Building Sustainable Model-based PCBs
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

Designing and building Printed Circuit Boards (PCBs) is a growing field in electronics. To succeed, it's important to learn the basics and keep improving your skills. PCB design is becoming a key part of many engineering teams and companies, so just knowing the basics isn't enough anymore. You need strong, up-to-date skills to keep up with today's advanced design needs.

The Building Sustainable Model-based PCBs course helps you understand both simple and complex ideas related to sustainability and model-based design. You'll work on a real-time sample design to connect ECAD and MCAD models and create a solid model-based PCB database. You'll learn emerging methodologies, technologies, how sustainability fits into PCB design and how to build a reliable ECAD/MCAD foundation. Additionally, we'll look at common engineering needs like constraint management, manufacturability, grounding, vendor requirements, and design for manufacturing (DFM). The goal is to help you build better, more sustainable PCBs and grow your ability to design any type of board.

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:

- Learn the history of previous PCB design methodologies.
- Define an electrical ECAD model including upfront Bill of Materials considerations.
- Develop and review the mechanical MCAD model and all its features.
- Analyze the MCAD model and how it connects to the ECAD Model.
- Develop and baseline techniques that will integrate ECAD & MCAD models.
- Develop and learn Sustainability for PCB Design and Digital Twins.
- Analyze key Global and Local sustainability methodologies for board design.
- Demonstrate producibility and constraint management fundamentals.
- Integrating the model and sustainability ideals and baselining a PCB Model.
- Develop a design meeting and fabrication review process with your vendors.
- Drive an Interactive Design Review Process with your design team.
- Baseline the importance of proper grounding and solder masking techniques.

COURSE STRUCTURE

- Instructor and participants meet online, twice per week from the comfort of their own home or office.
- 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.
- Course materials are accessible 24/7 on the 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

Session 1: PCB Design History & New Design Engineering Ideals

- A brief history of PCB design methodologies and the need for something better.
- Define a model-based design for PCB design.
- Let's define an example design and set forth the baseline requirements.
- Determine and develop your ECAD model database.
- Define initial constraints and producibility features for our sample ECAD model.
- Analyze and develop the mechanical requirements for the MCAD model.
- Develop strict constraints for everything mechanical.

ASSIGNMENT:

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

Session 2: Model-based Ideals and ECAD-MCAD Integration

- Round table 7-minute discussion of Session 1.
- Analyze ECAD/MCAD model relationships and interface tactics.
- Demonstrate model integration and set the PCB model baseline.
- Integrate our sample models and produce an initial PCB Database.
- Define and initialize producibility and constraint methodologies.
- Analyze and check for any 2-D/3-D interference issues.
- Develop an engineering vendor review package and schedule a meeting.
- Finalize model integration and prepare for utilizing sustainability ideals.

ASSIGNMENT:

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

WEEK 2

Session 3: Sustainability Methodologies

- Round table 7- minute discussion of Session 2.
- Evaluate Emerging Technologies as an energizing aspect of technology.
- Exploring the world of Sustainability with respect to PCB design.
- Analyze sustainability features and baseline into your model design.
- Interject our current Model-based design with sustainable methodologies.
- Evaluate Pros/Cons of this emerging technology versus Mother Earth ideals.
- Re-develop engineering constraints and producibility concerns.
- Demonstrate and evaluate our "new" sustainable sample design.

ASSIGNMENT:

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Session 4: Let's Unite and Realize our Sustainable Model-based PCB

- Round table 7- minute discussion of Session 3.
- Analyze and update constraint management and producibility specifications.
- Develop and evaluate model baseline and level the design stack-up.
- Drive logical component placement and develop sample routes.
- Baseline Design Rule Checks and confirm updated constraints.
- Drive an interactive design review process with your design team.
- Develop a fabrication review of the model-based sustainable design database.
- Move and lock down the PCB database and do what we do best – Route.

ASSIGNMENT:

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

WEEK 3

Session 5: Working our Models Within the PCB Database – Part One

- Round table 7-minute discussion of Session 4.
- Evaluate our sample design - fully routed and ready for production – or is it?
- Analyze the use of Digital Twins and is it part of our sustainable design?
- Develop and integrate functional use of digital twins for our signal integrity process.
- Evaluate simulation in parallel to baseline design engineering.
- Demonstrate and plan a change to the electrical model.
- Develop the updated electrical model in series with placement and routing.
- Our sample updated PCB design is ready for production – or is it?

ASSIGNMENT:

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

Session 6: Working our Models Within the PCB Database – Part Two

- Round table 7-minute discussion of Session 7.
- Evaluate an ME request to change the MCAD model.
- Develop and baseline a process to adapt to MCAD model changes.
- Review the MCAD update versus the ECAD model for changes.
- Question: How do we fix both models at the same time – in series or parallel?
- Baseline review and corrective action in series fashion then adapt to parallel.
- Finalize our PCB model and finalize it for production.
- Summary and Final Thoughts.

ASSIGNMENT:

- Submit any questions/concerns to me by email.