

ET Program Online Lab Requirements

General Note: Read and follow the directions and requirements for each Lab by clicking on the assignment in Canvas! Requirements for online ET131B-1901, ET132B-1901, ET212B-1901, and ET228B-1001.

1.a. **Minimum ET131B Lab Equipment Requirements.** The following details the minimum functionality that is required for this course and then we list some low-cost equipment that will be sufficient for this course in the next paragraph.

1. Function Generator that can supply square, sine wave and triangle waveforms of at least 20 Volts Peek-to Peek. The frequency should be able to range from a few hundred hertz to at least 50KHz. Finally, there should be a DC offset adjust.
2. A Dual trace O-Scope that has a minimum voltage resolution of at least 200 kHz Bandwidth and at least 20 V_{P-P} input voltage range on each channel. There must also be a capability of capturing the O-Scope display with both voltage and time base settings in a digital image.
 - i. **NOTE: Not needed until the last ½ of the course!**
3. Breadboard with at least 840 plug-in tie points.
4. DC power supplies with the following: regulated 5V, at least 2 variable supplies of approx. 0.5 ±15V. Capable of at least 1Amp DC for each voltage.
5. Digital Multimeter. Must have at least the following resolutions on the lowest scale
 - On DC voltages: 1 mV which is the same as 0.001V
 - On AC voltages: 1 mV which is the same as 0.001V
 - On DC currents: 1 mA which is the same as 0.001A
 - On AC Current: 0.1 uA which is the same as 0.000001A
 - Resistance: 0.1 Ohm

NOTE: In addition, you will need all some small jumper wires with alligator clips.

1.b Sufficient and inexpensive Lab and Test Equipment. The following equipment are inexpensive examples that will meet the course's minimum technical requirements, but they aren't required. Furthermore, CSN, the ET Program and the Instructor aren't stating anything about the safety, durability, or any other factor about these items. Finally, CSN, the ET Program and the Instructor aren't requiring you to purchase the following equipment. Any equipment that safely satisfies the above requirements in paragraph 2 is acceptable.

- Requirements "a, c, and d" from above can be met by PAD-234 - DIGITAL / ANALOG TRAINER from Electronix Express. **Link:**

<https://www.elexp.com/catalogsearch/result/?q=PAD+234><https://www.elexp.com/catalogsearch/result/?q=PAD+234> . Suggest the assembled version.

- Requirement “e” can be satisfied by a range of the Digital Multimeters, A low cost one along with an expensive Fluke meter with Amazon links for both.
Fluke 11& True RMS meter **Link:** https://www.amazon.com/Fluke-117-Electricians-True-Multimeter/dp/B00003LUEI/ref=sr_1_5?dchild=1&keywords=Fluke+117+Electricians+True+RMS+Multimeter&qid=1593717499&sr=8-5 Aprox \$176

Ths inde 18B+ meter **Link:** https://www.amazon.com/Ranging-Digital-Multimeter-Battery-Alligator/dp/B06ZZG2F2N/ref=sr_1_2?dchild=1&keywords=Ths inde+18B%2B&qid=1596661465&sr=8-2 Approx \$20

- Requirement “b” can be satisfied by a USB Oscilloscope. Suggest a search for ‘Picoscope 2204A’ or better (suggest TEquipment or tme.com based on a google search Newark has the Picoscope 2205A). Make sure you get the probes.

NOTE: *Not needed until the last ½ of the course!*

- Small jumper wires with alligator clips. Low cost option:
https://www.amazon.com/KAIWEETS-Electrical-Alligator-Connection-Experiment/dp/B07WQ21YMY/ref=sr_1_4?dchild=1&keywords=%E2%80%A2+Small+jumper+wires+with+alligator+clips&qid=1596663333&sr=8-4

2.a. Minimum ET132B Lab Equipment Requirements. The following details the minimum functionality that is required for this course and then we list some low-cost equipment that will be sufficient for this course in the next paragraph.

1. Function Generator that can supply square, sine wave and triangle waveforms of at least 20 Volts Peek-to Peek. The frequency should be able to range from a few hundred hertz to at least 50KHz. Finally, there should be a DC offset adjust.
2. A Dual trace O-Scope that has a minimum voltage resolution of at least 200 kHz Bandwidth and at least 20 V_{p-p} input voltage range on each channel. There must also be a capability of capturing the O-Scope display with both voltage and time base settings in a digital image. In addition, you will need
3. Breadboard with at least 840 plug-in tie points.
4. DC power supplies with the following: regulated 5V, at least 2 variable supplies of approx 0.5 ±15V. Capable of at least 1Amp DC for each voltage.
5. Digital Multimeter. Must have at least the following resolutions on the lowest scale
 - On DC voltages: 1 mV which is the same as 0.001V
 - On AC voltages: 1 mV which is the same as 0.001V
 - On DC currents: 1 mA which is the same as 0.001A
 - On AC Current: 0.1 uA which is the same as 0.000001A
 - Resistance: 0.1 Ohm

NOTE: In addition, you will need all some small jumper wires with alligator clips.

2.b Sufficient and inexpensive Lab and Test Equipment. The following equipment are inexpensive examples that will meet the course's minimum technical requirements, but they aren't required. Furthermore, CSN, the ET Program and the Instructor aren't stating anything about the safety, durability, or any other factor about these items. Finally, CSN, the ET Program and the Instructor aren't requiring you to purchase the following equipment. Any equipment that safely satisfies the above requirements in paragraph 2 is acceptable.

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Fluke 11& True RMS meter **Link:** https://www.amazon.com/Fluke-117-Electricians-True-Multimeter/dp/B00003LUEI/ref=sr_1_5?dchild=1&keywords=Fluke+117+Electricians+True+RMS+Multimeter&qid=1593717499&sr=8-5 Aprox \$176
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- Requirement "b" can be satisfied by a USB Oscilloscope. Suggest a search for 'Picoscope 2204A' or better (suggest TEquipment or tme.com based on a google search). Make sure you get the probes.
- Small jumper wires with alligator clips. Low cost option:
https://www.amazon.com/KAIWEETS-Electrical-Alligator-Connection-Experiment/dp/B07WQ21YMY/ref=sr_1_4?dchild=1&keywords=%E2%80%A2+Small+jumper+wires+with+alligator+clips&qid=1596663333&sr=8-4

3.a Minimum ET212B-1901 On-Line Lab Equipment Requirements. The following details the minimum functionality that is required for this course and then we list some low-cost equipment that will be sufficient for this course in the next paragraph.

1. Function Generator that can supply square, sine wave and triangle waveforms of at least 20 Volts Peek-to Peek. The frequency should be able to range from a few hundred hertz to at least 50KHz. Finally, there should be a DC offset adjust.

2. A Dual trace O-Scope that has a minimum voltage resolution of at least 200 kHz Bandwidth and at least 20 V_{p-p} input voltage range on each channel. There must also be a capability of capturing the O-Scope display with both voltage and time base settings in a digital image. In addition, you will need
3. Breadboard with at least 840 plug-in tie points.
4. DC power supplies with the following: regulated 5V, at least 2 variable supplies of approx 0.5 ±15V. Capable of at least 1Amp DC for each voltage.
5. Digital Multimeter. Must have at least the following resolutions on the lowest scale
 - On DC voltages: 1 mV which is the same as 0.001V
 - On AC voltages: 1 mV which is the same as 0.001V
 - On DC currents: 1 mA which is the same as 0.001A
 - On AC Current: 0.1 uA which is the same as 0.0000001A
 - Resistance: 0.1 Ohm

NOTE: In addition, you will need all some small jumper wires with alligator clips.

3.b. Sufficient and inexpensive Lab and Test Equipment. The following equipment are inexpensive examples that will meet the course's minimum technical requirements, but they aren't required. Furthermore, CSN, the ET Program and the Instructor aren't stating anything about the safety, durability, or any other factor about these items. Finally, CSN, the ET Program and the Instructor aren't requiring you to purchase the following equipment. Any equipment that safely satisfies the above requirements in paragraph 2 is acceptable.

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- Requirement “b” can be satisfied by a USB Oscilloscope. Suggest a search for ‘Picoscope 2204A’ or better (suggest TEquipment or tme.com based on a google search). Make sure you get the probes.
- Small jumper wires with alligator clips. Low cost option:
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4.a Minimum ET228B-1101 On-Line Lecture/Lab Equipment Requirements. The following details the minimum functionality that is required for this course and then we list some low-cost equipment that will be sufficient for this course in the next paragraph.

1. Function Generator that can supply square, sine wave and triangle waveforms of at least 20 Volts Peek-to Peek. The frequency should be able to range from a few hundred hertz to at least 50KHz. Finally, there should be a DC offset adjust.
2. A Dual trace O-Scope that has a minimum voltage resolution of at least 200 kHz Bandwidth and at least 20 V_{p-p} input voltage range on each channel. There must also be a capability of capturing the O-Scope display with both voltage and time base settings in a digital image. In addition, you will need
3. Breadboard with at least 840 plug-in tie points.
4. DC power supplies with the following: regulated 5V, at least 2 variable supplies of approx 0.5 ±15V. Capable of at least 1Amp DC for each voltage.
5. Digital Multimeter. Must have at least the following resolutions on the lowest scale
 - On DC voltages: 1 mV which is the same as 0.001V
 - On AC voltages: 1 mV which is the same as 0.001V
 - On DC currents: 1 mA which is the same as 0.001A
 - On AC Current: 0.1 uA which is the same as 0.000001A
 - Resistance: 0.1 Ohm

NOTE: In addition, you will need all some small jumper wires with alligator clips.

4.b. Sufficient and inexpensive Lab and Test Equipment. The following equipment are inexpensive examples that will meet the course’s minimum technical requirements, but they aren’t required. Furthermore, CSN, the ET Program and the Instructor aren’t stating anything about the safety, durability, or any other factor about these items. Finally, CSN, the ET Program and the Instructor aren’t requiring you to purchase the following equipment. Any equipment that safely satisfies the above requirements in paragraph 2 is acceptable.

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Fluke 11& True RMS meter **Link:** https://www.amazon.com/Fluke-117-Electricians-True-Multimeter/dp/B000O3LUEI/ref=sr_1_5?dchild=1&keywords=Fluke+117+Electricians+True+RMS+Multimeter&qid=1593717499&sr=8-5 Aprox \$176

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