

ECE 230L - LAB 3

INTRODUCTION TO CIRCUIT SIMULATION USING PSpICE

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1 Objectives of this Laboratory

The objectives of this laboratory session are to introduce you to the basics of PSpice by learning:

- How to set-up your PSpice simulation environment,
- How to represent the circuit elements,
- How to construct the circuits, and
- How to simulate the circuits.

2 Setting Up a Circuit Using ORCAD Capture

To create a circuit in a PSpice environment, one must first launch ORCAD:

1. Open ORCAD Capture CIS
2. Create a new project by selecting **File** → **New** → **Project**
3. Name your project 'Lab 3'
4. Choose **Analog or Mixed A/D** under the **Create a New Project Using** menu
5. Select **Create a blank project** when prompted

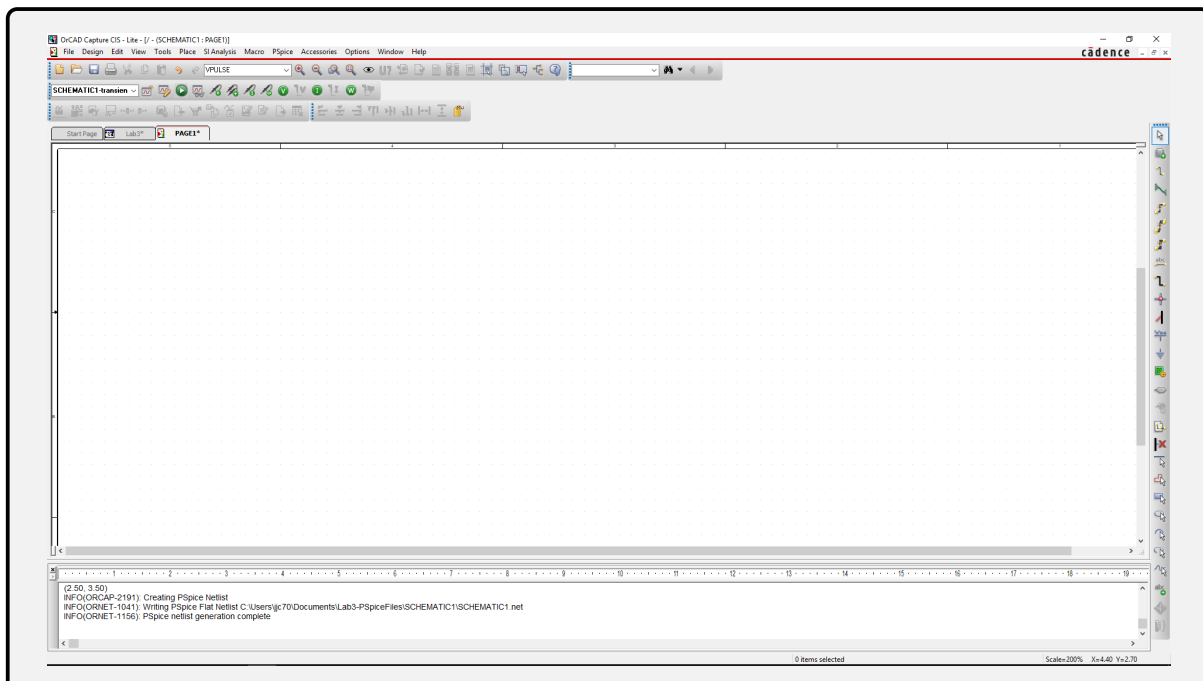
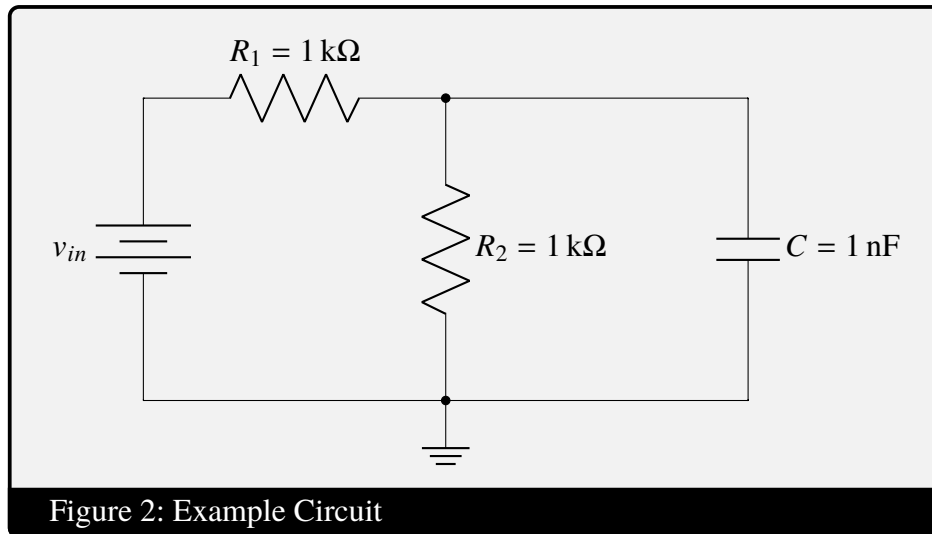


Figure 1: Blank Schematic

Once the new project has been created, circuit design can begin. Sources, components, ground nodes, and wires can be selected using the **Place** menu.

PSpice will be used to model the circuit in Figure 2 and perform DC, AC, and transient analysis on the circuit.



To make the circuit,

1. Add a DC Voltage Source by following **Place** → **PSPice Component** → **Source** → **Voltage Source** → **DC**

Add a DC voltage source to the circuit by following **Place** → **PSPice Component** → **Source** → **Voltage Sources** → **DC**. After adding the voltage source to the schematic, use the **Place** → **PSPice Components** → **Passives** menu to insert the remaining resistors and capacitors. Use **Ctrl-R** to rotate the components. Use **Place** → **Wire** to connect the circuit nodes. To change values of circuit elements, double click on the element and adjust the desired properties. Finally, add a ground node to the circuit schematic. Follow **Place** → **Ground** and select 0/SOURCE as your ground node.

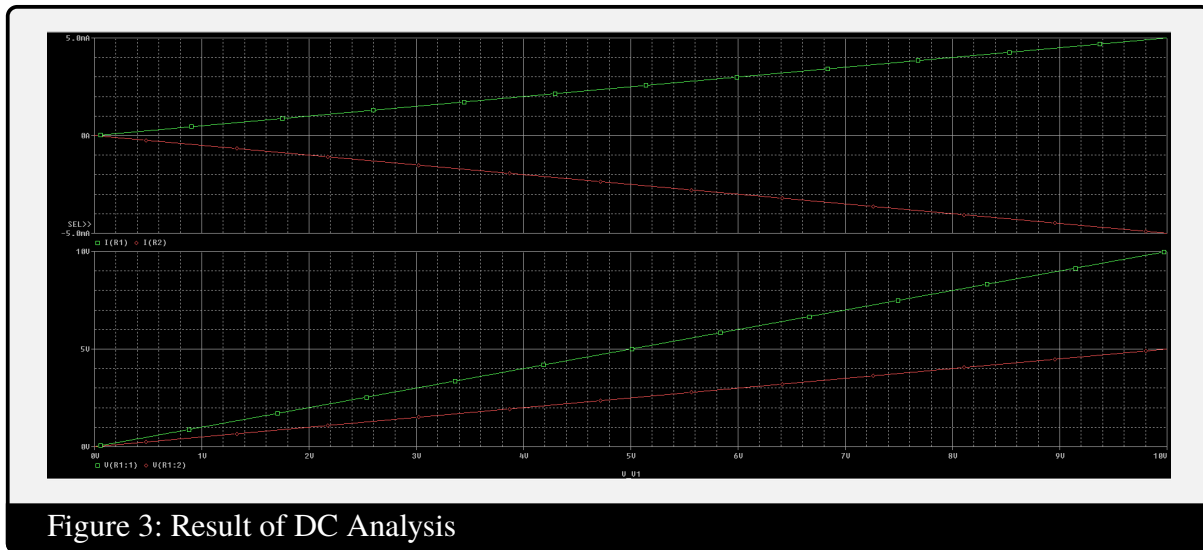
3 DC Analysis in PSpice

To perform a DC analysis of the circuit, you will create a new simulation profile. To create a new profile select **PSpice** → **New Simulation Profile**. Name the new profile 'dc' and press **Create**. To analyze the example circuit, select 'DC Sweep' in the **Analysis Type** drop down menu and use the following parameters:

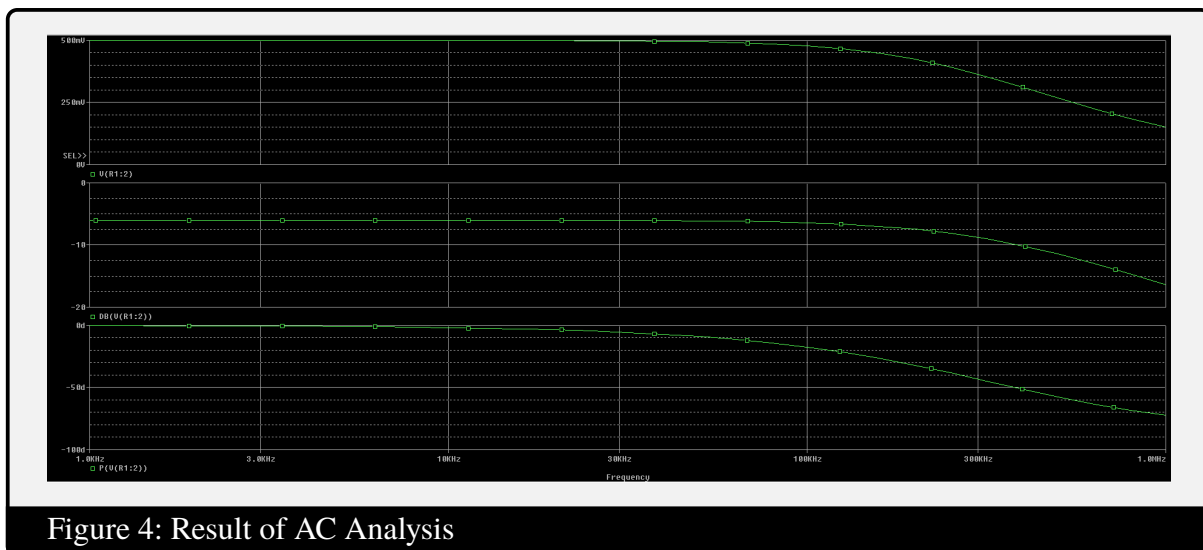
- Sweep variable > Voltage source: V1
- Sweep Type: Linear
- Start Value: 0
- End Value: 10

- Increment: 0.01

Press 'Apply' and 'OK' to save the profile settings. Begin the simulation by selecting PSpice-> Run. To view the circuit behavior at a particular point, follow Trace-> Add Trace to select different values to plot. Plot V(R1:1), V(R1:2), I(R1), and I(R2). Figure 2 shows the circuit schematic and figure 3 shows the result of DC analysis (top plot: current, bottom plot: voltage).



4 AC Analysis in PSpice



4.1 Trace Expressions in PSpice

5 Transient Analysis in PSpice

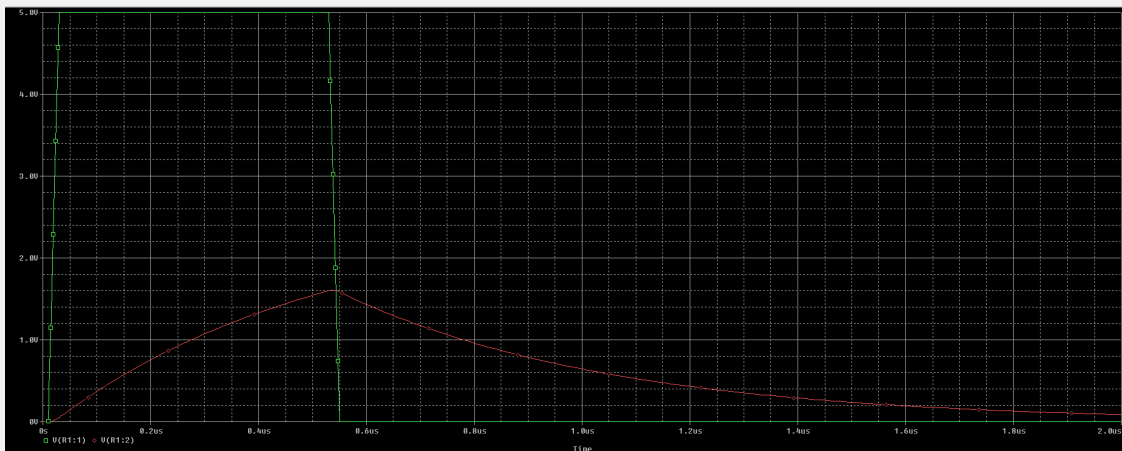


Figure 5: Result of Transient Analysis

6 Practice Example

7 Exploration: Thevenin Equivalent Circuits

7.1 Purpose

7.2 Introduction

7.3 Exercise

7.4 Practice Exercise: Thevenin Equivalent Circuit

Grading Rubric

Table 1: ECE 230L Laboratory 3 Grading Rubric

Criteria	Points Possible
DC Analysis	10
Circuit Diagram	5
Waveforms	5
AC Analysis	10
Circuit Diagram	5
Waveforms	5
Transient Analysis	10
Circuit Diagram	5
Waveforms	5
Practice Exercise	35
Circuit Diagram	5
DC Analysis	10
AC Analysis	10
Transient Analysis	10
Thevenin Equivalent Example Circuit	20
Circuit Diagram	10
V_{OC} and I_{SC} Labeled	5
Correct R_{TH} Value	5
Thevenin Equivalent Challenge Circuit	15
Circuit Diagram	5
V_{OC} and I_{SC} Labeled	5
Correct R_{TH} Value	5
Total	100