

Chapter 17

What's Next

In this chapter, you will learn the following to World Class standards:

- **The World of Electromechanical Design**
- **Learning the Fundamentals of AC and DC Circuits**
- **Common Projects using Electrical Design**

The World of Electromechanical Design

At World Class CAD, we start out learning about the basic Computer Aided Design (CAD) tools using a project oriented approach. If we have earned at least one World Class CAD certification, we know the fundamentals of making part drawings by arranging orthographic views, dimensioning and placing the information inside an engineering or architectural drawing border. With our excellent 3D training, we can draw simple, medium and complex solids and produce the multiple views even faster. We left the environment of 2D and 3D CAD to enter the arena of engineering programming, writing code in Visual AutoLISP. Many of us have gone through the chapters of Mechanics and Mechanical Design, to learn how to make common parts, such as screws, cover plates, castings and springs. All of the training to date concentrated on parts that hold things and can be said to be strictly mechanical. The next leg of our journey is to learn how to incorporate electrical and magnetic components into our designs.

Our textbook in electrical design will just concentrate on the special style of drawing symbols and techniques to produce safe and workable electromechanical assemblies. For the basic instruction of electronics, as we see on the World Class CAD website, we use the Siemens quickSTEP online course material. They are interactive and take a professional or student through Internet exercises in simple circuit, to sine wave formations, to how magnetic phenomenon results in to electrical current flow. What the World Class CAD text on Electrical Design does is puts the knowledge we gain from the online material and certification examination to use in a series of challenging projects. As we go further in the list of projects, they become more taxing; we are able to experience the necessary transition from mechanical designer to electromechanical designer.

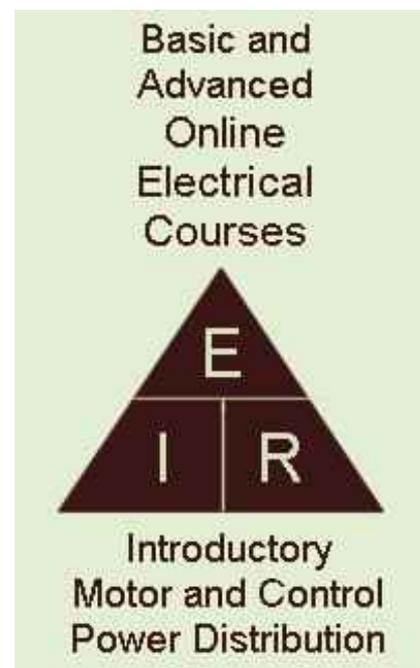


Figure 17.1 – Path to Siemens Training

Learning the Fundamentals of AC and DC Circuits

The Siemens quickSTEP Online Electrical courses are excellent training for those individuals wanting a good fundamental approach to AC and DC circuits. The most impressive feature of the learning series is the online graphics, hands-on examples and the reinforcement training that springs up throughout the presentation. The link shown in Figure 17.1 on World Class CAD website sends the student to the Siemens quickSTEP homepage as shown in Figure 17.2.

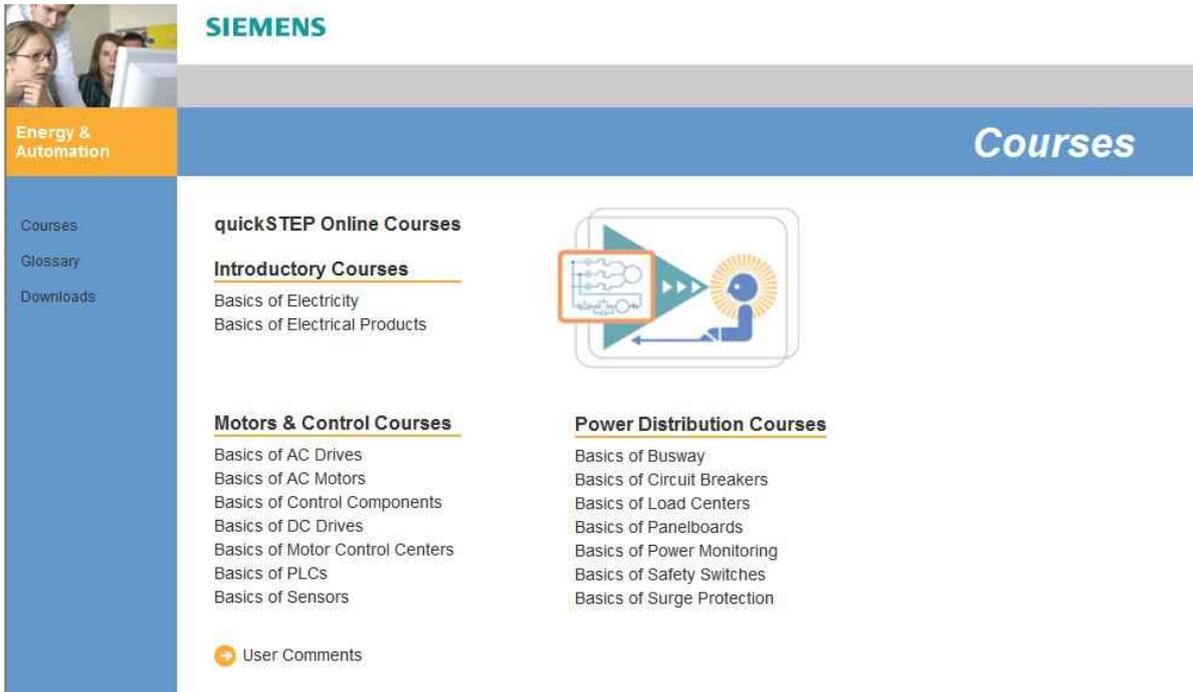


Figure 17.2 – Siemens Online Courses in Basic Electricity

Students of this series of training can earn 15 certificates. The classes are listed as follows.

Siemens quickSTEP Online Electrical Courses

Introductory Courses

- Basics of Electricity
- Basics of Electrical Products

Motor and Control Courses

- Basics of AC Drives
- Basics of AC Motors
- Basics of Control Components
- Basics of DC Drives
- Basics of Motor Control Centers
- Basics of PLCs
- Basics of Sensors

Power Distribution Courses

- Basics of Busway
- Basics of Load Centers
- Basics of Panelboards
- Basics of Power Monitoring
- Basics of Safety Switches
- Basics of Surge Protection

Periodically throughout each training segment, the student will have a pop quiz covering the material they just learned. There is a final examination for each course and after passing the final assessment, a certificate as shown in Figure 17.3 is awarded to the student.

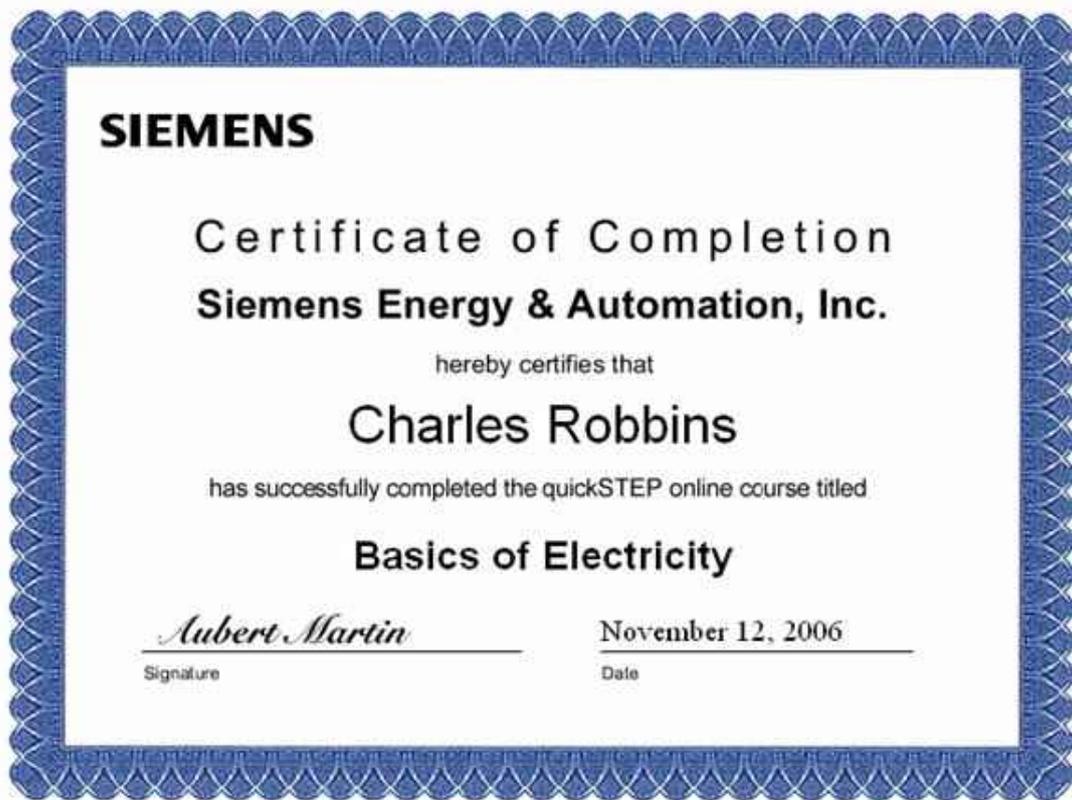


Figure 17.3 – Certification for Basics of Electricity

Students can print the certificate for their own file. Students will register with Siemens when they pass the test. We recommend to the student to print one certificate for their instructor and one for their own records.

Common Projects using Electrical Design

In the World Class CAD Computer Aided Electrical Design, we will have the opportunity to make decisions on several projects and create engineering drawings that allow the student to learn about the following applications.

- Basic series circuit
- Parallel circuit
- Control Panel Design and Layout
- Printed Circuit Board Design and Layout
- Power Supplies
- Designing a Light
- Lighting
- 3 Phase Power
- Motors

For one our first projects, we begin with designing a circuit for a light that uses a single battery. The design uses a compression spring to push the battery against the light socket at the manufacturer prescribed pressure. The battery is sized for the bulb and the switch has heavy enough contacts to handle the current and the correct insulation to safely withstand the voltage. The project reinforces mechanical design while adding a simple series circuit and diagram to the assembly drawing.

Another job has us designing an electrical distribution box and control panel that we could find at a commercial business. When we select the manual interfaces, we will have a few different types of switches that control contactors that distribute the electrical power. In this project, we will size the contactors that will be mounted inside the NEMA 12 enclosure per the engineering specification. We place input terminal block in front of the power relays and another set of terminal blocks that output to the load. We pick wires based upon current carrying capacity, insulation for the amount of voltage, the size of the bundle and for the maximum temperature in the enclosure. We select the multiple switches on the front door of the electrical enclosure from switch supplier catalogs. The project is extremely practical and teaches us how to draw control and power diagrams.

To gain knowledge about printed circuit boards, we will use smaller electrical components such as resistors, diodes, capacitors and integrated circuits to control a series of Light Emitting Diodes (LED). The project is to build a cable tester for broadband networking cable, Category 5e. Different from the previous assignments, the professional learns to read DC electrical schematics, select parts from a catalog, layout a printed circuit board, solder components and test the board. The printed circuit board will fit into a small plastic case that needs to be modified for our design. After completing this project, the engineering student will have the capability to design and add small DC products to their organization's product line. We will learn how to design and build DC products as efficiently as larger companies.

For architectural projects, we learn to create electrical drawings displaying 3-phase power coming into the building and how to show distribution panels for power and lights in the office. We also learn to show electrical connections on the drawing for machinery we find in commercial buildings such as motors. Both architectural and engineering designers will learn to read from a sketch and installation manuals and make drawings that are common for commercial buildings.

At World Class CAD, we are confident that the professional designer who uses and completes the coursework in the Computer Aided Electrical Design textbook and online Siemens resource material will have the necessary skills to complete fundamental projects in electromechanical design.

Welcome to the program.

Charles Robbins

*** World Class CAD Challenge 09-00 * - Complete this textbook in 40 hours of classroom training. Pass your Electrical Design Levels 1, 2 and 3 certifications to be ranked among the best in the world.**