Transform Your Constraint Engineering PCB Designs

SYLLABUS

INSTRUCTOR INFORMATION

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Availability: Usually available between 6 p.m. and 9 p.m., Pacific Standard Time. You may leave a message anytime.

PROGRAM DESCRIPTION

The design and engineering of Printed Circuit Boards is not only an artform but a booming career path in the electronics world. Not only should you learn the basics to thrive in this design arena, one must yearn to learn, drive, build and continue to build their skill set to be part of the solution needed to make PCB Design and Engineering not just a career but an important role in all engineering communities and companies around the world. That's why merely knowing the basics won't cut it anymore. You need a robust skill set to lead in today's advanced packaging realm.

This IPC Transform Your Constraint Engineering PCB Designs course is developed to provide specific paths to understanding the general and complex related features necessary to develop and further elevate your skill set. We'll work with a real-time sample design to implement various design methodologies to create and develop an ECAD/MCAD collaboration model. We'll use this PCB Model database to develop methods to jumpstart your skill set and transform your PCB designs to meet demanding engineering levels. We'll establish a goal to baseline engineering methodologies that will propel your designs to be producible and meet assembly requirements.

Moreover, you'll also discover how to drive engineering requirements using producibility, DFMA and local/global constraint management as well as ECAD/MCAD model design grounding and solder masking techniques. Lastly, we'll establish a simple but bold way to develop a design review process with your vendors and incorporate producibility, Design for Excellence (DFE), and Design for Manufacturing/Assembly (DFM/A) concepts into your winning design strategies.

Taught by a process-driven PCB design engineer with more than 30 years of experience in the electronic and aerospace industry, this three-week program aims to improve the board designs from engineers of varying levels of proficiency and elevate your designs to be more precise and

yield-worthy. The principles and methods you'll learn here are essential for adapting to the specific requirements of all boards, including complex RF and mixed-type designs.

LEARNING AND PERFORMANCE OBJECTIVES

Upon completion of this course, you will:

- A brief history of previous PCB design methodologies.
- Understand the electrical and mechanical engineering concepts that drive PCB Design.
- Develop producibility, engineering and constraint techniques that will transform your board designs.
- Embrace special baselines like stack-up and DFM/A to increase producibility.
- Understand how to combine and build the ECAD/MCAD interface into a model-base structure that yields a solid PCB model-base database.
- Utilize, understand and adapt general and complex routing methodologies that propel your engineering of your PCB design.
- Establish local and global Constraint Management tools to engineer all board types.
- Embrace the "after routing non-metal process" that moves your engineered PCB model to fabrication and assembly.
- Develop and drive interactive design and fabrication meetings and reviews with your in-house design team and with your board development vendors.
- Understand the special methodologies of transforming complex RF/COB board designs.

COURSE STRUCTURE

- Instructor and participants meet online twice per week from the comfort of their own home.
- Participants can view recorded online sessions to review course content and class discussions.
- Participants apply key concepts to create a real-world design from concept to completion.
- All required materials are included in the course. Participants may utilize a PCB design authoring software program of their choice. If participants do not have access to PCB design authoring software, IPC will provide complimentary access to Altium.
- Course materials are accessible 24/7 on the new IPC Edge Learning Management System.
- The course can be accessed on virtually any device with an Internet connection and major web browser, including Chrome, Firefox, Safari, Edge, and Internet Explorer.

SUPPLEMENTAL MATERIALS

- *Printed Circuit Handbook* (Clyde F. Coombs, McGraw-Hill)
- *Right the First Time: A Practice Handbook on High-Speed PCB and System Design* (Lee W. Ritchey, Speeding Edge)
- *Signal Integrity Issues and Printed Circuit Boards* (Douglas Brooks, Prentice Hall)

IPC STANDARDS COVERED (PROVIDED WITH COURSE)

- IPC-2152: Standard for Determining Current Carrying Capacity in Printed Board Design
- IPC-2221: Generic Standard on Printed Board Design
- IPC-2222: Sectional Design Standard for Rigid Organic Printed Boards
- IPC-2611: Generic Requirements for Electronic Product Documentation
- IPC-2612: Sectional Requirements for Electronic Diagramming Documentation (Schematic and Logic Descriptions)
- IPC-2612-01: Sectional Requirements for Electronic Diagramming Symbol Generation Methodology

COURSE SCHEDULE

WEEK 1

Lecture #1: PCB Design History & The New Scheme of Things Engineering Baseline

- A brief history of PCB design methodologies and the need for something better.
- What exactly does it mean to "transform your designs."
- Capture schematic diagrams that meet troubleshooting engineering ideals.
- Define an Special Routing Instructions (SRI) for your design to enable the beginning of the constraint process.
- Develop techniques that will transform engineering baselines for all board types.
- Understand the need for an ECAD/MCAD model leading to a PCB model database.
- Embrace producibility standards for stack-ups and DFM/A as a strict design baseline.
- Generate board design notebooks that enable stable process flow of your designs.

ASSIGNMENT:

- Review today's lecture and list any questions for the next lecture.

Lecture #2: Pre-routing schemes & Model-base Methodologies

- 7-min round table discussion on Lecture #1.
- Let's understand ECAD/MCAD model relationships and interface tactics.
- An introduction to producibility methodologies.
- Design and understand via structures and space minimization methods.

- Apply component placement methodologies incorporating DFM/A concepts.
- Understand and adapt general and complex routing features to your designs.
- Establish local and global constraint management tools to engineer your PCB designs.
- Unify ECAD/MCAD models to deliver an engineered and producible PCB Model-based database.

ASSIGNMENT:

- Review today's lecture and list any questions for the next lecture.

WEEK 2

Lecture #3: A Sample Model to Show Us How to Transform Through Constraints

- 7-min round table discussion on Lecture #2.
- Introduction to our sample PCB Design Model.
- Schematic + Housing + Layout = PCB Design Model-based database.
- Develop and shape the mechanical model to the PCB design model.
- Learn methodologies to control the PCB Design model.
- Utilize PCB design "visions" to enable process constraint management practices.
- Understand PCB fabrication and assembly processes that maximize design constraints.
- Prioritize producibility guidelines to establish proper design flows of routing.
- Update and engineer our sample PCB Design Model.

ASSIGNMENT:

- Review today's lecture and list any questions for the next lecture.

Lecture #4: Continuing Motivation to Engineer Your Designs

- 7-min round table discussion on Lecture #3.
- Review an upper level of engineering our design methodologies and process flow.
- Establish producibility and DFE and DFM/A concepts as winning design drivers.
- Apply producibility concepts: Route to meet design engineering baselines.
- Drive an Interactive Design Review Process with your design team.
- Develop a design meeting and fabrication review process with your vendors.
- Conduct pre-final producibility and vendor check.
- Identify and address problems revealed by a mechanical check.
- Drive and develop a 2-D/3-D electronic mechanical check process.

ASSIGNMENT:

- Review today's lecture and list any questions for the next lecture.

WEEK 3

Lecture #5: Looking at All Board Types & Complex RF/COB Designs – Part One

- 7-min round table discussion on Lecture #4
- Do all board types have the same process flow and constraint methodologies?
- Identify various board design types and their common features.
- Simplify and categorize designs based on features and constraints.
- Utilize the model-based structure to engineer the grouping of board types.
- Manage mounting holes and via sizing within designated DFE groups.
- Organize the non-metal features for each design type group.
- Recognize that all board design types have specific features critical for their success.
- Develop Constraint Management rules/features for each board design type.

ASSIGNMENT:

- Review today's lecture and list any questions for the next lecture. Please bring a list of questions you may have about RF/COB designs.

Lecture #6: Looking at All Board Types & Complex RF/COB Designs – Part Two

- Let's go back to our sample model design and review the RF/COB circuits.
- Confirm the PCB design is ready for RF/COB design.
- Utilize model-base ideals to define the RF/COB baseline engineering scheme.
- Organize Strict Baselines/How-To/Guidelines to help Model RF/COB designs.
- Develop a separate design engineering skill set for complex RF and COB designs.
- Develop a process to update and fix broken RF/COB designs.
- Our RF/COB Model is broken – Let's fix it.
- Summary and Final Thoughts.

ASSIGNMENT:

- Submit any questions/concerns to me by email.