

5-day Robust Engineering Course

Course Description

High manufacturing costs, rework, early failures in the field and high warranty costs are often symptomatic of a sensitive design. Discovering a sensitive design in manufacture or in the hands of the customer is not good for business as options of tightening specifications, redesign or even “living with it” are all extremely expensive. Robust Engineering provides a complete methodology that can be used in the design of systems to ensure that they perform consistently in the hands of the customer. It comprises a process and tool kit that allows the designer to assess the impact of variation that the system is likely to experience in use, and if necessary, modify the design the system if it is found to be sensitive.

This 5-day Robust Engineering course is a natural follow-on from the Systems Engineering Fundamentals Course. It aims to both educate and train participants in the concepts, principles and practice of Robust Engineering. The Course will cover the theoretical basis of Robust Design established by Dr Genichi Taguchi through the concept of the *loss function* and his parameter and tolerance design approach. It will also present a pragmatic proven process for undertaking Robust Engineering together with the tools necessary to complete the steps.

Course Numbers and Who Should Attend?

The 5-day Robust Design Engineering can be delivered to up to 20 participants. The course is suitable for all personnel involved in the detailed design and optimisation of any complex system.

Benefits to the Individual and Business

During an intensive five days of teaching and practical ‘hands on’ exercises, participants will be challenged to develop the skills and mindset that can be applied to ensure a conceptual design is robust against likely sources of variation.

At the end of the course participants will:

- Have an understanding the principles of Robust Design and how it applies to the creation of a new system through the appropriate blend of people, process and tools.
- Understand the importance of Taguchi’s “loss function” and recognise where it can be applied practically.
- Be able to identify and prioritise system parameters that contribute to system sensitivity.
- Be able to perform qualitative and quantitative sensitivity assessments.
- Be able to undertake parameter and tolerance design.
- Be able to use Design of Experiments to search a system design solution space.
- Be able to specify statistical tolerances.
- Know how Robust Engineering contributes to verification and validation evidence.
- Be able to consider the impact on future business of adopting Robust Design.

Learning Approach

The learning approach is based on the Kolb learning cycle with a significant proportion of the course set aside for exercises to reinforce the learning. Indeed, many of the small group exercises involve a case study that provides a practical focus for the course and enables the delegates to practise the methodology and tools presented. We offer a number of case study exercises to reflect the nature of the client organization.

Course Content

The block diagram below presents the high-level agenda for the 5-day course. The course follows the detailed design of a conceptual solution to a user need, introducing the Systems (Robust) Engineering processes and tool set. The focus of the course is on **doing** the Engineering. More detail on the content can be provided on request.

	Monday	Tuesday	Wednesday	Thursday	Friday
0830	Introductions, Aims and Agenda	Review of Day 1	Review of Day 2	Review of Day 3	Review of Day 4
1000	Systems Engineering Reminder	Qualitative Robustness Assessment to Identify Key Parameters and Noise Using: The P-Diagram Design 2 Noise Matrix	Characterising the Design Space Using the Design of Experiments	Non Linear Responses and Response Surface Methods	Concepts and Principles of Monte Carlo Simulation
1100	The Concepts and Principles of Robust Design		How to Design, Conduct and Analyse Designed Experiments		Handling Noise in Design of Experiments
1200	Understanding Variation	Lunch	Lunch	Lunch	Simple Parameter Design
1230	Data and Collecting Data				
1500	Measurement Systems Analysis	Qualitative Robustness Assessment Using: Design Failure Mode and Effects Analysis	Screening Designs		Summary, Review and close
1700	Concepts and Principles of Hypothesis Testing	Measuring Robustness Through Quantitative Metrics			

Course Delivery and Costs

The 5-day Robust Engineering Course is very intensive and is delivered by two tutor-consultants.

The cost of delivering the 5-day course, excluding delivery tutor-consultant accommodation and expenses, but including all courseware, is £14,700. VAT will apply at the prevailing rate.

The course can be tailored to suit individual client's engineering lifecycle and review processes.

More Information and Contact Details

For more information about the 5-day Robust Engineering Course or any of our other Systems Engineering courses please contact **Dr Stuart Burge** on +44 (0) 7803 131614 or sburge@burgehugheswalsh.co.uk.