Electronics Assembly for Engineers
SYLLABUS

The Electronics Assembly for Engineers course introduces the key tools, materials, and processes for engineers working in electronics assembly. This course is designed to encompass the entire assembly process, including a selection of Modules to address the current needs and future goals of engineers and organizations.

COURSE OBJECTIVE

After completing this course, you will be able to employ the key tools, materials, and processes required for engineers to build Printed Circuit Board Assemblies (PCAs) within an electronics manufacturing facility.

LEARNING OBJECTIVES PER COURSE MODULE

MODULE 1: INTRODUCTION TO THE ELECTRONICS INDUSTRY

- Explain the difference between electronics products in Class 1, 2, and 3
- Describe the role of IPC standards within the electronic manufacturing industry
- Describe the topics covered by common IPC standards
- Explain the focus and function of IPC training and certification programs

MODULE 2: INTRODUCTION TO PRINTED CIRCUIT BOARD (PCB)

- Describe the assembly process of a Printed Circuit Board (PCB)
- Identify the common components of a Printed Circuit Board (PCB)

MODULE 3: INTRODUCTION TO PRINTED CIRCUIT ASSEMBLY (PCA)

- Identify the common components of a Printed Circuit Assembly (PCA)
- Describe the different attachment methods used in printed circuit assembly

MODULE 4: COMPONENT IDENTIFICATION

- Identify types of components used in electronic assemblies
- Explain how component reference designators are used to locate components on a PCB
- Distinguish between component polarity and orientation
- Differentiate between wires, cables, and harnesses
- Identify types of terminals used in electronic assemblies
- Identify types of hardware used in electronic assemblies

MODULE 5: ENGINEERING DOCUMENTATION & MEASUREMENT

- Differentiate types of documentation used in electronics assembly
- Explain how engineering drawings are used as a build reference

- Describe the relationship between engineering drawings and work instructions
- Identify the components of a Bill of Materials (BOM)
- Identify common measurement tools used in the assembly process

MODULE 6: INTRODUCTION TO HAND SOLDERING

- Use quality condition criteria to determine component acceptability
- Explain the function of common hand soldering tools, equipment, and materials
- Identify best practices and methods for hand soldering
- Identify common hand soldering defects and soldering anomalies

MODULE 7: SURFACE MOUNT TECHNOLOGY

- Describe the assembly process of Surface Mount Technology (SMT)
- Identify tools and materials used in surface mount technology (SMT) assembly process
- Describe steps in surface mount technology (SMT) assembly process
- Define the reflow soldering process for SMT assemblies
- Identify the cause and types of SMT defects within the soldering process

MODULE 8: THROUGH-HOLE TECHNOLOGY

- Describe the assembly process of through-hole (TH) Technology
- Describe the process and properties of through-hole (TH) technology
- Identify common through-hole insertion methods, tools, and machines
- Identify common through-hole assembly defects

MODULE 9: WIRE, CABLE, AND HARNESS TECHNOLOGY

- Identify characteristics of wire and cables used in electronics industry
- Recognize steps in wire preparation
- Identify inspection criteria for cutting, stripping, and tinning wire
- Identify types of wire terminations
- Differentiate between methods of connecting wires to terminals
- Differentiate between acceptable and defect soldered and crimped terminations
- Identify types of connectors used in wire harness technology
- Distinguish methods of connectorization
- Distinguish methods for making and evaluating wire splices
- Describe the wire harness assembly process

MODULE 10: CONFORMAL COATING

- Identify equipment, tools, and materials used in conformal coating
- Explain steps in conformal coating process
- Classify causes and characteristics of conformal coating defects

MODULE 11: HARDWARE

- Identify tools used in electronics assembly
- Recognize hardware and other materials used in electronics assembly
- Differentiate between acceptable and defect conditions of installed hardware and materials

MODULE 12: QUALITY ASSURANCE

- Define quality in electronics manufacturing
- Identify tools used for PCB and PCA inspection
- Recall different quality conditions specified in IPC-A-610 and IPC-A-600
- Identify PCB and PCA defects according to IPC standards

FINAL EXAM

Participants must complete the Final Exam with a passing score of 80% to access and download their Electronics Assembly for Engineers Certificate. Students may attempt the exam up to three (3) times. Please note that a third and final attempt is permitted after 24 hours of the second attempt.

COURSE RESOURCES

Everything you need to successfully complete the Electronics Assembly for Engineers course is included and available on the IPC EDGE Learning Management System.

MODULE COMPONENTS AND REQUIREMENTS

The Electronics Assembly for Engineers program provides engaging videos, activities, and quizzes designed to help you learn, remember, and apply the knowledge and skills you will need to excel as an electronics assembly engineer. Each module is composed of the components described in Table 1.

Table 1. Module Components and Description

Module Component	Description
Module Pre-Quiz	Short (3 to 5-questions) quiz designed to help you identify what you know and what you still need to learn
Module Sections	"Bite-sized" segments of text, videos, graphics, and activities that explain the key points of the Module content and provide opportunities for you to think about how you would apply electronics assembly processes at work
Module Post-Quiz	Five to 10-question quiz designed to help you confirm what you know, identify areas that still need work.

IPC EDGE LEARNING MANAGEMENT SYSTEM

Upon accessing the course for the first time, make sure to take a moment to update your personal profile. IPC EDGE supports the most recent versions of Google Chrome, Firefox, Safari, Internet Explorer, and Microsoft Edge. Courses can be accessed on desktops, laptops, tablets, and mobile phones. Please refer to Browser Settings under the Start Here! Tab on your dashboard to make sure your browser is set to function seamlessly with the IPC Edge Learning Management System. If you need further technical assistance, please send an email to certification@ipc.org or call IPC Member Support at +1 847-597-2862.