

**COURSE NUMBER:** DR2410

**COURSE TITLE:** Electronic Computer Aided Design I

**COURSE DESCRIPTION:**

This course is designed to give the student a basic knowledge of Printed Circuit Board design techniques required in the electronics industry through the use of AutoCAD, Circuit Maker 2000 and Isopro software. It introduces the student to specific types of drawings required in the electronics industry to include: Block Diagrams, Logic Diagrams and Schematic Diagrams.

The Electronic Specific drawings will be done using Circuit Maker 2000 or equivalent Schematic Capture software. A PCB design will be created using the T-Tech Quick Circuit CNC machine and Isoprosoftware.

**PREREQUISITES:** EG1110 – Engineering Graphics AND either:  
ET2100 – Electrotechnology OR:  
MP2140 – Circuit Analysis I

**CO-REQUISITES:** None

**CREDIT VALUE:** Two (2)

**COURSE HOURS PER WEEK:** One (1)

**LAB HOURS PER WEEK:** Two (2)

**SUGGESTED TEXT:** To be determined by instructor

**LEARNING RESOURCES:** To be determined by instructor

**MAJOR TOPICS:**

- 1.0 Electronic Component Packaging
- 2.0 Block Diagram
- 3.0 Logic Diagram
- 4.0 Schematic Diagram
- 5.0 Printed Circuit Board Layout

**LEARNING OBJECTIVES:**

Upon completing this course a student will be able to identify standard electronic symbols, utilize CAD software to design Printed Circuit Boards and produce appropriate documentation.

## **1.0 Electronic Component Packaging**

- 1.1 Axial
  - 1.1.1 Describe axial component packaging
- 1.2 Radial
  - 1.2.1 Describe radial component packaging
- 1.3 Disc
  - 1.3.1 Describe disc component packaging
- 1.4 Semiconductor
  - 1.4.1 “Toxxx”
    - 1.4.1.1 Illustrate “Toxxx” component packaging
  - 1.4.2 DIPs
    - 1.4.2.1 Illustrate DIP component packaging
  - 1.4.3 QFP
    - 1.4.3.1 Illustrate QFP component packaging
  - 1.4.4 PLCC
    - 1.4.4.1 Illustrate PLCC component packaging
  - 1.4.5 SOIC
    - 1.4.5.1 Illustrate SOIC component packaging
  - 1.4.6 LCCC
    - 1.4.6.1 Illustrate LCCC component packaging
- 1.5 Electrical
  - 1.5.1 Describe electrical component packaging
- 1.6 Component Outline Drawing
  - 1.6.1 Describe component outline drawings
- 1.7 Electronic component data manuals
  - 1.7.1 Utilize electronic component data manuals

## **2.0 Block Diagram**

- 2.1 Graphic Symbols
  - 2.1.1 Identify types of graphic symbols used in producing a block diagram
- 2.2 Information Flow
  - 2.2.1 Describe information flow on a block diagram

- 2.3 Text
  - 2.3.1 Outline acceptable use of text on a block diagram
- 2.4 Drawing Procedure
  - 2.4.1 Demonstrate correct drawing procedure

### **3.0 Logic Diagram**

- 3.1 Types of Logic Diagrams
  - 3.1.1 Identify types of logic diagrams
- 3.2 Distinctive Shape Logic Diagrams
  - 3.2.1 Basic Logic Diagram
    - 3.2.1.1 Define basic logic diagrams
    - 3.2.1.2 Demonstrate correct drawing Procedures
  - 3.2.2 Detailed Logic Diagram
    - 3.2.2.1 Define detailed diagrams
    - 3.2.2.2 Demonstrate correct drawing procedures
- 3.3 Rectangular Shape Logic Diagram
  - 3.3.1 Define rectangular diagrams
  - 3.3.2 Demonstrate correct drawing procedures
- 3.4 Function Identification Letters
  - 3.4.1 Tagging Lines
  - 3.4.2 Describe the function of tagging lines
  - 3.4.3 Illustrate the use of tagging lines
- 3.5 Signal Flow
  - 3.5.1 Describe signal flow in a logic diagram
- 3.6 Method for Drawing Logic Diagram
  - 3.6.1 List drawing procedure guidelines for logic diagrams
  - 3.6.2 Demonstrate correct drawing procedure for logic diagrams

### **4.0 Schematic Diagram**

- 4.1 Graphic Symbols
  - 4.1.1 Identify types of graphic symbols used in producing a schematic diagram
- 4.2 Conductor Paths
  - 4.2.1 Define conducting paths
- 4.3 Connecting Lines

- 4.3.1 Define connecting lines
- 4.4 Reference Designations
  - 4.4.1 Generate reference designators list
  - 4.4.2 Describe proper use of reference designators
- 4.5 Method for Drawing Schematic Diagram
  - 4.5.1 List drawing procedure guidelines for schematic diagrams
  - 4.5.2 Demonstrate the correct drawing procedure for schematic diagrams

## **5.0 Printed Circuit Board Layout**

- 5.1 Printed Circuit Boards
  - 5.1.1 Define printed circuit boards (PCB)
- 5.2 Common PCB Terminology
  - 5.2.1 Components/Modules
    - 5.2.1.1 Define components
  - 5.2.2 Tracks
    - 5.2.2.1 Define tracks
  - 5.2.3 Pads
    - 5.2.3.1 Define pads
  - 5.2.4 Vias
    - 5.2.4.1 Define vias
  - 5.2.5 Isolation
    - 5.2.5.1 Define isolation
  - 5.2.6 Layer
    - 5.2.6.1 Define layer
- 5.3 Types of PCB's
  - 5.3.1 Single Sided
    - 5.3.1.1 Describe single sided PC
  - 5.3.2 Double Sided
    - 5.3.2.1 Describe double sided PCB
  - 5.3.3 Multilayer
    - 5.3.3.1 Describe multilayered PCB
- 5.4 PCB Drawing Types
  - 5.4.1 Describe the different drawing types involved in the PCB design process

- 5.5 PCB Design Procedure (Manual)
  - 5.5.1 Describe the steps involved in PCB design
- 5.6 PCB Design Considerations (Manual)
  - 5.6.1 Describe the specification considerations in the design process
- 5.7 PCB Layout (Manual)
  - 5.7.1 Employ proper design techniques to lay out PCBs
- 5.8 PCB Design using Circuit Maker 2000
  - 5.8.1 Utilize Circuit Maker 2000 to lay out PCBs
- 5.9 Routing using T-Tech Quick Circuit 5000 CNC Machine
  - 5.9.1 Import PCB Design into ISOPRO 2.5
  - 5.9.2 Create layer using ISOPRO 2.5 software
  - 5.9.3 Isolate layers using ISOPRO 2.5 software
  - 5.9.4 Set up T-Tech Quick Circuit 5000 CNC Machine
  - 5.9.5 Utilize T-Tech Quick Circuit 5000 CNC Machine to Route a PCB

**EVALUATION:**

Assignments	30%
Quizzes	30%
Major Projects	40%

**DATE DEVELOPED:** September 2003      **DATE REVIEWED:** March 2012

**REVISION NUMBER:** 1      **DATE REVISED:** March 10, 2004

*Note to instructor: Check PIRS to ensure this outline is the most current version.*