

# Alpha Experiments and Omega Lab Explorers Proof of Skills

## Introduction to ECSE

Proof of Skills is an assignment meant to teach you the practical skills you will need to complete the laboratory assignments in this course, as well as begin your journey as a responsible engineer. The skills are broken down into the five categories below:

1. **Professional Accountability**
2. **Circuit Simulation**
3. **Experimental Measurement and Personal Instrumentation**
4. **MATLAB and Simulink Basics**
- \* **Community, Communication, Asking for Help, Helping Others**

Starting with the 2<sup>nd</sup> lecture, you will have time to work on Proof of Skills during class. While everyone must complete and *submit their own work*, we highly encourage you to work together and help each other out. During the Proof of Skills days, teaching assistants, undergraduate student assistants, and the instructor will be available in class as resources while you complete each category – take advantage of this time to ask us questions! The entirety of Proof of Skills is not meant to be finished during class and completing it will be your primary homework assignment for the first three weeks of the course.

We will be working on the categories in class in the order listed above, meaning you'll start with Professional Accountability on the 2<sup>nd</sup> day of class, then begin Circuit Simulation on the 3<sup>rd</sup> day of class, etc. There will not be a separate day for working on the “Community, Communication, Asking for Help, Helping Others” category, since you will complete those questions simultaneously with the other categories.

Within each category, there are multiple questions to be answered on Gradescope (the questions are also listed in this document by category). You will answer these questions by submitting them on Gradescope. Each category will be graded regularly, and you will receive feedback on how you can improve your submissions. If needed, resubmit your revised documentation to get maximum scores. Your goal is to be 100% proficient at these BASIC skills BEFORE Lab Proof of Concepts begin!

The information you need to complete your Proof of Skills objectives is contained in this editable [Self-Directed Skills Documentation](#). Improving this document to include more detail/links organization is a part of this semester's exercise. You get points for it!

### **Submission Format:**

1. For questions on Gradescope that consist of a text box, you may enter your answer there in text.
2. For questions on Gradescope that ask for a file upload, submit your file as a PDF. Other formats will not be graded. In your submission, be sure to include:
  - a. the title of the question being answered
  - b. all relevant screen shots or photos with proper labeling and formatting as outlined in the Self-Directed Skills Documentation
  - c. a description of what your results demonstrate.

For some good examples of Proof of Skills submissions, see the link below:

[https://sites.ecse.rpi.edu/%7Essawyer/videos/ProofofSkills\\_FrankFiles/](https://sites.ecse.rpi.edu/%7Essawyer/videos/ProofofSkills_FrankFiles/)

### **Grading Procedure**

You will have an initial deadline for each of your Proof of Skills categories within the first few weeks of the semester, after which you will receive feedback on your submissions. After that, you may continue to make revisions to your submissions and resubmit them to be graded again for a better score. The course staff will grade new submissions multiple times during the semester, giving you multiple rounds of *optimizations*.

*Note:* once you upload a new submission to a question on Gradescope for an *optimization*, it will replace your previous submission, along with the grade that you originally received for it. Therefore, it's a good idea to keep track of the scores you receive for each of your questions in the rubric below and only resubmit answers to questions on Gradescope that you would like to have regraded for optimization.

Use the rubric below to keep track of your current grade on Proof of Skills.

## Professional Accountability (15 Points)

Skill to be Proven	First Submission	Optimization #1	Optimization #2	Optimization #3	Best Score from All Submissions
<p><b>1. I know the ABET Engineering Student Outcomes (Criterion 3).</b> There are 7. Comment on one that you are most excited to accomplish while at RPI. Comment on the one that will be the most challenging for you to accomplish while at RPI.</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p><b>/3</b></p>
<p><b>2. I know the IEEE Code of Ethics (list them all).</b> Choose one to write a few sentences that seems most important to your lived experience or your future experience!</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p><b>/2</b></p>
<p><b>3. I know the difference between A Good Failure and a Bad Failure (Consequences):</b> I have a plan for “Good Failures”. What to do when it doesn’t go well? Who takes responsibility? How do you address it? Write what you will do (A good failure plan!) if things don’t go well for an experiment, for an exam, or assignment....</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p><b>/3</b></p>
<p><b>4. I can make a draft of my Plan of Study according to my own personal interests</b> at the moment. Write/fill in a draft of your 4-Year <a href="#">Plan of Study</a> excel spreadsheet. Where do you find 2027 Curriculum templates (<a href="#">EE</a> and <a href="#">CSE</a>) for all majors? Where will you find <a href="#">Program templates</a> and more detail about Navigating ECSE?</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p><b>/3</b></p>

<p>5. I can begin to <b>prepare for my future internship or job search on RPI's Handshake portal</b>. Handshake connects college students looking for jobs with companies looking to hire college students. Navigate to <a href="#">RPI Handshake</a> and create an account. Name three career-oriented things that students can do via Handshake. Also choose a company that you would be interested in doing an internship with or working for – why does this company interest you?</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p><b>/3</b></p>
<p>6. <b>Make your portfolio</b> in Box or start formatting your website</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/1</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/1</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/1</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/1</p>	<p><b>/1</b></p>

# Circuit Simulation (21 Points)

Each of the **Circuit Simulation Objectives** below should reflect the following goals (each are worth 1 pt where applicable):

1. I can **change my schematic and plot background to white** and cut and paste on an external document
2. I can **change the line thickness and color** of my schematic and simulation output
3. I can **label the simulation output clearly with the circuit schematic component names**
4. I can intentionally show the most relevant part of a simulation by **changing the simulation output window**

Skill to be Proven	First Submission	Optimization #1	Optimization #2	Optimization #3	Best Score from All Submissions
1. I can <b>use operation point dc analysis</b> to find voltages across a resistive circuit ( <b>Must be two or more resistors</b> , <i>hint: to do something useful to you, try to simulate a homework or class problem!</i> )	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	<b>/3</b>
2. I can <b>label and identify Nodal Voltages</b> in a circuit. (creating a well labeled schematic!!)	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	<b>/3</b>
3. I can <b>use transient analysis with a sinusoidal source</b> to measure voltage across ONE resistor in a resistive circuit ( <b>Total resistor count in the circuit must be two or more</b> )	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	<b>/5</b>
4. I can <b>step through parameters with parametric analysis</b> to repeatedly measure voltages as I vary my resistance over a range of values	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	<b>/5</b>
5. I can <b>use AC analysis to find the frequency response of an RC or RL filter</b> ( <i>hint: find a filter with or without an op amp, we'll understand how this works later!</i> )	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	<b>/5</b>

# Experimental Measurements and Personal Instrumentation (26 Points)

Each of the **Experimental Measurements and Personal Instrumentation Objectives** below should reflect the following goals:

1. I can use consistent **color coding of wires when I build circuits on my breadboard** to aid in troubleshooting (you must include a photo of your circuit when relevant).
2. I can “zoom in” to an oscilloscope output by **changing the time scale (x-axis)** to show important parameters (for example, a sinusoid with 25 cycles would be easier to see if only 3-5 cycles were shown instead!) when needed
3. I can “zoom in” to an oscilloscope output by **changing the voltage scale (y-axis)** to show important parameters (for example, a sinusoid with 500mV amplitude would be difficult to see with 5V/div...) when needed
4. I can **change the THICKNESS** of my trace lines for easy viewing.
5. I can **change the background color of my oscilloscope output to white** and paste in an external document for easy viewing.
6. I can **label the measurement output clearly** with the circuit schematic component names

Skill to be Proven	First Submission	Optimization #1	Optimization #2	Optimization #3	Best Score from All Submissions
<p><b>1.</b> I can use my instrumentation board’s function generator to <b>create a DC, sinusoid, and pulsed signal</b> and measure with its oscilloscope directly (<i>hint: no circuit necessary but need external wires!</i>)</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p><b>/5</b></p>
<p><b>2.</b> I can <b>build a resistive circuit</b> and <b>measure dc voltage across ONE resistor using a dc input source</b> and vary dc voltage at least 3 times (-5,+5 and any voltage in between) (<b>Must be two or more resistors</b>, <i>hint: to do something useful to you, try to simulate a homework or class problem!</i>)</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/5</p>	<p><b>/5</b></p>
<p><b>3.</b> I can <b>build a resistive circuit</b> and <b>measure the dc current through ONE resistor using a dc source</b> (OR find another way if needed depending on board!) (<b>Must be two or more resistors</b>, <i>hint: to do something useful to you, try to simulate a homework or class problem!</i>)</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/6</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/6</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/6</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/6</p>	<p><b>/6</b></p>

<p><b>4.</b> I can <b>build a resistive circuit</b> and <b>measure voltage across ONE resistor using a sinusoidal input source</b> (<i>Must be two or more resistors, hint: try to make a sinusoidal source with amplitude 0 to 5V centered at 2.5 V and another from -5 to +5V centered at 0 then document whether your board can accomplish both or only one of these</i>)</p>	Attempted?	Attempted?	Attempted?	Attempted?	<b>/7</b>
Graded Score	Graded Score	Graded Score	Graded Score	Graded Score	
/7	/7	/7	/7	/7	
<p><b>5.</b> I can <b>use my cursor function</b> to show specific voltage and time points on an oscilloscope measurement.</p>	Attempted?	Attempted?	Attempted?	Attempted?	<b>/3</b>
Graded Score	Graded Score	Graded Score	Graded Score	Graded Score	
/3	/3	/3	/3	/3	

# MATLAB and Simulink Basics (27 Points)

Skill to be Proven	First Submission	Optimization #1	Optimization #2	Optimization #3	Best Score from All Submissions
<b>1.</b> I have completed the <a href="#">MATLAB Onramp Tutorial</a> (submit certificate to Gradescope)	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	       <b>/5</b>
<b>2.</b> I have completed the <a href="#">Simulink Onramp Tutorial</a> (submit certificate to Gradescope)	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	       <b>/5</b>
<b>3.</b> I can <b>add two sinusoid waves and show the display using MATLAB Simulink</b>	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	       <b>/2</b>
<b>4.</b> I can <b>analytically determine the amplitude, frequency, period and phase shift of a sinusoid</b> (hint: for phase shift you will need a reference point which could be two different sinusoids plotted together!)	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	Attempted?  Graded Score  /3	       <b>/3</b>
<b>5.</b> I can <b>find the solutions for linearly independent equations using the matrix function</b> on my personal calculator (TI-XX) and compare it to the calculation in MATLAB	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	Attempted?  Graded Score  /5	       <b>/5</b>
<b>6.</b> I can <b>import simulation data</b> (from LTSpice or equivalent) <b>to MATLAB</b> and plot the function	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	Attempted?  Graded Score  /2	       <b>/2</b>



<p>7. I can <b>import experimental data (from Scopy or Waveforms) to MATLAB</b> and plot the function</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p><b>/2</b></p>
<p>8. I can <b>use a regression in MATLAB</b> to help define my function</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/3</p>	<p><b>/3</b></p>

# Community, Communication, Asking for Help, Helping Others – Be an active part of the learning community! (6 Points)

Skill to be Proven	First Submission	Optimization #1	Optimization #2	Optimization #3	Best Score from All Submissions
<p><b>1.</b> I can <b>ask for help</b> from a TA or SA when needed for technical issues, parts, or general question as I complete this Proof of Skills work</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p><b>/2</b></p>
<p><b>2.</b> I can <b>HELP someone else OR ask another student for help</b> after I have mastered a skill</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p><b>/2</b></p>
<p><b>3.</b> I <b>add new information, add a comment or make a correction to the Intro to ECSE Skills documentation</b> in a meaningful way for future semesters</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p>Attempted?</p> <p>Graded Score</p> <p>/2</p>	<p><b>/2</b></p>