EET 150
Introduction to Electrical Engineering Technology

Instructor: TBA/Spezia

Office: E108

Office Hours: To be Arranged

Textbook: Class presentation notes

References: Model SP-1A Solder Practice Kit Assembly and Instruction Manual, Elenco, 2010.
Model FG-500K Function Generator Kit Assembly and Instruction Manual Elenco, 2010.

Grading Scale:

100-90%	A
89-80%	B
79-70%	C
69-60%	D
59-below	F

Hour Exams (2 at 100 points each)		25%
Final Project		15%
Homework-Lesson Quizzes		20%
Laboratory Projects/Activities		
Writing lab activity reports		
Worksheets		
Demonstrated construction skills		
Informal Presentations		40%
	Total	100%

Course Policies

1. **Late Work and Makeup Exams**
   No make-up exams. All homework handed in at the beginning of the period it is due. No late homework accepted. Late lab grades reduced by 5% per working day starting from due date.
2. **Attendance Policies-On-Campus Students**
   Class attendance is required and attendance will be taken at the beginning of every period. Students are allowed **three** unexcused absences. Any further absences will reduce the TOTAL grade by 0.25% per day absent.

Course Policies-Continued

3. **Cell Phone/Electronic Device Usage-On Campus Students**
   Cell phone usage during meeting periods is prohibited. Devices should be TURNED OFF prior to entering class. Other electronics devices (Tablets, iPads, Readers etc) are only allowed for academic/research purposes. No electronic devices other than calculators are allowed during exams. Those violating this policy are subject to disciplinary action under the Student Conduct Code. Follow this link to review this code: (http://policies.siuc.edu/policies/conduct.html)
4. **Nicotine Consumption**
   No use of electronic cigarettes during class.

Course Description and Prerequisites

This laboratory course gives students instrumentation and construction skills for electrical/electronic technology. Students learn to identify components and determine their values using color codes and identifying markings. The course introduces error analysis and units common to electrical/electronic measurement. The course covers schematic diagram reading and drawing using CAD/CAM tools. Students learn electronic circuit design and assembly techniques such as bread-boarding, printed circuit layout, soldering, and wire-wrapping. The course covers the proper use of test instruments for measuring circuit values and generating test signals. Students demonstrate skills by assembling, testing, and troubling-shooting an electronic kit.

Prerequisite: Math 111 or equivalent

Course Content Overview

This course produces a set of practical skills necessary for the assembly and testing of electrical and electronic circuits. This course introduces the fundamental technical concepts and components of electrical systems through online videos and laboratory projects. The course builds skills necessary to conduct electronic tests effectively and measurements. Effective electronic design verification and troubleshooting require these skills. The course introduces the terminology and fundamental components of electrical/electronic systems. The course covers CAD and circuit analysis tools used in developing electric circuit diagrams. The experience prepares students for more advanced EET work.

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Course Objectives

At the end of this course, you will be able to**:**

1.) Explain qualitatively the physical principles required to produce electricity.
2.) Identify the basic quantities and components used in electric circuits.
3.) Explain the difference between ac and dc sources.
4.) Define and identify materials that are conductors and insulators.
5.) Use Ohm's law formulas to compute circuit quantities.
6.) Use formulas to compute component power dissipation.
7.) List agencies and organizations responsible for electrical safety and product standards.
8.) Identify and list types of personal protective devices used in industrial facilities and laboratories.
9.) Identify the cause and physiological effects of electrical shock.
10.) Perform experiments and design projects safely.
11.) Identify electrical and electronic components.

12.) Determine the values and ratings of electronic components based on color codes and other markings.
13.) Use a digital multimeter to measure electrical quantities.
14.) Connect and adjust variable-output dc power supplies and batteries to achieve desired voltages and polarities.
15.) Connect power meters and measure device power and energy consumption.
16.) Explain how the subsystems of an analog oscilloscope work to make measurements.
17.) Use an oscilloscope to measure ac voltage magnitudes, frequency and phase shift.
18.) Adjust the waveform shape, frequency and amplitude of a function generator output.
19.) Explain the electrical limitations of function generator output.
20.) Identify schematic symbols used in electrical/electronic systems.
21.) Read and draw electrical diagrams.
22.) Assemble simple circuits using a solderless experimenters' board.
23.) Assemble an electric/electronic circuit by soldering.
24.) Splice and connect wire using appropriate mechanical connectors.
25.) Identify inoperable circuit components using signal injection and tracing.
26.) Use basic test instruments to troubleshoot inoperable circuits.
27.) Verify the operation of a multistage circuit.
28.) Perform tests to verify circuit operation.

Emergency Procedures-On-campus Students Only

SIUC is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on the BERT website at www.bert.siu.edu, Department of Public Safety's website www.dps.siu.edu (disaster drop down) and in the Emergency Response Guidelines pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency**. The Building Emergency Response Team will assist your instructor in evacuating the building or sheltering within the facility.

Required Tools and Components

This course requires experimentation and construction of electronic and electrical circuits. The following tools will allow you to perform these tasks in a professional and skillful way. By the third week of the course, you should acquire the following items:

Solderless Experimenters Board (breadboard)
Wire cutters* (4-6 inch)
Needle Nose Pliers (4-6 in)
Wire Stripper*
Spool of hookup wire 22 AWG solid copper (Red Insulation)
Spool of hookup wire 22 AWG solid copper (Black Insulation)
Spool of hookup wire 22 AWG solid copper (White Insulation)
Spool of Hookup wire 22 AWG solid copper (Yellow Insulation)
Pocket-size flat-blade screwdriver
Pocket-size Philips screwdriver

*These tools are sometimes combined into one function.

Tool and Component Suppliers

The following companies supply all or some of the required tools and components for this course. A complete parts list for all lab activities is attached to the syllabus

Jameco Electronics: www.jameco.com
Digikey Corporation www.digikey.com

Educational Electronic Kits

Students will purchase two electronic kits for assembly during the semester. You will take these projects with you after completing the course. The first kit teaches soldering skills and includes a soldering iron and lead-free solder. You will construct a flasher/siren while you master the assembly technique of soldering. You will also gain skill in using test instruments for measuring component and circuit values. You will learn basic techniques for troubleshooting electronic circuits if the fail to work properly.

The second kit is a variable frequency function generator. This device produces signals used in testing and troubleshooting other electronic circuits. It uses components that you will use in advanced design courses. Assembling this kit will continue to build your practical knowledge of electronic components and develop manual skills for electronic circuit construction and experimentation.

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Course Outline

Period 1 Lab/Lecture Class Introduction Review Syllabus Distribute list of required tools and parts Lecture Laboratory Safety Electrical Codes and Standards Electric shock Arc Flash and Blast Personal Protective Equipment Basic First Aid Electrical Safety Procedures Using Instrumentation Safely	Online Presentations Lesson 0 Laboratory Safety
Period 2 Lab/Lecture View Examples of Components Resistors Type (carbon, wire-wound) Fixed, Variable (Potentiometers) Power Dissipation Values: Color code, Tolerance Inductors Air Core Iron Core Power Dissipation Capacitors Non-polarized Polarized Reading values Tolerance Voltage Ratings Demonstration of DVM Measuring Resistance Using DVM **Activity 1:** Identify resistor values using color code, use DMM to verify. Complete lab work sheet of values	Online Presentations Lesson 1 - Atoms and Material Properities Lesson 2 - Basic Components and Symbols Lesson 3 - Fundamentals of Electrictiy Video Demonstrations Digital Multimeter (DMM) Introduction Resistance Measurement With DMM

Period 3 Lab/Lecture Measuring Voltage with DMM Live Demonstration Activity: Measure DC battery voltage Connect Series and parallel batteries and measure voltages using DMM Measure ac from transformers Live Demonstration Triple output dc supplies **Activity 2:** set dc power supplies and measure values using DMM.	Online Materials-Presentations Lesson 4 - Dc Sources Batteries Lesson 5 - Ac Voltage Sources Video Demonstrations Voltage Measurement With DMM
Period 4 Lab/Lecture Live Demonstration Using Solderless Experimenter Boards (SEB) . Live Demonstration Making Current Measurements using DMM **Activity 3:** Assemble on solderless experimenter board a series resistor circuit using schematic. Measure values of V, I, R using DMM. Assemble on solderless experimenter board a parallel resistor circuit using schematic. Measure values of V, I, R using DMM.	Online Materials-Presentations Lesson 6 - Ohms Law Lesson 7 - Series Circuits Lesson 8 - Parallel Circuits Video Demonstrations Solderless Experimenters' Boards (SEBs) Current Measurement in Series/Parallel Circuits
Period 5 Lab/Lecture Live Demonstration Setting up dual power supplies using lab supplies and batteries. **Activities 4:** Build 555 flasher on SEB. LED output, period 0.5 sec. Students must us proper construction techniques of lead dress, component organization, and test points.	Online Materials-Presentations Lesson 9 - Component Data Sheets Video Demonstrations Working With Dc Power Supplies

Period 6 Lab/Lecture TA live Demonstration on Oscilloscope Manual measurements Auto measure **Activity 5:** Measure circuit ac waveforms using oscilloscope. Determine amplitude, frequency of signals. Observe affects of ac vs dc coupling of probe.	Online Materials-Presentations Lesson 10-Ac Signal and Measurements Lesson 11-Measuring Ac Signals Using Oscilloscopes Lesson 12-Oscilloscope Controls and Adjustments Video Demonstrations Using Oscilloscopes
Period 7 Lab/Lecture Live Demonstrations Soldering safety. Proper use of Soldering Stations. Proper soldering techniques. **Activity 6:** Practice wire splicing and soldering of splices	Online Materials-Presentations Lesson 13 - Electrical Connections Video Demonstrations Introduction to Soldering and Wire Splicing
Period 8 Lab/Lecture **Activity Kit 1:** Start soldering kit	Online Materials Exam 1 Study Guide
Period 9 Lab/Lecture Instructor assistances with kit construction as necessary. **Activity Kit 1:** Continue soldering kit	Online Materials-Presentations Lesson 14 -Soldering Kit Operation Theory Readings Solder Practice Kit Instructions, p. 9
Period 10 Lab/Lecture **Exam 1** **50 minute Multiple Choice Test** **50 minute Lab Practical** **DMM Measurements, component ID, Color Codes**	Online Materials None this period

Period 11 Lab/Lecture Return Exams and review them **Activity Kit 1:** Continue soldering kit	Online Materials Exam solution
Period 12 Lab/Lecture **Activity Kit 1:** Complete soldering kit and troubleshoot. Total lab time: 8 hours	Online Materials-Presentations Lesson 15-Introduction to Troubleshooting
Period 13 Lab/Lecture Present Soldering project and demonstrate function. Grading: Neatness of construction, quality of soldering, functionality.	Online Materials None
Period 14 Lab/Lecture Demonstration of circuit simulator software using Multisim. **Activity 7:** construct and simulate series and parallel circuits that include dc sources and resistors. Measure circuit voltages and currents using the simulator software.	Online Materials-Presentations None this period Video Demonstrations Circuit Simulation With Multisim
Period 15 Lab/Lecture Using the function generator Live demo and online video Setting output levels, frequency, dc offset, duty cycle. **Activity 8:** Set function generator outputs according to specifications and verify with digital scope.	Online Materials-Presentations Lesson 16 - Common Electric Signal Wavesforms Lesson 17 - Wavesform Characteristics Lesson 18 - Using A Function Generator Video Demonstrations Operating a Function Generator

Period 16 Lab/Lecture Instructor assists with activity as necessary **Activity 8:** Continue function generator activity.	Online Materials-Presentations Lesson 19-Advanced Troubleshooting Video Demonstrations Operating a Function Generator
Period 17 Lab/Lecture Review concepts of power and energy as necessary. **Activities 9 and 10:** Compute the energy consumption of typical household devices and compute costs. Measure power dissipation from resistors. Assemble circuits and measure V and I. Compute power values.	Online Materials-Presentations Lesson 20 - Power and Energy Measurement Video Demonstrations None this period
Period 18 Lab/Lecture Instructor assists in power measurements as necessary. **Activity 10:** Complete power measurements	Online Materials-Presentations None this period Video Demonstrations None this period
Period 19 Lab/Lecture Introduction to LabVIEW programming. Students work with software installed on lab computers **Activity 11:** Programming a sine wave display using LabVIEW.	Online Materials-Presentations None this period Video Demonstrations Introduction to LabVIEW Learning LabVIEW

Period 20 Lab/Lecture Introduction to the operational amplifier and the integrated circuit temperature sensor. **Activity 12:** Construct and test the sensor amplifier circuit.	Online Materials-Presentation Sensor Circuit Construction Video Demonstrations None this period
Period 21 Lab/Lecture Instructor assists in construction and troubleshooting of circuit as necessary **Activity 12:** Continue construction and testing of sensor amplifier circuit. Complete by this period	Online Materials – Presentations Sensor Circuit Construction Video Demonstrations None this period
Period 22 Lab/Lecture Introduction to data acquisition using computer software. On-campus students use LabVIEW while on-line students will use WaveForms software. **Activity 13:** Computer-based data collection of temperature sensor output using LabVIEW (On-campus) or WaveForms (On-line).	Online Materials-Presentations None this period Video Demonstrations LabVIEW and WaveForms Tutorials
Period 23 Lab/Lecture Instructor assists with interfacing and programming as necessary. **Activity 13:** Continue interfacing and program of temperature sensor data collection project	Online Materials-Presentations None this period Video Demonstrations LabVIEW and WaveForms Tutorials

Period 24 Lab/Lecture Instructor assists with interfacing and programming as necessary. Prepare for Exam 2. **Activity 13:** Complete temperature data collection project and demonstrate to instructor	Online Materials Exam 2 Study Guide Online Materials-Presentations None this period Video Demonstrations LabVIEW and WaveForms Tutorials
Period 25 Lab/Lecture **Exam 2** **50 minute Multiple Choice Test** **50 minute Lab Practical** **Oscilloscope and Function generator operation. Characteristics of waves. Measuring waveforms.**	Online Materials None
Period 26 Lab/Lecture Return exams and review results **Activity Kit 2:** Begin construction of function generator kit.	Online Materials Exam 2 solution Online Materials-Presentations Lesson 21 - Electronic Circuit Construction Techniques
Period 27 Lab/Lecture Instructor assists in construction and troubleshooting of function generator kit as necessary. **Activity Kit 2:** Construct and troubleshoot function generator kit.	Online Materials None

Period 28 Lab/Lecture Instructor assists in construction and troubleshooting of function generator kit as necessary. **Activity Kit 2:** Construct and troubleshoot function generator kit.	Online Materials None
Period 29 Lab/Lecture Instructor assists in construction and troubleshooting of function generator kit as necessary. **Activity Kit 2:** Construct and troubleshoot function generator kit.	Online Materials None
Period 30 Lab/Lecture Instructor assists in construction and troubleshooting of function generator kit as necessary. **Activity Kit 2:** Complete function generator kit. On-campus students: Present and demonstrate to instructor On-line students: Produce and submit video to instructor that demonstrates function. Total lab time: 10 hours	Online Materials None
Final **Presentation of function generator kit**	Online Materials None