BURGE HUGHES WALSH

SYSTEMS ENGINEERING

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 is 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 of 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

This course can be delivered remotely online or face-to-face on the client's site or preferred venue. 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 can be selected to reflect the client's organization.

Course Agenda

Day 1	Day 2	Day 3	Day 4	Day 5

• Introductions, Aims and Agenda
• Why Systems Engineering
  ○ Complexity and Undesirable Emergence
• Systems Thinking Concepts used in Systems Engineering
• This is Systems Engineering
  ○ Process | People | Tools
	• Day 1 Review
	• Gather Requirements
	  ○ Identifying Stakeholders using Stakeholder Map
	• Eliciting and Capturing Requirements using:
	  ○ Affinity Diagrams
	  ○ Personas
	  ○ Use Cases
	  ○ Gemba Visits
	  ○ Voice of the Customer Translation
		• Day 2 Review
		• Analyse Requirements
		  ○ Analysing Expressed Requirements using Systemic Textual Analysis
		• Analyse Requirements
		  ○ Deducing Unspoken Basic Requirements using Viewpoint Analysis
			• Day 3 Review
			• Confirm System
			  ○ Verifying and Validating Requirements using Quality Function Deployment
			• Specifying System Requirements
				• Design System
				  ○ System Concept Evaluation and Selection using a Pugh Matrix
				• Confirm System
				  ○ Verifying the System Design Concept using QFD 2
				• Design System
				  ○ A Systems Approach to Detailed Design
				  ○ Introduction to Robust Design and Searching the Design Space using the Design of Experiments

• A Systems Approach to Requirements
  ○ Requirement Issues
  ○ Requirement Models
  ○ Requirements Engineering
• Gather Requirements
  ○ A Systems Approach to Collecting
  ○ Stakeholder Needs— the Rational and Process
	• Gather Requirements
	  ○ Structuring Requirements using Tree Diagrams
	  ○ Analytic Hierarch Process
	• Specifying Stakeholders Requirements
	• Analyse Requirements
	  ○ Analyse Stakeholder Requirements
	• Analyse Requirements
	  ○ Assess the System Meta-solution using Needs Means Analysis
		• Analyse Requirements
		  ○ Understanding the Concept of Operation using Functional Modelling
		• Analyse Requirements
		  ○ Finding and Avoiding Undesirable Behaviour using Sensitivity and Failure Analysis
			• A Systems Approach to Systems Design
			• Design System
			  ○ System Architecting — Finding the best Architecture
			• Design System
			  ○ Generating System Concepts using Function Means Analysis
				• Subsystem Design
				• Build and Confirm System
				  ○ A Systems Approach to Integration, Verification and Validation (V&V)
				  ○ Writing V&V Requirements
				  ○ Developing Test Plans
				• Summary, Review and Close

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 **£16,200.** VAT will apply at the prevailing rate.

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

BURGE HUGHES WALSH

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ENDORSED TRAINING PROVIDER

BURGE HUGHES WALSH LIMITED

First Floor, 6 Allerton Road, Rugby, Warwickshire CV23 0PA

enquiries@burgehugheswalsh.co.uk

www.burgehugheswalsh.co.uk

01788 550015