Equipment (type, make , model, etc., but not serial numbers)

- Preparation (to be completed *before* coming into the lab)
- Circuit diagrams, block diagrams, simulation printouts, as appropriate
- Procedure (may be interleaved with results, if desired)
- Results and observations
- Notes on use of equipment/software
- Conclusions

Finally, a few words of advice may prove helpful in saving time in the lab without compromising on quality:

- **Be concise.** Complete sentences are not necessary as long as the context is clear. Don't state the obvious. (Be careful - liberal doses of "obvious" makes for an anaemic report.)
- **Label all data.** A list of unidentified numbers will be very disconcerting in a couple of months.
- **If mistakes are made, they should not be erased.** Just bracket them and make a short note explaining the problem.
- **Keep your own notebook.** Make entries as the lab progresses; don't assume you can fill it in later. The tutors will ask to see it during the lab.
- **The lab experiment hand-out is not a substitute for (any part of) the lab notebook entry.** It should be retained for reference only.
- **Date every page.**

The requirement of keeping a lab notebook is not just some form of pedantic torture developed for the inconvenience of students. It is a very necessary tool in the real engineering world, and one which requires a certain amount of skill to use painlessly and effectively. Design engineers spend a considerable amount of time with their lab notebook, so time spent acquiring the habit is not wasted.

The recommended notebook is one with alternate A4 size pages of graph and ruled paper, such as the Stripe Australia No.850 "Science Book", or equivalent.

Note that you will not be awarded any marks for notes that are not in a bound notebook.