

## ELEC 361 Measurement and Analysis Laboratory course outline

### The laboratory course

You will carry out tasks to explore some key ideas in modern electronics, including important circuit topologies, and transmitting of information represented as electrical signals. The main measurement tool we will use is the NI ELVIS II platform that provides a range of virtual instruments.

You complete the laboratory course by completing a number of experimental tasks, termed 'labs'. There are currently 7 labs available, some of which are designated 1-week labs (marked out of 10), the rest are 2-week labs (marked out of 20). We are running a type of Keller plan, which means that you progress at your own pace; there is no fixed time to start or finish a given lab. Your final grade is the sum of the grades you get for each lab that you complete, plus a mark for the end-of-semester presentation.

### Completing a lab

To complete a lab you need to complete the following 3 steps: You have to complete the pre-lab reading to a satisfactory level (and have your understanding verified by a demonstrator), complete the experimental component and record all activity and results in your lab book (and have your lab book record certified as being complete), then write up the lab and have it graded, achieving at least a pass grade.

You may have one not-submitted lab write-up at any given time, but you may not start a new lab while you have more than one lab write-up not graded as passed. In 2014 there will be giving a short presentation on each lab to make sure you know what are the important points of the lab; time and dates of those presentations to be announced.

### Laboratory and extra help times

Laboratory hours are weekly, Wednesday 2pm to 6pm in room 121. We do not plan to use the allotted lecture time (Wednesday 1pm, room 121), though we will allocate some time in the week for the pre-lab presentations.

Room 121 is open during laboratory hours. Students of ELEC 361 are welcome to use the electronics laboratory outside these hours ... just see one of the Physics Department administration staff, or Colin, to get access.

### Lab demonstrators

Colin Fox  
room 523  
phone: 479-7806  
email: fox@physics.otago.ac.nz

Hilary Lawrence  
room 527  
phone:  
email: hilaryl@physics.otago.ac.nz

**Office hours:** If you would like to meet with a demonstrator out of laboratory hours, please make contact via email to arrange a time. In the first instance, see Colin.

## Lab books

You need to maintain a lab book (laboratory notebook) in which you keep an organized and tidy record of all the things you did in the lab.

Lab books have a few hard rules:

1. Start every record by writing the date
2. All entries are made directly into the lab book
3. Records must be organized and neat (if it cannot be easily read, it is not adequately recorded)
4. Keep a record of everything relevant, especially:
  - the circuits you used, component values, and any changes you made
  - the names of files where you have saved data
  - screenshots of the data you have saved
  - ideas or conclusions that you have about the experiment
5. Never remove any pages
6. Never rub-out anything - you may cross out mistakes
7. Never 'correct' a lab outside the laboratory

Sound hard? It's not really. Keep to these rules and you will discover that your lab book is your single most important piece of laboratory equipment.

We recommend scissors and glue to include screenshots as an easy way to record measurements. Commercial laboratories require a hard-bound lab book; however, we recommend a spiral bound A4 lab book as they don't split when stuffed full of glued-in pages. Also, bring a USB stick to store the digital form of your data and screenshots.

## Lab write-ups

Apart from the first lab (in the first week) you need to produce a written report for each lab. You may hand-write or type-set your lab report. Either is fine as long as the result is clear and readable. Circuits are often best drawn by hand, while screenshots are easiest to include in type-set (electronic) documents. OpenOffice (and Word) is available on the lab computers.

Lab write-ups need to be readable and self-contained descriptions of the the lab, largely focussing on what you learned and concluded from the lab. What was interesting, and what new concepts did you discover? Present your methodology, measurements, and results. Include all set-ups and measurements, and results derived from measurements. If you estimated quantities, describe how you found accurate estimates from your measurements, and give the basis of calculations or code that you used.

We like photographs of your breadboard layout, especially if it is tidy.

If you have any doubts about what should be in your lab report, just ask the demonstrator.

### Presentation to the class

In the last lab session of the semester you will present one of the labs that you completed to the rest of the class (and ELEC staff). Towards the end of the semester you will be asked to choose which lab you want to present. You will have one week to prepare your presentation. The presentation consists of a short talk (10 minutes) to the class, followed by questions from the class (5 minutes). If you choose to write on the board we give you 5 minutes to put up the drawings you need, before starting your talk. Better still is to prepare slides (maximum of 4, using LibreOffice Impress). Sound easy - it is!

### Final grade

90% from lab reports, 10% presentation. Full marks require grades from labs totalling 90 points (or more), and a good presentation.

### List of labs in 2016

	Lab name	1- or 2-week*
1	Introduction to NI Elvis Environment	0
2	Time and Frequency Response of RC Circuits	1
3	Near-Field Electrostatic Communicator	2
4	Optical Data Link	2
5	Differential Amplifier	2
6	Arduino project #1 - bang-bang control	1
7	Arduino project #2 - half a Theremin, or other (see us)	2

\* Each lab is listed as taking 1-week or 2-weeks. This is an *indication* of time only, but it does mean that 2-week labs are worth *twice as many* marks as a 1-week lab. You may take as long, or as short, as you like to complete a lab. Your final grade depends on the *total* grade from the labs you complete, which obviously depends on how many labs you complete and how well you complete them. You need to complete the labs in the sequence shown.

### Web

Electronic resources (including this document) are available at the website <https://coursesupport.physics.otago.ac.nz/wiki/pmwiki.php/ELEC361/HomePage> which can be a pain to find - either google search, or go to Colin's elec home page and use the link from there.