

Instructors

Donald L. Sweeney has been teaching for over 30 years, at the University of Wisconsin, Oakton College and independent EMC design seminars. He is a senior EMC Engineer and President of D.L.S. Electronic Systems, Inc. He is a graduate of the Department of



Electrical Engineering at the University of Illinois at Urbana and has over 40 years experience in the EMC and electrical engineering fields. Don specializes in EMC, RFI and EMI consulting and testing, and is known worldwide for his problem solving abilities. He has served as a special consultant to the Lawrence Livermore National Laboratory and the Nuclear Regulatory Commission. He is past chairman of the Chicago area IEEE EMC Society, founding chairman of U.S. Council of EMC Laboratories (USCEL), served on the board of directors of the IEEE EMC Society for 12 years, and is a NARTE certified EMC Engineer.



Roger Swanberg, Senior EMC Engineer at D.L.S., teaches circuit board design. He is a graduate of the Illinois Institute of Technology in Chicago, with over 35 years in the electrical engineering field. He has worked for Motorola and Zenith in color TV design, Nuvatec Design Consulting as a consultant and EMC testing manager, US Robotics as an EMC designer and regulatory compliance manager, plus Motorola Lighting and Motorola Cellular as an EMC and electronics designer. He is Vice-Chairman for the Chicago Section IEEE EMC Society and a member of the DeVry Local Advisory Board.

Check out our website at www.dlsemc.com



Wheeling, IL 60090 (847) 537-6400

To register for the new seminar/workshop:

Course enrollment is limited; please reserve your place now.

Fax this page to 847-537-6488
Call Carol G. at 847-537-6400
Or email Carol at cgorowski@dlsemc.com

Name _____
 Company _____
 Address _____

 Phone _____
 Email _____

- Three-day seminar April 12-14, 2011 including lecture, discussion, hands-on workshop, textbooks, design software, product design evaluation, continental breakfast, gourmet buffet lunch
 \$1090 if you register before 3/22/11
 \$1390 if you register after March 22, 2011
- Free 45-minute Design Evaluation of your product on April 15. Call 847-537-6400 to schedule.



Individual EMC Design Evaluation of Your Product

Cancellations and Refunds

If you cancel your registration, you will be charged a \$50 administrative fee. To cancel, you must call 847-537-6400 at least seven working days prior to the program start date. Cancellations not following this procedure will be liable for the full fee. With the Program Director's approval, however, a portion of this charge may be applied to a future program. Enrollment substitutions may be made at any time. D.L.S. reserves the right to amend the program should circumstances warrant such action. In the event of course cancellation, D.L.S. Electronic Systems, Inc. will reschedule the course or refund course fees. Liability for course cancellation is specifically limited to the amount of pre-paid course fees and excludes any incidental or consequential damages.

DISCLAIMER: D.L.S. Electronic Systems, Inc., its employees and the instructors assume no responsibility for liability for any conclusions derived from the lectures, notes, product reviews and discussions, or any designs executed using the information provided.

EMC By Your Design

An EMC Practical Applications Seminar and Workshop

Including newly added material on Controlling Signal Return Currents of PCB's and How EMC and Signal Integrity are Interrelated

FREE EMC Design Software and FREE Optional Design Evaluation of Your Product

by Donald L. Sweeney and Roger Swanberg



April 12-14, 2011

Hilton Hotel, 2855 N. Milwaukee Ave., Northbrook, IL 847-480-7500

The New Way of Teaching EMC

Applies to:

- Military**
- Avionics**
- Medical**
- Appliance**
- Industrial**
- ITE**
- Radio**
- Wireless**
- Other**



Hear it



See it



Feel it



Experience it



Apply it

Goals of New Seminar/Workshop:

1. To give the Design Engineer an in-depth understanding and working knowledge of EMC design principles.
2. To give the Design Engineer the ability to calculate necessary information to validate the design (using simple math, graphical and **computer programs**).
3. To have the Design Engineer involved in the hands-on, step-by-step process of implementing the EMC principles learned in the seminar into real life products.

Who Should Attend:

1. Those needing a working knowledge in the field of electromagnetic compatibility (EMC) for their product, including: technical managers, electronic designers, system engineers, test and instrumentation engineers and technicians.
2. Those interested in a step-by-step design process to avoid EMC problems in the future.
3. Those concerned with FCC, CE, EU, CISPR, IEC, Mil 461, RTCA, Canada, and VCCI.

Two Textbooks plus Materials

Design Techniques for Controlling Radiated Emissions, 2nd edition by Michel Mardiguian, edited in part by Donald L. Sweeney and D.L.S. staff
PCB Design for Real-World EMI Control by Dr. Bruce Archambeault of IBM
Materials developed by Donald L. Sweeney and Roger Swanberg

Seminar Schedule:

Days 1-3: EMC Design Class, Lecture and Discussion
Day 3: Workshop using computer programs designed by instructors.

Day 1

1. Introduction to EMC
 - a. Why you need to consider EMC in your design
 - b. The Real World and EMC Test Standards
 - (1) FCC and Canadian EMC requirements
 - (2) European EMC Directive
 - (3) Mil 461 and RTCA EMC requirements
 - (4) Other world EMC regulations
 - (5) Real world measurements and levels
2. Interference overview
 - a. Typical noise path
 - b. Wavelengths, bandwidths and dB's
 - c. Overview of radiated interference



Lecture and Discussion

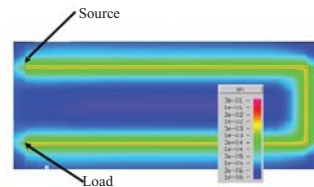
3. Grounding
4. Cabling - principles from crosstalk to how shielding works
5. Passive components
6. Electric and magnetic fields from simple circuits
7. Fields radiated by non-sinusoidal sources
8. General strategy for low emission product design

5:00-6:30 pm Laboratory Tour

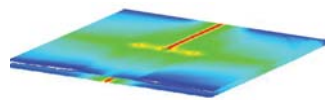
Optional tour of a modern EMC test facility

Day 2

1. Controlling radiated emissions at the device
2. Digital circuit noise and layout
3. Control signal return currents on PCB's
4. Learn how EMC and signal integrity are interrelated
5. Filtering - how filters work and ways they can be used in your design
6. Emission control in motherboards & backplanes
7. **Hands-on calculations** made throughout the day



Current density at 1 MHz from source to load



Current changing planes using two capacitors

8. Controlling radiated & conducted emissions from switch mode power supplies
9. Reducing emissions from cables and packaging.
10. Calculating emissions for a digital circuit
11. Shielding
12. Calculation of emissions for enclosures

Day 3

1. Troubleshooting radiated & conducted emissions
2. Electrostatic discharge (ESD)
3. Case study and validation of results
4. **The Workshop**

Using an example of a real life product and following typical design principles, students will:

1. Develop a block diagram
2. Determine the product's EMC parameters
3. Using our **proprietary computer programs** (a copy of which you will take home), calculate the probable emissions & immunity characteristics of:
 - a. circuit boards
 - b. power supply
 - c. I/O lines
 - d. enclosure

While meeting the North American and European EMC regulations, students will design/analyze a unit consisting of:

1. A motherboard with microprocessor, clocks, digital inputs and outputs
2. A power supply
3. Cables with and without shielding for the digital and analog inputs and outputs
4. An enclosure
5. An external keyboard
6. An interface to a video monitor

Students will go through the product's requirements



Designing a product to meet EMC compliance, Workshop - Day 3

and calculate its estimated emissions, providing rationale for various decisions.

When you leave this seminar/workshop, you should be ready to lead a design team with a high degree of confidence that your products will meet their EMC requirements.

Seminar/Workshop format:

7:30 am Tuesday - Registration
8:00-4:30 - Class lecture and discussion
12:00-1:00 - Lunch

Wear casual business attire. Prepare for moderate temperature variation in the room.

Included with the seminar/workshop:

1. A **large workbook** of the slides used in class
2. **Worksheets** to do the calculations
3. **Computer software** to calculate harmonics from PCB, cable emissions & cabinet shielding
4. **2 Textbooks** *Design Techniques for Controlling Radiated Emissions* - 2nd edition and *PCB Design for Real-World EMI Control*
5. **Specific sample problems** and calculations
6. **Lunch** each day

What to bring:

1. Your desire to learn
2. Calculator
3. A laptop running Word, Adobe Acrobat, Excel and a CD/DVD Drive. (Laptop useful, but not required)

Free 45-minute One-On-One Design Evaluation of Your Product 4/15/11.

Bring drawings, block diagrams, data, schematics or the product itself if it is small enough to handle. (For larger products, call D.L.S. to make possible arrangements.) Apply what you just learned to your own product. Have potential product pitfalls explained by Donald L. Sweeney or one of his associates. Time slots will be assigned when you register, so call 847-537-6400 today to reserve your place.

Lodging

You are responsible for making lodging arrangements at the facility of your choice. To obtain the D.L.S. seminar reduced room rate at the Northbrook Hilton, 2855 N. Milwaukee Ave, Northbrook, IL call 847-480-7500 before 3/22/11 and ask for the DIP Code Rate. Please advise us if you are physically challenged and require special accommodations.