

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 the European EMC Directive, 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 understand ..."

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

£2950.00 + VAT (no per-delegate fee)

plus travel and accommodation expenses for the course presenter

For a firm quote and booking

Contact:

Elmac Services,

Gorseacres, Puddletown Road, Wareham, Dorset

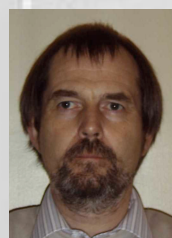
BH20 6AE UK Tel 01929 558279

e-mail courseenquiry@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. Cancellations less than one month before the agreed start date will incur a charge.



The presenter

Tim Williams, consultant with Elmac Services, is the author of "EMC for Product Designers" (third edition), now regarded as a standard reference for design engineers needing to meet the EMC Directive, 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. As well as being an EMC technical assessor for UKAS and SWEDAC, he has conducted EMC design 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

Day 1 – introduction and theory

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 Directives and requirements

The standards regime – standards generating bodies – the three types of 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 – coupling modes – electric, magnetic and electromagnetic fields – transmission lines – general emissions and immunity control
- 15.15-16.30 System partitioning and grounding
System partitioning – ground as a current return path – control of loop area – current flow in a ground plane and a shield surface – the effect of slots and apertures – conductor impedance and bonding
 Case study: current paths in ESD and EFT events

Day 2 – Mechanical, PCB and cables

Morning

- 09.30-10.45 PCB layout
Grounding and track impedance – proximity of return path – gridded and ground plane layouts – the optimum ground plane – on-board shielding – interface layout and grounding
- 11.00-12.30 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 installation

Afternoon

- 13.30-15.00 Shielding
Theory of reflection and absorption – effect of apertures and seams – conductive gaskets – conductive coatings and shielded windows – partitioning shielded enclosures – using the shield as ground – cable layout and large enclosures
 Exercise and case study – mechanical, PCB and cable design review

Day 3 – Electronics

Morning:

- 09.30-11.00 Digital and analogue circuit design
Emissions from logic circuits: clocks, transmission line ringing, decoupling, using single chip micros, using complex microprocessors – emissions from analogue circuits: unanticipated oscillations, video signals – logic circuit immunity: timing and logic threshold constraints, transient susceptibility, defensive programming – analogue circuit immunity: bandwidth, linearity and dynamic range, balance, isolation
- 11.15-12.45 Power switching circuits
Emissions from switching circuits – coupling paths – differential and common mode conducted – radiated – construction techniques: screens, transformers

Afternoon:

- 13.30-15.00 Filtering and suppression
Filter configuration and layout – component imperfections – ferrites on cables and within the circuit – I/O filtering – mains filtering – transient and motor suppression
 Exercise and case study: electronic product design review
- 16.45-17.00 Wrap up and final discussion