PROJECT PERFORMANCE INTERNATIONAL

Systems Engineering Overview 3-Day Course

Systems engineering principles and methods explained

Gain Systems Perspective – Fast

Systems engineering offers powerful tools and perspectives for managing complexity, aligning stakeholder values, and delivering effective technical solutions. In this three-day overview course, participants build a solid conceptual foundation in the principles and processes of systems engineering without needing to apply the techniques hands-on.

This is the course for professionals who interface with engineers or manage technical programs, and who want to **speak the same language**, understand the **systems life cycle**, and **appreciate the power of systems thinking** applied to technical development.

Earn CE/CPD Credit

PMI Talent Triangle® Suggested PDUs

- 22 Ways of Working
- 1 Power Skills
- 1 Business Acumen

INCOSE Certified Systems Engineering Professional (CSEP)

- 24 Continuing Education PDUs

Your Fast Track to Systems Engineering Insight

- Gain an appreciation of the systems approach to the engineering of systems regardless of **problem** and **solution technology** specifics.
- Understand how systems engineering provides the **structure** and **rigor** to reduce project risk and optimize outcomes.
- Learn how **requirements analysis, logical modeling, trade-off studies,** and **design optimization** underpin high-performance projects.
- Speak confidently about key topics like **MBSE, system life cycles, requirements traceability**, and **verification & validation**.

Designed for Leaders, Managers, & Collaborators

This course is ideal for:

- **Engineering managers** and team leaders
- **Project** and **program managers**
- **R&D professionals** and **product managers**
- **Test, verification,** and **quality personnel**
- **HR, procurement,** and **operations managers**
- Anyone who collaborates with or manages engineers.

No technical background is needed. This course focuses on **principles, process understanding**, and **big-picture thinking** rather than technical detail.

20,000 Professionals Trained Across 43 Countries

Turn Understanding Into Impact

Participants will complete the course with:

- A clear understanding of what systems engineering is (and is not)
- Insight into **different development strategies**: waterfall, incremental, evolutionary (including agile), spiral
- Knowledge of **key tools** and **methods** used in systems engineering (including MBSE)
- Familiarity with the **core SE process elements:** requirements analysis, physical and logical design, trade studies, system integration, verification and validation
- Awareness of **pitfalls** and **best practices** in systems development and delivery.

An Engaging, Hands-On Learning Experience

This engaging, fast-paced course includes:

- **Interactive workshops** using a single relatable system case study
- **Clear presentations** covering core concepts and frameworks
- **In-depth discussions** on key principles and their practical implications
- A balance of **theory** and **application** to reinforce learning.

You will receive:

- Comprehensive printed or digital training manual
- Workshop workbook and example outputs
- Checklists, templates and supplementary material for application and additional learning
- Complimentary access to PPI's **Systems Engineering Goldmine.**

What Our Participants Are Saying

*"Such an **informative course**, and the extensive material provided will be so valuable to use as reference."*

Course participant, USA

***"Irreplaceable!** The training gave structure to my work and my thinking."*

Course participant, Netherlands

*"The simultaneous visuals of the slides, the whiteboard and the instructor **worked very well**, allowing the sessions to run so smoothly."*

Course participant, USA

Trusted Worldwide

PPI delivers outstanding training and consulting to many hundreds of enterprises worldwide, from Fortune 100 companies (presently 18% of them) to small start-ups. PPI is a truly international company, with personnel based in eight countries, and clients across six continents benefiting from our work.

NEC SIEMENS BAE SYSTEMS AIRBUS THALES

MITSUBISHI TNO babcock BHP

Systems Engineering Overview 3-Day Course Outline

0. The Business Case for Systems Engineering

1. The System Life Cycle and Solution Development

- defining the problem domain
  - information, relationships, and artifacts of problem definition
- the solution domain: key concepts, relationships, and work products
  - problem versus solution
  - architectural/conceptual/preliminary versus detail
  - "our" problem versus "their" problem
  - architectural/conceptual/preliminary versus detail
  - scalability and recursion
  - complexity
  - top down, bottom up, "in-between"
- life cycle processes and models
- classes of stakeholders
- configuration items and baselines
- why a life cycle view – need to disposal?
- waterfall, incremental, evolutionary and spiral developments
- Product Line Engineering (PLE)
- Digital engineering, digital thread, digital twin
- summary of key points

2. Principles, Concepts and Elements

- ***workshop – principles of the engineering of systems***
- some more systems concepts
- why MBSE and digital engineering
- Model-Based Systems Engineering (MBSE) in the problem & solution domains
- SE process model and elements
- ***workshop – matching common activities to the SE process elements (shortened)***
- verification and validation related to the "Vee model", the "Wedge Model"
- work product attributes
  - requirements traceability
  - design traceability
  - verification traceability
- SE and SE-related standards
- relationship of SE to other engineering disciplines
- summary of key points

3. Requirements Analysis – Capture and Validation

- types of requirements
- RA methodology
- ***workshop – context analysis***
- ***workshop – design requirements analysis***
- ***workshop – parsing analysis of example requirements***
- software tools supporting requirements management and requirements analysis
- ***workshop – functional analysis in requirements analysis***
- common pitfalls in performing requirements analysis

4. Physical Solution Definition Part A

- technology and innovation in solution development
- generic influences in defining configuration items
- ***exercise – physical & functional design***

5. Logical Solution Definition

- types of logical representation
- functional analysis in design – how to do it
- functional design/architecture process
- ***workshop – a simple physical/functional design***
- performance threads
- behavior modeling, SysML, proprietary languages
- software tools supporting logical and physical design

6. Physical Solution Definition Part B

- what next? – FMECA, FTA, ETA, ...
- object-oriented design
- interface engineering, common interfacing pitfalls
- summary of key points

7. Effectiveness Evaluation, Decision & Solution Optimization

- approaches: AHP, MAUT, QFD
- ***workshop – engineering decision-making***
- multiple stakeholders, multiple uses, event-based uncertainty
- solution optimization
- software tools supporting effectiveness evaluation and decision

8. Requirements Specification Writing

- the ten requirement specification types and their uses
- public domain specification standards – the good, the bad, and the ugly
- recommended requirements specification standards
- specification structure principles

9. System Integration

- integration activities
- nine system integration strategies
- integration testing
- qualification
- summary of key points

Systems Engineering Overview 3-Day Course Outline (Continued)

10. Verification and Validation

- technical reviews
  - requirements reviews
  - principles of design review
  - architectural design review (ADR – PDR)
  - detail design review (DDR – CDR)
  - requirements satisfaction audits (FCAs)
  - design description (BS-BS) audits (PCAs)
  - technical reviews and incremental builds
  - administration of technical reviews
- technical performance measurement
- test and evaluation
- other verification and validation methods and tools
- summary of key points

11. Engineering Management

- planning the engineering
- integrating engineering specialties
- engineering team structure
- management frameworks – Specification Tree, Project Breakdown Structure (PBS – WBS)
- managing configuration
- managing interfaces
- managing residual risk
- summary of key points

12. Summary

- key points revisited
- tailoring of SE methods to specific activities or projects
- getting the most out of systems engineering methods
- process improvement: using CMMs™ and other benchmarks

Presenters

Mr. Robert Halligan

FIE Aust CPEng IntPE(Aus)
PPI Managing Director, Consultant & Course Presenter

PPI Founder Mr. Robert Halligan is an executive project manager, engineering manager and engineering practitioner, known internationally for his role in the advancement of SE practice. He is an authority on the strengths and weaknesses of a wide range of relevant systems engineering-related standards, and has consulted extensively in the areas of requirements quality, functional analysis, system architecting and their relationship to project risk.

Mr. John Fitch

ESEP
PPI Principal Consultant & Course Presenter

John Fitch has over four decades of engineering, engineering management, consulting and training experience. John has over 20 years of consulting experience in systems engineering with a focus on decision management, requirements management, risk management, systems design, product/technology road- mapping and innovation. Original work by John on Decision Patterns is ground-breaking.

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