

## 5-day Systems Engineering Fundamentals

### Course Description

Systems Engineering is the systematic application of Systems Thinking to the design and introduction of new systems. Applied correctly Systems Engineering provides considerable strategic advantage to an organization by reducing introduction times, improving system performance and reducing through life costs. Its relevance is the only proven approach to handling risks associated with highly complex products and services.

Applying Systems Engineering correctly, however, requires not only skills and knowledge but also a profound understanding of the underlying systems principles on which it is built. Education and training are therefore critical to the development of an organizational capability in Systems Engineering. This course is about educating and training participants in how to do Systems Engineering. Along the path participants will also learn what it is and why it's like it is. Put simply; its purpose is to teach people how to design better systems.

### Course Numbers and Who Should Attend?

The 5-day Systems Engineering Fundamentals course can be delivered to up to 20 participants. This course applies equally to the design of product-based as to service or process-based systems. The course is therefore suitable for all personnel involved in the introduction and through life support of any complex system. It is specifically aimed at those people who wish to practice or would like to practice a systems approach to system design.

### 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 any system design irrespective of type, scale or context.

At the end of the course participants will:

- Have an understanding the principles of systems thinking and how it applies to the creation of a new system through the appropriate blend of people, process and tools.
- Understand the critical role of requirements in engineering.
- Be able to identify system stakeholders and gather their requirements.
- Be able to analyse stakeholder requirements and translate these into specific, precise and measurable technical system requirements.
- Be able to specify (document) requirements.
- Be able to generate and down-select alternative system design concepts and architectures.
- Be introduced to the principles of robust system design.
- Understand the systems approach to verification and validation (V&V).
- Be able to document verification and validation requirements.
- Be able to consider the impact on future business of adopting a systems approach to engineering.

## 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 studies that be selected to reflect the client's organization.

## Course Agenda

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

	Monday	Tuesday	Wednesday	Thursday	Friday
0830	Introductions, Aims and Agenda	Gathering Requirements		Specifying Requirements	Verifying System Concept using QFD 2
0930	This is Systems Engineering: Systems, Systems Thinking and its application to creating complex systems	Analysing Requirements	Understanding the Concept of Operation using Functional Modelling	A Systems Approach to Systems Design	A Systems Approach to Optimisation and Robustness. An introduction to Robust Design and searching the Design Space using Design of Experiments
1030		Defining the Meta-solution using Need Means Analysis			
1130		Analysing Expressed Requirements using Systemic Textual Analysis	Understanding Potential Emergent Behaviour using Sensitivity and Failure Analysis	System Architecting: Finding the best Candidate Architecture	
1230	Lunch	Lunch	Lunch	Lunch	Lunch
1300	Engineering Requirements	Analysing Expressed Requirements using Systemic Textual Analysis	Understanding Potential Emergent Behaviour using Sensitivity and Failure Analysis	Creating Candidate Concept Designs How to Generate System Concepts using Function Means Analysis	A Systems Approach to Verification and Validation using Verification Compliance Matrices
1400	Determine System Requirements using the Holistic Requirements Model	Deducing Unspoken Basic Requirements using Viewpoint Analysis	Verifying and Validating Requirements using Quality Function Deployment 1	Selecting the System Concept using Pugh Matrix and Analytic Hierarchy Process	Course Close and Summary
1500	A Systems Approach to Gathering Requirements				
1600					
1700					

## Course Delivery and Costs

The 5-day Systems Engineering Fundamentals Course is very intensive and is delivered by two tutor-consultants in order to provide support particularly during the case study exercises.

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 customer's engineering lifecycle and review processes.

## More Information and Contact Details

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