ELG2336

Introduction to Lab
General info

- Lab sessions
  - **Lab**: Tuesday–Session 1 (CBY B302: 09:00–10:00); Session 2 (CBY B302: 13:30–14:30) (Starts 09 Jan 2012)
  - Possibly extending 15 min
- Tas
  - Mahfuz (**mmahf050@uottawa.ca**)
  - ??
- 4 Labs 15% of the final mark
- Lab reports due date
  - One week after each lab
  - Two weeks for each lab
In the Lab

- **Three students** in the same group
  - Find partners before you come to the lab
  - The names of the groups should be received by Tuesday 10 January 2011.

- From the same session
  - Your responsibility if change sessions

- Attendance for all group members
  - We sign the experiment results sheet as attendance
  - You have to two weeks to get your experiment results checked
  - If finish early, may skip the next week!
  - We are there to help, take advantage!
Scoring of the lab components

- Prelab – 5
- Participation (lab work) – 5
- Report – 5

- Each lab will be scored on a total of 15
- Labs will contribute to 15% of the course.
In the first part (pre-lab) all students “must” perform and analyze the pre-laboratory work individually in the electronic simulation software *Multisim* to learn how the laboratory circuit would perform. Students should also have their pre-lab *Multisim* simulation results scored by the TA. The pre-lab results have to be submitted by each student, not by groups. Please note that students will NOT be allowed to do the laboratory if their pre-lab works are not submitted on the day of the lab before starting the experiment with real circuit. Please note that it is the student’s responsibility to learn and simulate the circuits by *Multisim software*. All the computers in the lab have the *Multisim* software installed.
In the “participation” component each group would complete the experiment with real circuits. This includes recording measurements and verifying the results experimentally.
In the last part (report) of the lab, students must submit a report of the lab works. In the report each group should attach the “checked” pre-lab analyses along with the recorded measurements and results of the experiment. Laboratory reports should be submitted per group but pre-labs should be submitted per student.

In the lab report you should discuss the results of the experiments and compare the results with the theoretical results if possible by solving the circuit. You should also include any important observations and any reasons for the errors observed.
A Standard Lab Report

- A standard laboratory report should have the following sections:
  - objectives,
  - introduction,
  - equipment,
  - results,
  - analysis and discussion of the results, and
  - answers to any questions asked.
In the Lab

- 5–10 min tutorial
- Arrive prepared
- Return breadboard and other components at the end
- Power off the equipments
- Clean your desk
- Do not waste time
- **Make sure you get the TA sign on your “completed” lab works before leaving**
Lab reports format

- No copying from Lab Manual
- 5 steps
  - Problem identification/ experiment goal (abstract)
  - Gathering information
  - Experiment
    - Implementation
    - Measurement
  - Multisim (software testing) – MUST be before the experiment! (No lab will be allowed unless Multisim prelab is submitted before starting the experiment)
  - Conclusions – explain sources of errors, findings, etc.
Lab reports format

- Focus on measurements
- CALCULATE experiment errors
- Accurate graphs
  - Name and unit on all axis
  - Hand drawn graphs have to make sense in scale
- Answer all questions
- Concise yet Precise!
- No need to explain in the procedure in the report.
Lab reports

- Experiments + multisim
  - Attach signed multisim prelab with your report.

- Pictures from the screen
  - Save the graph
  - Or print screen, save in Paint then include in the lab report

- Graphs from oscilloscope
  - Camera phones (take a shot)
  - Resolution to read the axis
  - Include selections or settings on the scope
  - Be scientific!!!
Lab reports submission

- Electronically via email by midnight the week after each lab
- .doc or .docx only
- Zero tolerance for copying results
- Please follow uOttawa plagiarism guideline while preparing your report. Be careful about plagiarism.
Breadboard
Resistor

- Resistance (ohm Ω)
- Two terminal electrical component
- \( R = \frac{V}{I} \) (volt/amp)

Example: 4.7K or 4700 ohms (Carbon)

![Resistor Diagram]

Band 1, 2, 3:
- Black = 0
- Brown = 1
- Red = 2
- Orange = 3
- Yellow = 4
- Green = 5
- Blue = 6
- Violet = 7
- Gray = 8
- White = 9
- Gold = 0.1

Band 1: Yellow - 4 .......4
Band 2: Violet - 7 .........7
Band 3: Red - 2 ............00
Band 4, Gold, 5% Tolerance 4700 Ohms

Tolerance:
- Brown = 1%
- Red = 2%
- Gold = 5%
- Silver = 10%
- None = 20%

Band 5 & 6 usually for 1% metal film types. Band 6 for temp. coefficient.
Series / Parallel Connection

Series

Parallel
Series Connection on BB
Parallel Connection on BB

Schematic diagram

Real circuit using a solderless breadboard

Battery
Series or Parallel?

Real circuit using a solderless breadboard

Battery
Power Supply
To generate AC signals

- Shape
- Amplitude
- Frequency
Measurement Devices

- Digital Millimetre
  - Only DC (or rms)
  - Voltmeter
  - Ammeter
  - Ohmmeter
  - Short circuit check

- Oscilloscope
  - Voltage AC, also DC
  - \( R = \frac{V}{I} \rightarrow I = \frac{V}{R} \)
DMM
DMM
Measure Voltage

4 x 10kΩ resistors connected in series (brown, black, orange)

- Meter probe (red)
- Voltmeter 20 V DC fed
- Crocodile clip: 0 V
- Black lead

- R1
- R2
- Voltmeter

- 0V
- +6V
Measure Current

100 ohm resistors (4 off)

linkwire

0V

+0V

crocodile clip

crocodile clip

red lead

black lead

ammeter 200 mA DC fed

colours for 100 ohm: brown, black, brown

the ammeter is connected in series with power supply so that all the current flows through the meter.
Measure Ohm

\begin{align*}
I &= \text{current} \\
R_1 &= \text{resistor 1} \\
R_2 &= \text{resistor 2} \\
\text{ohmmeter} &= \text{device for measuring resistance}
\end{align*}
Capacitor

- Capacitance (farad)
- \( i = C \frac{dv}{dt} \)
- Reading capacitor
  - Pico farad \( 1e^{-12} (10^{-12}) \)
  - \( 151 = 150 \) pf
  - \( 105 = 10 \times 10^5 \) pf = 1 uf
- Polar capacitors
  - Look for sidebar (negative)
Polar Capacitor
Oscilloscope
Cables vs. Probes
Cables

0 V
brown, black, red

1 kΩ

+9 V
4.7 kΩ
yellow, violet, red
Coaxial Cable