

COURSE NUMBER: CI1310

COURSE TITLE: Electrical/Electronic Fabrication Techniques

COURSE DESCRIPTION:

This is a practical electrical/electronics course for students entering the primary electrical / electronics technical intersession. This course enables the student to obtain practical knowledge in soldering, wiring, fabrication and proper use of test equipment as related to accepted procedures found in industry.

PREREQUISITES: ET1101 – Electrotechnology or
ET1131 – Fundamentals of Electricity II (Qatar only)

CO-REQUISITES: None

CREDIT VALUE: Three (3)

COURSE HOURS PER WEEK: Four (4)

LAB HOURS PER WEEK: Five (5)

The course and lab hours per week are based on the intersession semester. In a 15 week semester, the course and lab hours will be adjusted to reflect the longer semester length.

SUGGESTED TEXT:

Coastal Training Technologies Corp. (2011). *WHMIS: Your safety net*. DuPont Sustainable Solutions Product 2994.

Coastal Training Technologies Corp. (2013). *Beware the bite*. DuPont Sustainable Solutions. SKU ELE005-HBK-ENG-0004

LEARNING RESOURCES: To be determined by instructor

MAJOR TOPICS:

- 1.0 Industrial/Commercial Workplace Safety
- 2.0 Basic Hand-tools Used in Electrical/Electronic Repair and Fabrication
- 3.0 Soldering and Desoldering Techniques
- 4.0 Schematic Diagrams and Component Identification
- 5.0 Proper Circuit Wiring Techniques
- 6.0 Construction of Electronic Kit(s) Using Hardwiring and Printed Circuit Board Techniques

LEARNING OBJECTIVES:

Upon completing this course a proficient student should be able to:

1.0 Industrial/Commercial Workplace Safety

- 1.1 Workshop Safety
 - 1.1.1 Workshop Cleanliness
 - 1.1.1.1 Keep the lab or workshop clean and tidy
 - 1.1.1.2 Store hand tools and test equipment in their proper locations
 - 1.1.2 Safety Precautions in Using and Working with Electrical/Electronic Equipment
 - 1.1.2.1 Observe proper procedures working with high voltages
 - 1.1.2.2 Properly test equipment grounding
 - 1.1.2.3 Observe proper procedures when working around moving and rotating equipment
 - 1.1.2.4 Identify the elements of effective lockout procedures
 - 1.1.2.5 Demonstrate familiarity with ladder and scaffold safety
 - 1.1.3 Classification of Fires and Extinguishing Techniques
 - 1.1.3.1 Identify types of extinguisher to use on particular types of fires
 - 1.1.3.2 Follow proper procedures when fighting fires
 - 1.1.4 First Aid Procedures
 - 1.1.4.1 Follow proper procedures when handling electrical shock situations
 - 1.1.4.2 Use procedures to assist in controlling bleeding caused by accidents
- 1.2 Occupational Health and Safety (OHS)
 - 1.2.1 Identify the purpose and background of OHS
 - 1.2.2 Identify the key provisions of federal legislation (Bill C45)
 - 1.2.3 Outline the responsibilities of the employer
 - 1.2.4 Outline the responsibilities of the employee
 - 1.2.5 Describe how to properly report accidents
 - 1.2.6 List the responsibilities when participating in investigations
- 1.3 Workplace Hazardous Materials Information Systems (WHMIS)

Students will be required to successfully complete an on-line safety course – “WHMIS in Minutes”. The major topics covered are listed below:

 - 1.3.1 Background of WHMIS
 - 1.3.2 Federal legislation
 - 1.3.3 Hazardous materials covered by WHMIS
 - 1.3.4 Hazardous materials exempt from WHMIS

- 1.3.5 Duties of the supplier
- 1.3.6 Duties of the employer
- 1.3.7 Duties of the worker
- 1.3.8 Application and enforcement

2.0 Basic Hand-tools Used in Electrical/Electronic Repair and Fabrication

2.1 Screwdrivers

- 2.1.1 Identify the various types of screwdriver drives including:
 - 2.1.1.1 Robertson
 - 2.1.1.2 Phillips
- 2.1.2 Proper Use and Drive Configurations Required for Specific Hardware
 - 2.1.2.1 Select a particular drive for a specific job
 - 2.1.2.2 State the advantage of one type of drive over another type
 - 2.1.2.3 Demonstrate the proper use of the various drive configurations

2.2 Pliers

- 2.2.1 Diagonal Side Cutting
 - 2.2.1.1 Identify wire size limitations when cutting hookup wires
 - 2.2.1.2 Demonstrate proper methods when using cutting pliers
 - 2.2.1.3 Identify heat considerations
- 2.2.2 Needle Nose Types
 - 2.2.2.1 Select the length and shape for a particular requirement
 - 2.2.2.2 Avoid misalignment due to excessive stress
- 2.2.3 Gas Pump and Other Special Types
 - 2.2.3.1 Use applicable pliers for holding round stock
 - 2.2.3.2 Use slip and rib-joint type pliers

2.3 Hacksaws & Files

- 2.3.1 Types and Shapes of Files
 - 2.3.1.1 State the classifications of files
 - 2.3.1.2 State four basic cuts of files
 - 2.3.1.3 Demonstrate proper methods in using files
- 2.3.2 Hacksaw Blade Types Required for Various Metals
 - 2.3.2.1 Define blade pitch
 - 2.3.2.2 Select a blade type for soft metals
 - 2.3.2.3 Select a blade type for hard metals
 - 2.3.2.3 Demonstrate proper methods in using Hacksaws

3.0 Soldering and Desoldering Techniques

3.1 Soldering Irons, Desoldering Systems, Soldering Guns

- 3.1.1 Types, Tip and Wattage Sizes of Irons
 - 3.1.1.1 Specify the shape of the tip for a specific job
 - 3.1.1.2 Select the proper wattage size to use
- 3.1.2 Tip Oxidation Problems and Correction Methods
 - 3.1.2.1 Perform proper tip tinning
 - 3.1.2.2 Store tip properly after use
 - 3.1.2.3 Adjust tip temperature
- 3.1.3 Types of Solder and Proper Soldering Methods
 - 3.1.3.1 Identify the following types of solder
 - 3.1.3.1.1 Lead-free
 - 3.1.3.1.2 Rosin
 - 3.1.3.1.3 Acid core
 - 3.1.3.2 State the correct tin-lead ratio
 - 3.1.3.3 Use correct amounts
- 3.1.4 Printed Circuit Board Soldering
 - 3.1.4.1 Demonstrate the use of the proper amount of solder
 - 3.1.4.2 Demonstrate how to avoid cold solder joints
 - 3.1.4.3 Select proper tip sizes for PCB soldering

4.0 Schematic Diagrams and Component Identification

- 4.1 Symbols of Common Electrical/Electronic Components
 - 4.1.1 Basic Passive Components and Devices
 - 4.1.1.1 Identify symbols used with schematic diagrams
 - 4.1.1.2 Relate wattage to physical size
 - 4.1.2 Contacts, Switches and Protection Devices
 - 4.1.2.1 Identify various types of contacts
 - 4.1.2.2 Identify single, double and multi-pole switches
 - 4.1.2.3 List the different types of fuses and circuit breakers
 - 4.1.3 Printed Circuit Board Layout
 - 4.1.3.1 Consider component size limitations while using a schematic diagram to lay out a PCB and chassis hardwiring

5.0 Proper Circuit Wiring Techniques

- 5.1 General Hook-Up Wire
 - 5.1.1 Wire Gauge Numbers, Proper Tinning Methods
 - 5.1.1.1 Select the correct size of hook-up wire for various purposes
 - 5.1.1.2 Properly tin wire to prevent oxidation

- 5.1.2 Soldering Wire Splice Samples
 - 5.1.2.1 Use different gauge wires to form and solder the three basic wire splices
- 5.1.3 Wire Formations and Terminations
 - 5.1.3.1 Correctly route wires around fixed components on hard wired units and PCBs
 - 5.1.3.2 Connect different types of A.F. connectors to various cables
 - 5.1.3.3 Connect different types of R.F. connectors to various cables

6.0 Construction of Electronic Kit(s) Using Hardwiring and Printed Circuit Board Techniques

- 6.1 Component Wiring and Assembly
 - 6.1.1 Component Identification and Mounting
 - 6.1.1.1 Select the proper components from the various types supplied
 - 6.1.1.2 Prepare components for mounting with reference to length and size
 - 6.1.2 Point-to-Point Wiring
 - 6.1.2.1 Connect components to various terminals and bus lines
 - 6.1.2.2 Form correct bends and lines
 - 6.1.3 Component Soldering and Desoldering
 - 6.1.3.1 Prepare the terminals and wires for soldering
 - 6.1.3.2 Place and solder the components to the necessary terminals and test points
 - 6.1.3.3 Desolder components when mistakes are made in wiring
 - 6.1.4 Ensuring Proper Connections as Per Schematic Diagram
 - 6.1.4.1 Check wired components are per schematic diagram
 - 6.1.4.2 Make voltage and waveform measurements to ensure operation
- 6.2 Printed-Circuit Board and Cabinet Assembly
 - 6.2.1 Mounting Components on the PCB
 - 6.2.1.1 Properly place resistors and diodes on the PCB
 - 6.2.2 Proper Soldering Techniques
 - 6.2.2.1 Tin the leads for board mounting
 - 6.2.2.2 Insert component leads into the board
 - 6.2.2.3 Demonstrate proper component soldering
 - 6.2.3 Assembling the PCB into the Cabinet
 - 6.2.3.1 Mount the PCB on the connecting posts
 - 6.2.3.2 Correctly hardwire any remaining connections
 - 6.2.3.3 Connect the battery

- 6.2.3.4 Test the circuit's operation
- 6.2.3.5 Troubleshoot the circuit for errors
- 6.2.3.6 Make any necessary modifications

EVALUATION:

Laboratories	40%
Project (s)	40%
Test (s)	20%

DATE DEVELOPED:	DATE REVIEWED:	March 2011
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REVISION NUMBER:	4	DATE REVISED:	March 2014
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Note to instructor: Check PIRS to ensure this outline is the most current version.