COURSE OUTLINE

Electronic Tools, Tests Instruments and Measurements — Course Title

GE 115 — Dep't. & Course No.

1 COURSE DESCRIPTION

This course is designed to train students to acquire knowledge and skills in the use of electronic hand tools, applications of soldering and de-soldering techniques and the use of electronic instruments necessary in making electronic test and measurements in various electronic circuits. It also requires the students to exercise laboratory safe practices.

11. SEMESTER CREDITS: 3 Credits

111. CONTACT HOURS PER WEEK:

2	3	5
Lecture	Lab	Total

1V. PREREQUISITE: None

V. STUDENT LEARNING OUTCOMES

At the end of the semester the student, with a combined accuracy of 65% will be able to:

1. **Discuss safety procedures in soldering and de-soldering electronics components**
2. **Identify different electronics hand tools**
3. **Discuss soldering technique**

V1. COURSE CONTENT

A. Safety Principles

1. Review of Safety Principles and Related Topics
2. Required Safety Practices in:
   a. Utilization of Tools & Equipment
   b. Working in the Electronics Laboratory

B. Basic Electronic Hand Tools

1. Manual Hand Tools
2. Mechanical Hand Tools
3. Power Hand Tools

C. Soldering Techniques

1. Parts of the Soldering Iron
2. Comparing Different Types of Soldering Iron
3. The Soldering Lead and Related Soldering Techniques
4. Correct Soldering Practice
5. Effects of Excess Heat
6. Effects of Movement During the Cooling Process
7. Physical Factors in Soldering
8. Faulty Soldered Joint

4. List the different materials, tools and equipment needed in creating PCB.

5. State the procedures in designing the PCB Foil pattern

6. Identify the different parts of multi-meter

7. Discuss the function of each part of the multi-meter

8. Measure the electrical properties of a circuit.

9. Identify the different parts of oscilloscope

10. Discuss the function of each part of the Oscilloscope

11. Measure the electrical properties of a signal in an electronics circuit.

12. Discuss the importance of signal garneting instruments and how to use them.

D. Instruments for Processing PCB

1. PCB Cutters
2. PCB Resists and methods of Application
3. Tools, Instruments and Materials for Transferring Circuit Designs into the Applied Resist
4. Resist Cutting Tools and Instruments
5. PCB Drilling Tools and Equipment
6. Component Lead Benders

E. The Analog and Digital Multi-meter.

1. Basic Meter Requirements
2. External Parts of the VOM
3. Internal Circuitry and Maintenance Procedures
4. Precautions in the Use of VOM
5. Ohmmeter Connections and Measurements
6. DC Voltmeter Connections and Measurements
7. AC Voltmeter Connections and Measurements
8. DC Milli-ammeter Connections and Measurements
9. Instrument Provability and Error Analysis

F. The Cathode Ray Oscilloscope

1. CRO Measurement Capabilities and Probe Settings
2. Operating Controls, Adjustments and Calibrations
3. Single Trace and Dual Trace Modes of Operations
4. CRO AC Voltage Measurements
5. CRO DC Voltage Measurements
6. CRO Frequency Measurements
7. CRO Phase Measurements
8. Triggering Operations
9. CRO Block Diagrams, Schematic Diagrams, Maintenance and Troubleshooting

H. Signal Generating Instruments

1. AF Generator
2. RF/IF Signal Generator
3. Sweep Marker Generator
4. Color Pattern Generator

V11. MATERIALS AND EQUIPMENT

A. Soldering work station
B. Hot air de-soldering station
C. Solder Wick
D. De soldering tool (and spare tips)
E. Soldering iron tips (replacements)
F. Electronic hand tools and test instruments
G. Drill press
H. Machine cutter
I. Axial lead electronic components (resistors, capacitors, diodes, transistors etc)
J. Single and double sided copper clad printed circuit board material
K. Photoresist Etched Circuit Kit. RSR catalogue No 03DFP101B (one per student).
L. Flux stripper
M. Cleaner/Degreaser
N. Work station magnifiers.
O. Copper wire (22 gauge & 24 gauge solid) (22 gauge hook up wire)

V111. TEXT AND REFERENCES

A. Required Text: Instructor's made handouts.

1X. METHOD OF INSTRUCTION

A. Lecture for the presentation of theory
B. Discussion and questioning for test of understanding
C. Demonstration for the presentation of skills
D. Practical laboratory exercises for emphasis of known principles.

X. METHOD OF EVALUATION

A. Lecture presentation will be tested using the written test.
Laboratory evaluation will be rated based on the following.

1. Accuracy
2. Speed
3. Completion
4. Techniques

B. The components with the corresponding weight in percent included in the computation of Midterm and Final grades are

Participation	10%
Portfolio.....	10%
Quizzes/Homework	10%
Midterm/Final Examination	20%
Laboratory Performance/Project.....	50%
TOTAL =	100%

The transmutation of percentages to letter grades is as follows:

90% - 100% ..... A
80% - 89% ..... B
70% - 79% C
65% - 69% ..... D
0 - 64% ..... F

TASK LISTING SHEET

Electronic Tools, Tests Instruments and Measurements GE 115
Dep't. & Course No.

Credits: 2 Lec 1 Lab 48 Total Lab Hrs

Laboratory objectives	Time Allotment
1. Solder And De-solder Electronic Components	
1. Perform soldering practice using solder pencils	9
2. Perform soldering practice using Hot Air.	6
2. Design Electronic Printed Circuit Board	
1. Design the PCB for power supply	3
2. Etch the PCB	3
3.. Bore the PCB and Mount the components	3
3. Check And Measure The Electrical Properties Of A Circuit Using Analog And Digital Multi-meter.	
1. Measure voltage, current and resistance using the VOM.	6
2.. Measure voltage, current resistance and capacitance using the DMM.	6
4. Check And Measure The Electrical Properties Of A Signal Using Oscilloscope	
1. Perform voltage measurements, frequency measurements and phase analysis using the CRO	9
5. Utilized Other Tests Instruments (Function Generator RF Signal Generator)	
1. Hook-up signal generating instruments to perform signal and waveform checking.	1
2.. Perform experiments using electronic power supplies and electronic trainers.	2

Palau Community College
GE 115 – ELECTRONIC TOOLS, TESTS INSTRUMENTS AND MEASUREMENT
Course Learning Outcomes

During the course experience, the course learning outcomes (CLOs) will be assessed through the use of signature assignments. A rating scale will be used to determine the students' proficiency level of each CLO using specifically aligned assignments. The numerical ratings of 3, 2, and 1 are not intended to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on the level of student performance of each of the course learning outcomes listed below:

Rating Scale: 5 Excellent
4 Above-Average
3 Average
2 Below Average
1 Unacceptable

CLO 1: Solder and de-solder Electronic Components.

5	Solder and de-solder all components on the board with 90% - 100% accuracy.
4	Solder and de-solder all components on the board with 80% - 89% accuracy.
3	Solder and de-solder all components on the board with 70% - 79% accuracy.
2	Solder and de-solder all components on the board with 65% - 69% accuracy.
1	Solder and de-solder all components on the board with below 65% accuracy.

CLO 2: Design electronic printed circuit board.

5	Demonstrate safety practices in designing a printed circuit board, lay out all the components properly without provisions for jumper wires, and design the circuit board with 90% to 100% accuracy.
4	Demonstrate safety practices in designing a printed circuit board, lay out all the components properly without provisions for jumper wires, and design the circuit board with 80% to 89% accuracy.
3	Demonstrate safety practices in designing a printed circuit board, lay out all the components properly without provisions for jumper wires, and design the circuit board with 70% to 79% accuracy.
2	Demonstrate safety practices in designing a printed circuit board, lay out all the components properly without provisions for jumper wires, and design the circuit board with 65% to 69% accuracy.
1	Demonstrate safety practices in designing a printed circuit board, lay out all the components properly without provisions for jumper wires, and design the circuit board with below 65% accuracy.

CLO 3: Check and measure the electrical properties of a circuit using analog and digital Multimeters

5	Demonstrate safety practices in using analog and digital multi-meters and perform measurement and reading with 90%.-100% accuracy.
4	Demonstrate safety practices in using analog and digital multi-meters and perform measurement and reading with 80%.-89% accuracy.
3	Demonstrate safety practices in using analog and digital multi-meters and perform measurement and reading with 70%.-79% accuracy.
2	Demonstrate safety practices in using analog and digital multi-meters and perform measurement and reading with 65%.-69% accuracy.
1	Demonstrate safety practices in using analog and digital multi-meters and perform measurement and reading with below 65% accuracy.

CLO 4: Check and measure the electrical properties of a signal using an oscilloscope.

5	Demonstrate safety practices in using an oscilloscope and perform measurement and reading with 90%- 100% accuracy.
4	Demonstrate safety practices in using an oscilloscope and perform measurement and reading with 80%- 89% accuracy.
3	Demonstrate safety practices in using an oscilloscope and perform measurement and reading with 70%- 79% accuracy.
2	Demonstrate safety practices in using an oscilloscope and perform measurement and reading with 65%- 69% accuracy.
1	Demonstrate safety practices in using an oscilloscope and perform measurement and reading with below 65% accuracy.

CLO 5: Utilized other tests instruments (AF Generator and RF Signal Generator)

5	Demonstrate safety practices in using the Function generator and RF signal generator and perform measurement and reading with 90% - 100% accuracy.
4	Demonstrate safety practices in using the Function generator and RF signal generator and perform measurement and reading with 80% - 89% accuracy.
3	Demonstrate safety practices in using the Function generator and RF signal generator and perform measurement and reading with 70% - 79% accuracy.
2	Demonstrate safety practices in using the Function generator and RF signal generator and perform measurement and reading with 65% - 69% accuracy.
1	Demonstrate safety practices in using the Function generator and RF signal generator and perform measurement and reading with below 65% accuracy.