

**Advanced Manufacturing and Integrated Photonics Certificate Program (AMIP)**

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**Course module: Tools and Testing Equipment**

**Topic 3**

Topic title: Circuits, trouble-shooting, and soldering

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**SAFETY NOTICE:** Safety should always be your top priority. While engaging in any actual or practical experiments or the implementation of any activity or exercise discussed or referenced in these course materials, be certain to learn about and take all necessary and appropriate safety precautions, including, without limitation, abiding by electrical, optical, and laser protocols and wearing any and all appropriate protective coverings and eye protection. Be advised that your engagement in any course, including any actual or practical experiments or the implementation of any activity or exercise discussed or referenced in these course materials, is entirely at your own risk. The authors and owners of these course materials hereby disclaim any and all liability with respect to your engagement in any course, including your participation in any actual or practical experiments or the implementation of any activity or exercise discussed or referenced in these course materials.

**Circuits, Troubleshooting, and Soldering**

**Goals:**

* **To be able to troubleshoot electrical circuits**
* **To be able to solder electronic components**
* **To be able to read circuit diagrams**

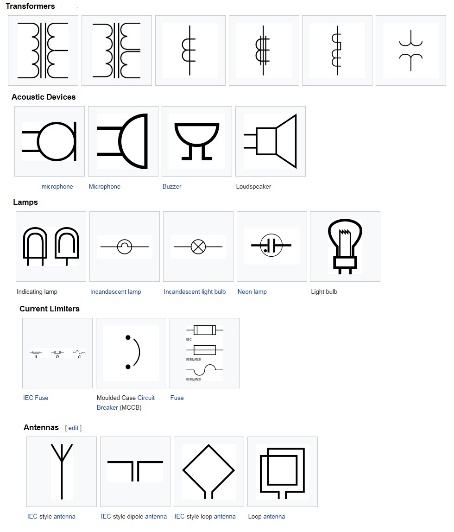
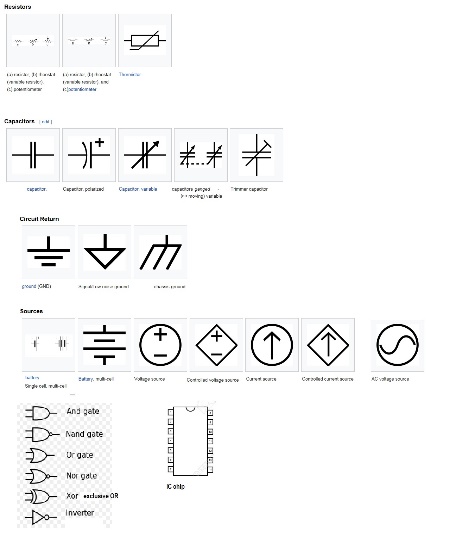
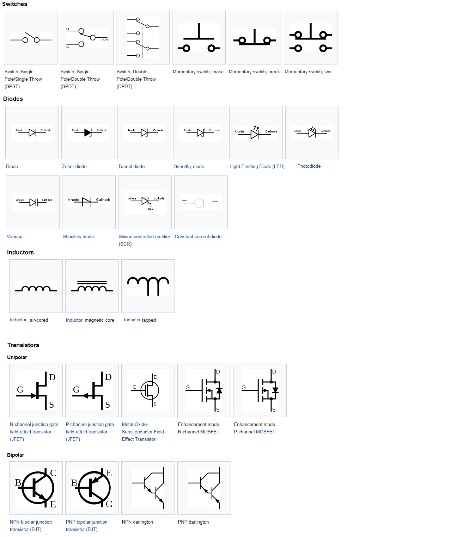
1. **Videos & PowerPoints**
   1. Troubleshooting & soldering electronic circuitboards– PowerPoint

[Troubleshooting & soldering electronic circuitboards.pptx](Troubleshooting%20&%20soldering%20electronic%20circuitboards.pptx)

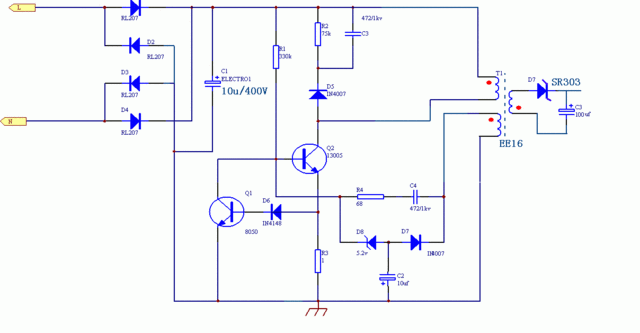
* 1. Brief Introduction to Optical Measuring Devices - PowerPoint

[optical measuring devices.pptx](optical%20measuring%20devices.pptx)

1. **Online resources**
   1. How to solder electronic components – video:
      1. <https://www.youtube.com/watch?v=Qps9woUGkvI>
2. **Handouts**
   1. Hand out – sheets
      1. Electronic Symbols Charts



* + 1. Example of an electronic schematic



1. **Projects, Discussions, and Written Assessment**
   1. Match up electronic components with their symbols

[**match up electronic components with their symbols on a schematic- team format.doc**](match%20up%20electronic%20components%20with%20their%20symbols%20on%20a%20schematic-%20%20team%20format.doc)

* 1. How to safely solder – through hole (9.1)

[**how to populate a PCB - team format(1).doc**](how%20to%20populate%20a%20PCB%20-%20team%20format(1).doc)

* 1. How to safely solder – assessment

[**how to solder safely - assessment.doc**](how%20to%20solder%20safely%20-%20assessment.doc)

* 1. How to safely solder – surface mount

[**how to safely solder SMT components to a PCB - assessment.doc**](how%20to%20safely%20solder%20SMT%20components%20to%20a%20PCB%20-%20assessment.doc)

* 1. Build and measure breadboard circuit

[**build & measure breadboard circuit - team format.doc**](build%20&%20measure%20breadboard%20circuit%20-%20%20team%20format.doc)

* 1. Calculate, build, and measure double loop LED circuit

[**calculate build measure double loop LED circuit - team format.doc**](calculate%20build%20measure%20double%20loop%20LED%20circuit%20-%20%20team%20format.doc)

* 1. Troubleshoot and repair circuits

[**troubleshoot & repair circuits - team format(1).doc**](troubleshoot%20&%20repair%20circuits%20-%20%20team%20format(1).doc)

* 1. Optical Measurement Instruments

[**examine ID & discuss use of optical instruments - team format(1).doc**](examine%20ID%20&%20discuss%20use%20of%20optical%20instruments%20-%20%20team%20format(1).doc)

* 1. Final exam

[Final exam & project.docx](Final%20exam%20&%20project.docx)

1. **Supplies or equipment required:** 
   1. Bread boards
   2. Resistors
   3. 555 timer
   4. Capacitors
   5. LEDs
   6. 74 series IC chips
   7. DMM
   8. soldering stations
   9. brass iron tip cleaner
   10. .3 mm solder
   11. soldering kits
   12. soldering wick
   13. resistors
   14. LEDs
   15. tweezers
   16. diodes