

# Lab 1: Learning Objectives 2 70 Points Possible and 5 (TLOs 1,2,4)

2/20/2026



Attempt 1 ▼



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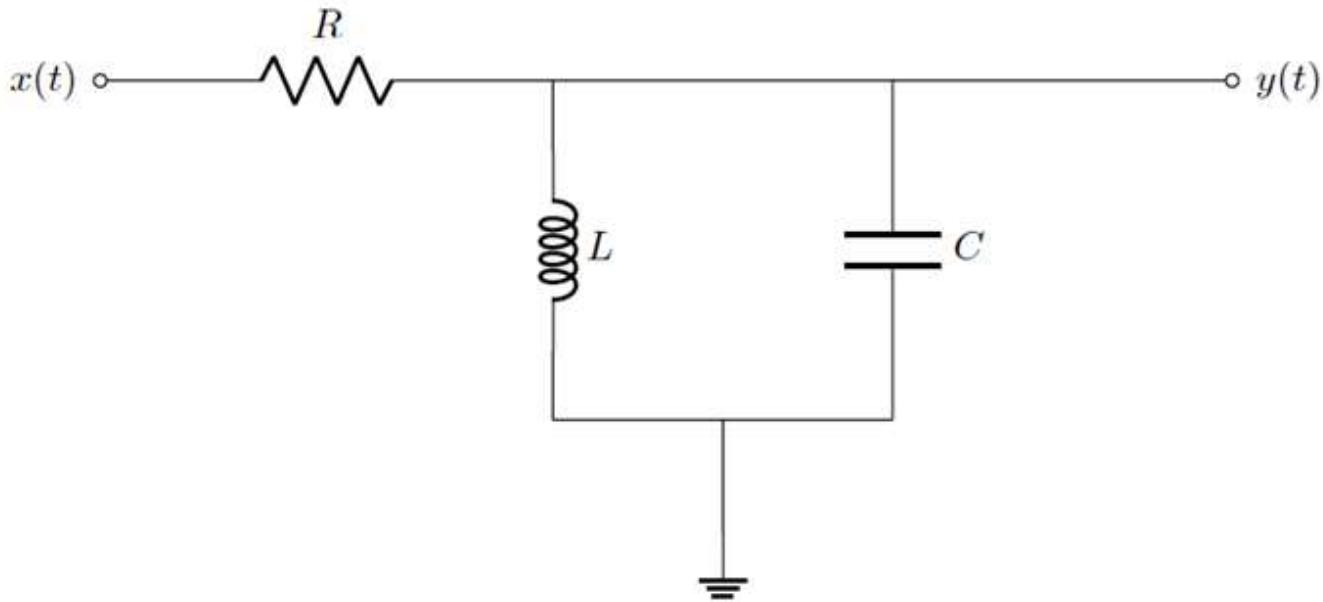
## ECE2714 SP26 Lab 1

Due Date: Friday, February 20, 2026

Learning Objectives: 2 and 5

TLOs: 1,2 and

The purpose of this initial lab is gain experience deriving impulse and step responses for a CT physical system and comparing to measurements.



Part List

Component	Value

$R$	68 $k\Omega$
$L$	100 $mH$
$C$	0.01 $\mu F$

These should all be in your kit.

## Instructions

- Derive the governing equation (LCCDE) of the above circuit for a general input  $x(t)$  in terms of  $R$ ,  $L$ , and  $C$ .
- Substitute the numerical values of  $R$ ,  $L$ , and  $C$  to get the final LCCDE.
- Find the impulse response,  $h(t)$ , from the LCCDE from step 2.
- Integrate the impulse response from step 3 to get the step response in the time domain.
- Plot the step response and find the approximate time  $T$  at which it reaches its final (steady-state) value.
- Construct the circuit on a proto-board. Take a photo of your circuit with a piece of paper showing your name and the date and include it in your report.
- Using your function generator, apply a  $0 - 5$  V square wave input with period  $3T$ , as the input voltage. Measure the signal  $x(t)$  on channel 1 and  $y(t)$  using channel 2 of the scope over one period. Export your traces as an image and include it in your report. Treating the first half of the square wave input as a step input, compare it to your theoretical response from step 4.
- Discussion question 1.** Using your governing equation in Step 1, derive an expression for the step response as a function of  $R$ ,  $L$ , and  $C$ . In this question, the value of the resistor is  $136 k\Omega$  (that is the resistor value is doubled). In 1-2 complete sentences, discuss how the step response of this circuit is similar to the step response in Step 4. In 1-2 complete sentences, discuss how the step response of this circuit is different from the step response in Step 4.
- Discussion question 2.** This discussion question uses the expression for the step response as a function of  $R$ ,  $L$ , and  $C$  derived in Discussion question 1. In this question, the value of the capacitor is  $0.1 \mu F$  (that is the capacitor value is multiplied by a factor of 10). In 1-2 complete sentences, discuss how the step response of this circuit is similar to the step response in Step 4. In 1-2 complete sentences, discuss how the step response of this circuit is different from the step response in Step 4.
- Write up your report using the template below and submit it as a pdf file named `lab1.pdf`. This should be done in a word processing system (e.g. Microsoft Word or

LaTeX) and include explanatory text, math, figures, and tables as appropriate. Box final results and make sure you include the appropriate axis on all plots, including those captured from the scope. Your report will be graded on completeness and clarity using the rubric below.

**Important Note:** All equations must be typeset using a word processing software such as Latex or Microsoft Word. Handwritten equations are not acceptable. All figure axes must be properly labeled with the correct units.

## Template for Report

### Template for Report

**ECE 2714 – Spring 2026**

**Lab 1**

NAME and DATE

#### 1. Introduction

Restate the analysis problem that constitutes the lab and the theory required to solve it in your own words.

#### 2. Theoretical Results

Include the derivation of your results for steps one through four. This section should include explanatory text, math, and figures. Highlight your final results (e.g. with a box).

#### 3. Experimental Design and Results

Describe your experimental setup and measurement process. Include the photo from step six and the traces from step seven.

#### 4. Discussion and Conclusion

Discuss, interpret, and compare the theoretical and experimental results. Explain how your theoretical analysis relates the input/output behavior observed.

## Grading Rubric

Note: You can assign half points for partial credit. For components with a derivation, the steps must be shown to receive full credit. Each bullet point is worth 1 point unless otherwise noted.

#### 1. (5 Points) Instructions followed

- template is followed
- all content is typeset, including equations
- all images have correctly labeled axes

#### 2. (5 Points) Introduction

- at least one paragraph stating the problem.
- at least two paragraphs describing the theory involved.
- clarity of the prose in this section
- grammar of the prose in this section
- spelling of the prose in this section

### 3. (10 Points) Theoretical Results

Derive the governing equation of the circuit.

- (5 points) correct governing equation
- (5 points) correct solution to the differential equation

### 4. (10 Points) Experimental Design and Results

- at least one paragraph describing the construction.
- at least one paragraph describing the measurements made
- (5 points) correct input-output traces
- clarity of the prose in this section
- grammar of the prose in this section
- spelling of the prose in this section

### 5. (40 Points) Discussion and Conclusion

- (7 points) At least one paragraph making reference to the traces explaining the relationship between theory and experiment.
- (10 points) Expression for the step response as a function of  $R$ ,  $L$ , and  $C$ .
- (10 points) **Discussion question 1:** 1-2 complete sentences discussing how the step response differs from the step response in Step 4.
- (10 points) **Discussion question 2:** 1-2 complete sentences discussing how the step response differs from the step response in Step 4.
- clarity of the prose
- grammar of the prose
- spelling of the prose

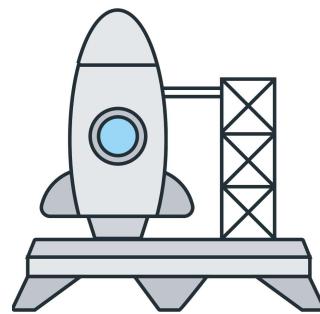
TOTAL: 70 points.

[View Rubric](#)

### ECE2714 Lab 1 Rubric

Criteria	Ratings	Pts
Introduction <a href="#">view longer description</a>	5 pts Introduction	0 pts Missing / 5 pts
Theoretical Results <a href="#">view longer description</a>	10 pts Theoretical Results	0 pts Not visible / 10 pts
Experimental Design and Results <a href="#">view longer description</a>	10 pts Experimental Design and Results	0 pts No Marks / 10 pts
Discussion and Conclusion <a href="#">view longer description</a>	40 pts Discussion and Conclusion	0 pts No Marks / 40 pts
Optional Lab 1 live demo with working circuit and Waveforms software (5 pts)	0 pts Missing	0 pts Optional Lab 1 live demo with working circuit / 0 pts
Instructions followed <a href="#">view longer description</a>	5 pts Introduction	0 pts Missing / 5 pts
		Total Points: 0

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