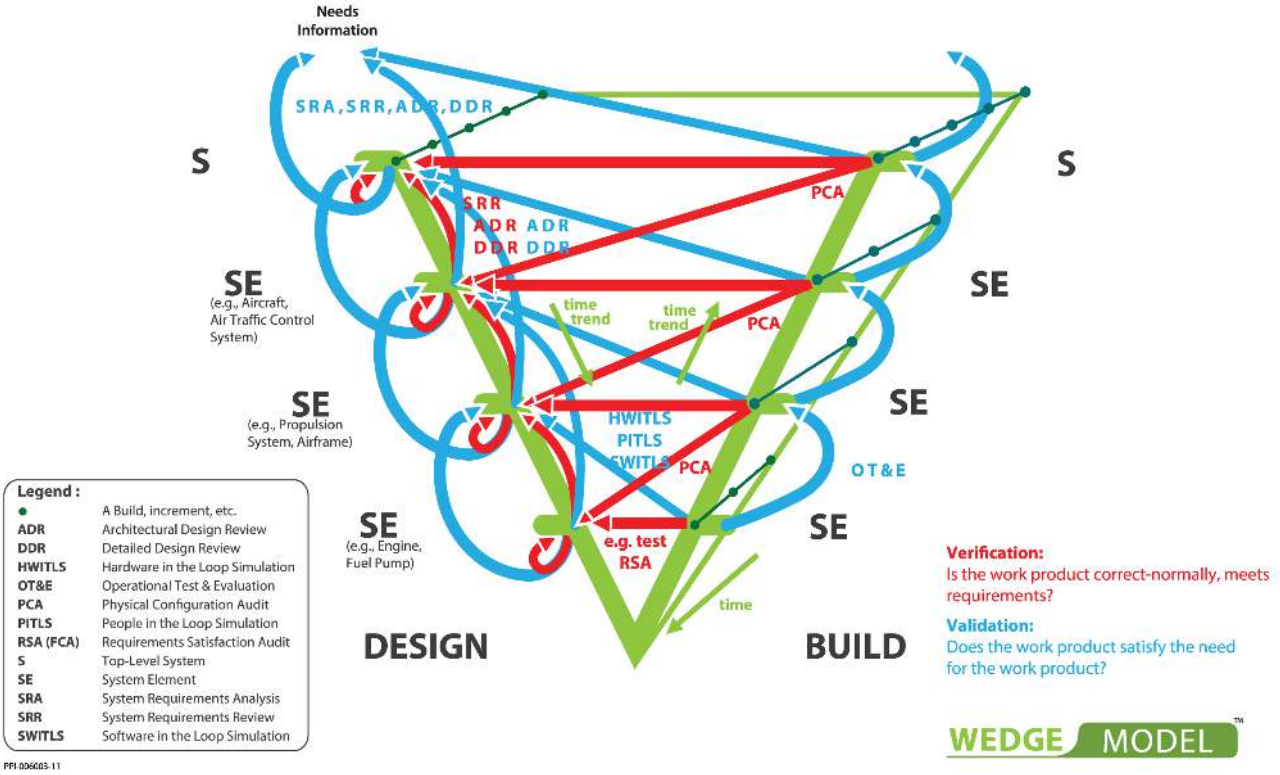
SYSTEMS ENGINEERING OVERVIEW

LEARN ENOUGH ABOUT SYSTEMS ENGINEERING TO INTERFACE AND INTERACT WITH ...

3-DAY COURSE

... SYSTEMS ENGINEERING ACTIVITIES, WITHOUT NECESSARILY PRACTICING SYSTEMS ENGINEERING YOURSELF.

The course is suited to those who need familiarity with systems engineering principles and methods, without actually practicing them to any significant degree. Those in roles that interface with systems engineering activities will find the course especially relevant. We have found that it is not possible to teach systems engineering in a three-day course to those who have to practice it to any substantial degree. Decades of experience in delivering systems engineering training support this view. However, an objective of achieving a common understanding of the nature and principles of systems engineering, viz. the systems approach to the engineering of systems, is certainly achievable.



"The best thing about the course was the interactive component and the presenter's extensive knowledge (and vocabulary) on the subject."

- delegate, CSIR-DPSS, South Africa

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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 "V" 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***
- software tools supporting requirements management and requirements analysis
- summary of key points

4. Physical Solution Definition Part A

- technology and innovation in solution development
- generic influences in defining configuration items

5. Logical Solution Definition

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

6. Physical Solution Definition Part B

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

7. Effectiveness Evaluation, Decision & Solution Optimization

- approaches: AHP, MAUT, QFD
- ***workshop – developing a system effectiveness model***
- ***workshop – performing a trade-off study***
- multiple stakeholders, multiple uses, event-based uncertainty
- solution optimization
- handling conflict of interest between acquirer and supplier
- 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
- specification structure principles

9. System Integration

- integration planning
- integration
- integration testing
- design interaction with hardware and software production
- configuration audits related to system integration – RSA (FCA), BS/BS Correspondence (PCA)
- qualification
- summary of key points

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

To register visit our website or call our friendly registration team:

PO Box 2385
Ringwood North
Victoria, 3134
Australia

+61 3 9876 7345

www.ppi-int.com

contact@ppi-int.com

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