Optima
Systems Consultancy

SYSTEMS THINKING TRAINING COURSES

Broaden your Systems Thinking skills to manage complex technological & engineering challenges successfully.

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What are Systems Thinking and Systems Engineering?

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What is Systems Thinking?

Systems Thinking sets out a way of tackling the whole of a complex Problem by focussing first on the Problem itself, developing a structured Design and integrating the Parts to create a System that provides a Solution, all controlled within a development Process in accordance with a Lifecycle.

What is Systems Engineering?

Systems Engineering applies Systems Thinking to the development of any sort of complex system. It involves a wide range of techniques, methods, and processes to achieve this in a manner intended to minimise risk, development time and cost, whilst providing clarity on the nature of the Problem and how a Solution can be agreed to be acceptable.

It provides the detail of how Systems Thinking can be applied successfully to any type of complex Problem that involves a developed system as the key element in providing a Solution.

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Who is it for?

Optima's bespoke courses and modules on Systems Thinking and Systems Engineering aim to equip practitioners, programme, project, and engineering managers as well as senior leaders of enterprises with the skills and understanding of systems approach to scope and solve complex business challenges.

Our training can be tailored to meet your unique needs:

- Whether you are new to the discipline or have some level of prior knowledge.
- Whether you are looking for a traditional and full-time training package, over a number of days, or a more modular form of delivery over a longer period.
- Whether you would prefer the training to be classroom-based (either at our office or your site) or delivered online.
- Whether you need a broad-brush syllabus, or something focussed on specific challenges, topics or tools/techniques.

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About us

Optima Systems Consultancy is an independent Systems Engineering and Business consultancy, based in Thornbury, North Bristol. We specialise in the Defence, Aerospace, Transport and Nuclear sectors, combining in-depth technical expertise with broader business consultancy disciplines to scope and solve clients' complex problems. We pride ourselves on delivering the independent and impartial advice needed to make pragmatic decisions and develop a balanced system. In short, we enable client success.

Our experienced training team have delivered courses across the UK and internationally for major global companies and industry clients in Defence, Transport and Nuclear Energy sectors. Our course leaders are all practising Systems Engineers who have extensive industrial experience of supporting major programmes with complex engineering challenges. They have established links with academia, with roles including:

- Invited speaker on Technology Management at Cranfield University Masters course
- External Examiner for Cranfield University MSc in Systems Engineering
- Lecturer on the Cranfield Vehicle Systems Integration course

Syllabus

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Systems Engineering
Orientation courses

A series of related modules to be delivered individually or as a tailored package.

- Executive SE Leadership
- Systems Thinking
- Systems of Systems
- SE Awareness

Systems Engineering
Foundation Course

Available as a five-day course, or it can be taken as tailored packages of modules.

- Introduction to SE
- Requirements
- Architectures
- Integration
- Verification & Validation
- Completeness & Coherence
- Managing a Systems Approach

Model-based SE
Foundation Course

Available as a five-day course, or it can be taken as tailored packages of modules.

- Introduction to MBSE
- Capturing Stories, Use Cases, Flows & States
- Capturing Structure & Relationships
- Capturing Interfaces
- Frameworks, Languages & Tools

Systems Engineering
Supplementary courses

Supplementary courses that compliment the orientation and foundation training.

- Risk-based SE
- SE for supply chains
- SE for programme managers
- Communication for Engineers

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Training delivery

Our training courses range from half day modules to five-day packages and can be tailored to you/your team's specific needs and adapted to fit a broad range of complex business challenges. The delivery is also flexible; it can be a classroom setting or remote learning (via Teams/Zoom/Skype etc).

Our five-day foundation courses, endorsed by the National Skills Academy for Nuclear (NSAN), are structured to include a module delivery in a classroom setting, followed by students' workshops around a business case study, allowing them to apply the principles being taught to the unique demands of their programme or business. The supporting case study will be developed in consultation with each client prior to delivery. These courses are modular, therefore, instead of opting for the package, elements can be delivered individually and flexibly to suit your team's needs.

Training delivery partners

We are proud to partner with the Bristol Management Centre to offer Systems Engineering for Specialist Vehicles Advanced Training course.

We also deliver Systems Engineering Training outside the UK with our partners, SE Training. They are an international team of experts specialising in cross-functional disciplines such as Systems Engineering and Project Management, working across multiple industries and academia.

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SE Orientation courses

Executive SE Leadership

This course will help executive leaders to understand the role of Systems Engineering in achieving business advantage in complex development programmes.

Learning objectives

- Understand the value proposition of Systems Engineering.
- Provide insight into why many programmes fail.
- How SE controls risks, fundamental to complex development programmes
- How SE enables. successful delivery, and an outline of what it entails.

Duration: 2 hours

Systems Thinking

This module will help you develop a more structured approach to solve complex and highly technical problems.

Learning objectives

- Introduce the systems approach to complex problem solving.
- Provide the tools to improve your understanding of complexity.
- Show you how to develop more optimal solutions.

Duration: 2 hours

Systems of Systems

It's for everyone who faces a particularly complex, large-scale challenge that would benefit from a system of systems perspective.

Learning objectives

- Help you to recognise when System of Systems is an issue for development.
- What it means for the development.
- Tools & techniques to help you deal with the added complexity that it brings to systems.

Duration: 3 hours

SE Awareness

This course can provide orientation for Engineers who are new to the discipline and work on complex development programmes, providing a grounding in SE.

Learning objectives

- An introduction to SE, describing its benefits.
- Learn about the fundamental components involved in a Systems Approach.
- Provide an insight into the range of techniques, tools and processes involved.

Duration: 8 hours

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SE Foundation course

nsan
NSAN Endorsed Programme

Systems Engineering Foundation Course

Our NSAN Endorsed-Systems Engineering foundation course comprises up to 7 modules, with a combined teaching time of 16 hours.

We can deliver this course as a 5-day package, combining classroom time with supporting workshops of a tailored Case Study to explore the application of general principles to the specifics of your business, products or your customers.

Alternatively, you can opt for a shorter, tailored package of modules, based on your specific business needs.

MODULE 1

Introduction to Systems Engineering

Learning objectives

- What is a Systems Approach and why is it so important in solving complex problems?
- Development of a Schema to understand how a Systems Approach can be applied to a given problem.
- Understand who is important in solving complex problems and how to engage them effectively via a Systems Approach.
- Understand what success will look like when the work is completed.

Duration: 2.5 hours

MODULE 2

Requirements

Learning objectives

- Understand the importance of knowing the needs, wants, desires for the System and how to manage this information throughout its development.
- Techniques to assess completeness, coverage and understanding.
- Ensure that everything about the System is captured to an appropriate level of understanding.
- Techniques for managing changes to core understanding and how to trace the impact of changes to System development activity.

Duration: 2.5 hours

MODULE 3

Architectures

Learning objectives

- How parts of a System of Systems relate to each other; identifying and controlling the interfaces between them.
- Use formal methods to control interfaces of various types so that parts can be procured or manufactured that work together.
- Use techniques such as Multi-Criteria Decision Analysis to decide which arrangement or structure of things combine.
- Use the underpinning architecture to provide information to subsequent stages of development.

Duration: 2.5 hours

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SE Foundation course (2)

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MODULE 4

Integration

Learning objectives

- How to determine the best way to bring all the parts of the complex system together in conjunction with the necessary testing.
- Using this information early in the development to ensure all supply and manufacturing will provide material and evidence to make sure the system is available at the right time.

Duration: 2 hours

MODULE 5

Verification & Validation

Learning objectives

- What's the difference and why is it important?
- Understanding techniques for testing, how to apply them and when to ensure that the complex system can provide the right performance, in the right way and repeatably.

Duration: 2 hours

MODULE 6

Completeness & Coherence

Learning objectives

- Ensuring that all aspects of a complex system development are appropriately addressed, specifically:
  - Safety & Security;
  - Reliability;
  - Supportability & maintenance;
  - Sustainability & the environment;
  - Configuration management.
- How to use an architectural approach to system definition to ensure these activities are fully address and coherent across all elements of the System.

Duration: 2 hours

MODULE 7

Managing a Systems Approach

Learning objectives

- Understanding the Systems Approach as it applies to your problems.
- Tailoring of the Systems Approach to specific problems.
- Managing material throughout the life of the development.
- Data /& information mgmt: having the right material at the right time.
- Programme Mgmt & a Systems Approach working together.
- System of Systems Issues
- Outline of Model-based Systems Engineering

Duration: 2.5 hours

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MBSE Foundation course

Model Based SE Foundation Course

Our Our NSAN Endorsed- Model Based Systems Engineering (MBSE) foundation course comprises up to 5 modules, with a combined teaching time of 4.5 hours.

We can deliver this course as a 5-day package, combining classroom time with the guided development of a system model, to help develop the concepts covered, and demonstrate the power of MBSE in a more practical context.

Alternatively, we can provide a tailored package of modules over a shorter period of time.

MODULE 1

Introduction to Model Based SE

Learning objectives

- What is Model Based Systems Engineering (MBSE) and why is it so powerful in managing development of complex systems.

Duration: 1 hour

MODULE 2

Capturing Stories, Use Cases, Flows & States

Learning objectives

- How to tell a story in Use Cases and techniques for using MBSE in Stakeholder management.
- Extracting and formalising requirements from MBSE Use Cases.

Duration: 1 hour

MBSE Foundation course (2)

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MODULE 3

Capturing Structure & Relationships

Learning objectives

- How to identify and express structure, relationships, connections and dependencies from stories and requirements.
- How to use this information in design decision making.

Duration: 1 hour

MODULE 4

Capturing Interfaces

Learning objectives

- How to identity and specify interfaces in order to fully define subsystems, connections and components.
- Using the overall model to support transversal analysis such as safety, security, reliability.

Duration: 1 hour

MODULE 5

Frameworks, Languages & Tools

Learning objectives

- Explanation of some of the background of MBSE including languages, techniques and tools used to support the method.
- Some guidance on which tools to use when and what some of the issues are with each.

Duration: 30 minutes

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Risk-based Systems Engineering

This course will help you to solve complex problems by ensuring a transparent and managed level of risk.

Learning objectives

- Show you how Systems Engineering can help identify, manage and mitigate risk in dealing with complex technical problems.
- Equip you with tools and techniques to both capture, report and mitigate risk from a systems perspective.

Duration: 4 hours

Systems Engineering for supply chain managers

This course will help those involved in managing the supply chains associated with complex development, learning to take a joined up systems approach.

Learning objectives

- An overview of Systems Engineering and how technical control on each side of contractual partitions deeply effects the outcomes in complex development.
- Learn to control specifications at each contractual boundary to enable integration & collaboration.

Duration: 4 hours

SE for programme managers

This course will show how the roles of Project Manager & Systems Engineer are natural counterparts, and equip you as PM with the understanding of what is entailed in SE.

Learning objectives

- An introduction to SE that shows how it acts as the technical counterpart to P3M.
- Show you the benefits to a programme that arises from taking a Systems Approach.
- Tackling the risks fundamental to complex development, setting you up for success.

Duration: 4 hours

Communication for Engineers

This module will help you exchange complex, technical concepts with a wide range of stakeholders, both technical and non-technical.

Learning objectives

- Help you to understand interpersonal communication from a technical perspective.
- Give you an insight into how communication between people works from both technical and psychological perspectives.

Duration: 1 hour

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THALES

"I have engaged Optima on two significant learning interventions for my company. The first as a part of my delivery team to support an engineering multinational client which involved the delivery of a comprehensive System Engineering training package which was delivered twenty times in 7 different countries around the world inside 12 months. On the second occasion I commissioned Optima to develop a series of technical papers explaining how to tackle some of the thorny issues that occur when delivering engineering projects. Optima was able to flex to meet our needs and deliver times during the pandemic. I will be using Optima again because I find them expert professional engineers who work hard for their clients, and they know how to design and deliver high quality technical training. Most of all I trust the people at Optima to do a good job and they are great to work with."

Radioactive Waste Management

"Optima delivered a 5-day Systems Engineering training to a small cohort of RWM delegates, the session we also arranged a subsequent half-day awareness session to a wider cohort of RWM employees. Overall, both workshops were well received, with good feedback on the quality of content and delivery from the team."

Would like to learn more?

Get in touch to discuss how we can support your training needs. Our team will be in touch with you as soon as possible.

- **+44 (0)1454 850 528**
- **training@optimasc.co.uk**

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MANAGING COMPLEXITY
ENABLING SUCCESS.