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Electric Circuits

Alpha and Omega Lab Proof of Skills

Section 1

Click here for editable Skills Documentation (How-to document)

Improving this document to include more detail/links organization is a part of this semester's exercise. You get points for it!

You should rotate each day to a new category. On Gradescope, you'll see your submission days and scores. If needed, resubmit skills to get maximum scores. Your goal is to be 100% proficient at these BASIC skills BEFORE Lab Proof of Concepts begin!

Submission Format:

1. Please mark this sheet on the due date for each Proof of Skills Day by the next Proof of Skills Day (See Gradescope deadlines). Please indicate for each submission day, which skills you attempted. If you have already received a graded score, include this as well.
2. Each Skill is listed in Gradescope with a place to add a .docx, .pdf, video or other file…..pdf is preferred but we will accept equivalent files. Be sure to address ALL criteria before submitting (the skill AND format list if supplied at the end of each section….)

To find a couple of examples of a submission, see these files…

https://sites.ecse.rpi.edu//courses/F22/ECSE-1010/ProofofSkillexample_BESTOF.pdf

https://sites.ecse.rpi.edu/~ssawyer/videos/ProofofSkills_FrankFiles/

Requirements: You must complete AT LEAST the essential skills in the red boxes for each category by February 26th. If you cannot complete essential skills by this deadline 1) You will be asked to drop the course or 2) You will be asked to work alone for your labs until you finish a strict plan (including attending open hours/office hours for help) to complete these skills with a hard deadline after which you get 0% for the entire Proof of Skills assignment and must work in your labs alone for the rest of the course. *Why? A student can get all the help they need to improve their skills to accomplish lab goals if the student can put the time in (please come to open hours, class, labs, and office hours and ask for help!).* ***But a student cannot depend on lab mates to do ALL the work for them because they don't have skills.*** *Instead, the student should drop the course and work on these skills until they are ready and have enough time for full participation in the course!*

Proof of Skills is an individual evaluation in a collaborative environment which means you may work together to figure out how to accomplish the skills **BUT YOU MUST SUBMIT YOUR OWN WORK**. Not doing so, (submitting graphs and data that you as an individual did not generate) puts you in violation of the academic dishonesty code which will result in a minimum penalty of 0 pts for the Proof of Skills assignment worth 15% of the course final grade. You may receive help from your entire learning community, TAs, SAs, other students, and professor (we strongly encourage reaching out!). You are not allowed to copy results.

Proof of Skills Learning Objectives	**Proof of Skills Day 1** **Choose your Day 1 skill set here**	**Proof of Skills Day 2** **Choose your Day 2 skill set here**	**Proof of Skills Day 3** **Choose your Day 3 skill set here**	**Proof of Skills Day 4** **Choose your Day 4 skill set here**	**Course Competency Check: Must complete AT LEAST the ESSENTIAL SKILLS by February 26th (to be graded by the day before drop deadline).** ***After essential skills are completed you may improve your scores until the end of the semester.***
Circuit Simulation (LTSpice or equivalent)					
I can use operation point **dc analysis** to find voltages across a resistive circuit ***(Must be two or more resistors**, hint: to do something useful to you, try to simulate a homework or class problem!)*	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	
I can label and identify Nodal Voltages in a circuit. (creating a well labeled schematic!!)	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	
I can use **transient analysis** with a sinusoidal source to measure voltage across ONE resistor in a resistive circuit (**Total resistor count in the circuit must be two or more**)	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	
I can step through parameters with **parametric analysis** to repeatedly measure voltages as I vary my	Attempted?	Attempted?	Attempted?	Attempted?	

resistance over a range of values	Graded Score /5	Graded Score /5	Graded Score /5	Graded Score /5	
I can use **AC analysis** to find the frequency response of an RC or RL filter (*hint: find a filter with or without an op amp, we'll understand how this works later!*)	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	Attempted? Graded Score /5	
Each of the Circuit Simulation Objectives above should reflect the following goals:					
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**					
Experimental Measurements and Personal Instrumentation (M1K board, Analog Discovery 2 Board, M2K board, or equivalent)					
I can use my instrumentation board's function generator to **create a DC, sinusoid, and pulsed signal** and measure with its oscilloscope directly (*hint: no circuit necessary but need external wires!*)	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	
I can **build a resistive circuit** and **measure dc voltage across ONE resistor using a dc input source** and vary dc voltage at least 3 times (-5,+5 and any voltage in between) (***Must be two or more resistors**, hint: to do something useful to you, try to simulate a homework or class problem!)*	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	

I can **build a resistive circuit** and **measure the dc current through ONE resistor using a dc source** (OR find another way if needed depending on board!) ***(Must be two or more resistors**, hint: to do something useful to you, try to simulate a homework or class problem!)*	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	
I can **build a resistive circuit** and **measure voltage across ONE resistor using a sinusoidal input source** ***(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)*	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	
I **can use my cursor function** to show specific voltage and time points.	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	
I can provide **power and measure the output of a working operational amplifier** circuit	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	Attempted? Graded Score /7	

Each of the Experimental Measurements and Personal Instrumentation Objectives above 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.
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

Analytical Calculations with personal calculator (TI-XX) and MATLAB or equivalent					
I have completed the MATLAB Onramp Tutorial (submit certificate to Gradescope)	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can analytically determine a time constant** for an exponential function	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can analytically determine the amplitude, frequency, period and phase shift of a sinusoid** (hint: for phase shift you will need a reference point which could be two different sinusoids plotted together!)	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can find the solutions for linear independent equations using the matrix function** on my	Attempted?	Attempted?	Attempted?	Attempted?	

personal calculator (TI-XX) and compare it to the calculation in MATLAB	Graded Score /1	Graded Score /1	Graded Score /1	Graded Score /1	
I **can import simulation data** (from LTSpice or equivalent) **to MATLAB** and plot the function	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can import experimental data (from ALICE or Waveforms) to MATLAB** and plot the function	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can use a regression** in MATLAB to help define my function	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
Community, communication, asking for help, helping others and answering for yourself "Is this right?'					
I **can ask for help** from a TA or SA when needed for technical issues, parts, or general question as I complete this Proof of Skills work	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I **can HELP someone else OR ask another student for help** after I have mastered a skill	Attempted?	Attempted?	Attempted?	Attempted?	

	Graded Score /1	Graded Score /1	Graded Score /1	Graded Score /1	
Make your portfolio in Box or start formatting your website	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
I can **add new information, add a comment or make a correction to the Intro to ECSE Skills documentation** in a meaningful way for future semesters	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	
MAX LEVEL PROOF OF SKILLS - FULL INTEGRATION! I **can clearly document and compare a calculated, simulated, and experimental result** to answer the question "Is this right?" for myself	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	Attempted? Graded Score /1	