

Product design for EMC

A three day in-house training course for electronic product designers

Suitable for all electronic manufacturing and related companies

Description

This seminar will cover design to meet the compliance requirements of European and international standards, as well as other commercial and military requirements. Good EMC design gives you a product that is more reliable and better fitted for its environment. The seminar is structured to achieve the maximum learning potential from a combination of tutorial and case study exercises. It emphasises the underlying physics of interference generation and coupling and how it affects design methods, without resorting to complex mathematics.



"Ah, now I get it ..."



Who should attend

Electronic product designers and design managers: a basic knowledge of electronics is assumed. The course will be of particular interest to design engineers in industrial, medical, transport, telecomms, IT, consumer, marine and military sectors who have to meet EMC requirements as part of their project specification. It will help them deal with the technical and compliance aspects of EMC, as well as avoiding the costly EMC-related design mistakes that disrupt project timescales and budgets.

Course material: course notes, including all slides used and explanatory text, will be sent before the start for copying and distribution to the delegates.

Cost for the basic course

£3650.00 (no per-delegate fee)

plus travel and accommodation expenses as required for the course presenter

For a firm quote and booking

Contact:

Elmac Services, Chichester, UK

Tel +44(0)1243 673372

e-mail courses@elmac.co.uk

web <http://www.elmac.co.uk>

Payment, admin and cancellations

The course will be invoiced on completion. The client is responsible for administering the seminar. Confirmation by purchase order is needed at least four weeks before the agreed start date and cancellations thereafter will incur a charge.

The presenter



Tim Williams, consultant with Elmac Services, is the author of "EMC for Product Designers" (fourth edition), now regarded as a standard reference for design engineers needing to meet EMC specifications, and "EMC for Systems and Installations" (with Keith Armstrong). He has written and presented many articles, conference papers and seminars internationally on circuit design and testing for EMC. He has conducted EMC design and test reviews for numerous companies in every industry sector, and considers himself principally as an electronics design engineer who happens to know a fair bit about EMC.

Programme

NB: demonstrations are an integral part of the course presentation

Day 1 – introduction and theory

(Timings are approximate)

Morning

09.30-12.30 Introduction to EMC; CISPR and IEC test standards

Why EMC? – the definition of EMC – the various phenomena – the product life cycle and reliability aspects – the EMC and R&TTE Directives – other requirements incl. military and aerospace

The standards regime – standards generating bodies – the three types of commercial EMC standard – content of the most common test standards

(continued)

Afternoon

- 13.30-15.00 Principles of interference coupling
Using the dB – frequency versus time domain, broadband versus narrowband – electric, magnetic and electromagnetic fields – transmission lines – differential versus common mode
- 15.15-16.30 System partitioning and grounding
System partitioning – grounding vs. earthing – ground as a current return path – control of loop area – conductor impedance and bonding – the parallel ground conductor

Day 2 – Mechanical, PCB and cables

Morning

- 09.30-11.00 PCB layout
Grounding and track impedance – proximity of return path – gridded and ground plane layouts – current in the ground plane – the effect of slots and apertures – A and D planes: to separate or not? – layer stack – power planes and plane resonance – decoupling capacitor layout – interface layout and grounding – connecting the PCB to the chassis – the EMC cost of heatsinks
- 11.15-12.30 Enclosure and PCB level shielding
Theory of reflection and absorption – effect of apertures and seams – enclosure resonance – conductive gaskets – conductive coatings, shielded windows and the waveguide tube – on-board shielding – partitioning shielded enclosures – filtering interfaces through the shield

Afternoon

- 13.30-15.00 Cables and connectors
Mode of propagation – unscreened cables: twisted pair, ribbon – cable balance and LCL – screened cables: screen operation, transfer impedance – the effect of the connector – cable routing – board-to-board connectors – galvanic isolation – interfaces compared
- 15.15-16.10 ESD protection
Electrostatic charge generation and the hazard to electronics – current paths in the ESD event – mechanical design issues – circuit design issues – protection devices
- 16.10-16.30 Exercise and case study: mechanical, PCB and cable design review

Day 3 – Electronics

Morning:

- 09.30-11.15 Filtering and suppression
Filter configuration and layout – common vs. differential mode filters – component imperfections and special types – ferrites on cables and within the circuit – I/O filtering – supply filtering – effect of supply frequency and LF resonance – transient and surge suppression – contact and motor suppression
- 11.30-12.45 Power switching circuits
Emissions from switching circuits – coupling paths – differential and common mode conducted – DC-DC converters – construction and circuit techniques: screens, transformers, snubbers

Afternoon:

- 13.30-15.00 Digital and analogue circuit design
Emissions from logic circuits: clocks, preventing ringing, decoupling principles – emissions from analogue circuits: unanticipated oscillations – logic circuit immunity: timing and logic threshold constraints, the watchdog, defensive programming – analogue circuit immunity: bandwidth, linearity and dynamic range, op-amp susceptibilities, the effect of audio rectification
- 15.15-16.30 Exercise and case study: electronic product design review
- 16.45-17.00 Wrap up and final discussion