

Systems Engineering: Requirements, Architecture and V&V

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Course Overview:

The Systems Engineering Training Course: Requirements, Architecture & V&V is a practical 1-week program designed to help participants understand and apply the core principles of systems engineering across complex technical, engineering, infrastructure, software, and technology-based projects. This course provides a structured approach to defining stakeholder needs, developing clear system requirements, designing system architecture, managing interfaces, planning integration, and conducting verification and validation activities.

Unlike general project management training, this course focuses on the technical discipline of building systems that work as intended in real operational environments. Participants will learn how to manage the full system life cycle, from concept definition and requirements analysis to architecture development, integration, testing, technical reviews, deployment, and operational support.

The course uses references and concepts aligned with recognized systems engineering materials such as the NASA Systems Engineering Handbook, ISO/IEC/IEEE 15288 system life cycle processes, INCOSE systems engineering guidance, MIT systems engineering course materials, MBSE resources, and technical review frameworks. Through case studies, exercises, and practical workshops, participants will learn how to reduce technical risk, improve traceability, control system interfaces, and support successful delivery of complex systems.

Target Audience:

- Systems Engineers
- Project Engineers
- Technical Project Managers
- Engineering Managers
- Solution Architects
- System Analysts
- Business Analysts involved in technical systems
- Integration Engineers
- Test and Validation Engineers
- Requirements Engineers

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Targeted Organizational Departments:

- Engineering and Technical Departments
- Project Management Office
- Systems Engineering Teams
- Research and Development
- Product Development
- IT and Digital Transformation
- Infrastructure and Operations
- Quality Assurance and Quality Control
- Testing and Validation Teams
- Risk Management
- Configuration and Change Control

Targeted Industries:

- Aerospace and Defense
- Oil and Gas
- Energy and Utilities
- Telecommunications
- Transportation and Rail
- Infrastructure and Construction
- Manufacturing and Industrial Engineering
- Information Technology
- Software and Digital Systems
- Government and Public Sector
- Healthcare Technology
- Automotive and Mobility
- Mining and Heavy Industry
- Engineering Consulting
- Research and Development Organizations

Course Offerings:

By the end of this course, participants will be able to:

- Explain the role and value of systems engineering in complex projects.
- Apply systems thinking to analyze technical problems and system behavior.
- Define stakeholder needs and convert them into system requirements.
- Write clear, measurable, testable, and traceable requirements.
- Develop logical and physical system architecture.
- Identify and manage system interfaces and dependencies.
- Apply trade-off analysis to support technical decision-making.
- Understand the basics of Model-Based Systems Engineering.
- Plan system integration, verification, and validation activities.
- Use technical reviews such as SRR, PDR, CDR, TRR, FCA, and PCA.
- Manage risk, configuration, change control, and technical baselines.
- Prepare a practical systems engineering plan for a complex project.

Training Methodology:

This course uses a practical, application-focused training methodology designed for professionals working on complex systems and technical projects. The program combines instructor-led explanations, real-world examples, group discussions, templates, and hands-on exercises to help participants move from theory to implementation.

Participants will work through the full systems engineering life cycle, beginning with stakeholder needs and system context, then progressing into requirements development, architecture, interface management, integration, verification, validation, and technical governance. Each day includes practical activities such as writing requirements, building traceability links, mapping system interfaces, conducting trade-off analysis, and preparing verification and validation plans.

The course also includes case studies from sectors such as aerospace, infrastructure, IT, energy, telecom, transport, and industrial engineering. These case studies help participants understand how systems engineering reduces technical failures, improves project outcomes, and supports better decision-making. The final workshop allows participants to apply the course concepts by preparing a practical systems engineering plan for a sample complex project.

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Course Toolbox:

- 1-week instructor-led training program
- Practical systems engineering exercises
- Requirements writing workshop
- System architecture and interface mapping activities
- Verification and validation planning exercises
- Case studies from engineering, IT, infrastructure, and technology projects
- Group discussion and technical review simulations
- Course workbook and reference materials
- Certificate of completion
- Optional end-of-course assessment

Course Agenda:

Day 1: Foundations of Systems Engineering

- **Topic 1:** Introduction to Systems Engineering and Complex Systems
- **Topic 2:** Systems Thinking and Whole-System Perspective
- **Topic 3:** Systems Engineering Life Cycle Models
- **Topic 4:** Stakeholder Needs and Mission Objectives
- **Topic 5:** Systems Engineering Processes and Deliverables
- **Topic 6:** Role of the Systems Engineer
- **Reflection & Review:** Review systems engineering fundamentals and life cycle roles.

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Day 2: Requirements Engineering and System Definition

- **Topic 1:** Stakeholder Requirements Elicitation
- **Topic 2:** Translating Needs into System Requirements
- **Topic 3:** Writing Clear and Testable Requirements
- **Topic 4:** Requirements Validation and Baseline Control
- **Topic 5:** Requirements Traceability and Change Control
- **Topic 6:** Common Requirements Failures
- **Reflection & Review:** Review requirements quality, traceability, and change control.

Day 3: System Architecture, Design, and Trade-Off Analysis

- **Topic 1:** Functional Analysis and System Decomposition
- **Topic 2:** Logical and Physical Architecture
- **Topic 3:** Interface Identification and Control
- **Topic 4:** Design Constraints and Technical Risks
- **Topic 5:** Trade-Off Studies and Decision Analysis
- **Topic 6:** Introduction to Model-Based Systems Engineering
- **Reflection & Review:** Review architecture, interfaces, and trade-off decisions.

Day 4: Integration, Verification, Validation, and Technical Reviews

- **Topic 1:** System Integration Planning
- **Topic 2:** Verification Methods and Techniques
- **Topic 3:** Validation Against Stakeholder Needs
- **Topic 4:** Test Planning and Acceptance Criteria
- **Topic 5:** Technical Reviews: SRR, PDR, CDR, TRR, FCA, PCA
- **Topic 6:** Defects, Nonconformities, and Corrective Actions
- **Reflection & Review:** Review integration, V&V, and technical review readiness.

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Day 5: Systems Engineering Management and Practical Application

- **Topic 1:** Systems Engineering Management Plan
- **Topic 2:** Risk, Configuration, and Interface Management
- **Topic 3:** Technical Performance Measures
- **Topic 4:** System Transition and Operational Support
- **Topic 5:** Lessons Learned from Complex Projects
- **Topic 6:** Final Workshop: Build a Systems Engineering Plan
- **Reflection & Review:** Review key lessons and finalize the systems engineering plan.

FAQ:

What specific qualifications or prerequisites are needed for participants before enrolling in the course?

Participants should have a basic understanding of engineering projects, technical systems, project life cycles, product development, IT systems, infrastructure, or operations. Prior experience in engineering, project management, system analysis, technical design, testing, integration, quality assurance, or product development is recommended but not mandatory. This course is suitable for professionals who work with complex systems and want to strengthen their knowledge of requirements, architecture, integration, verification, and validation.

How long is each day's session, and is there a total number of hours required for the entire course?

Each day's session is generally structured to last around 4–5 hours, including breaks, discussions, case studies, and practical activities. The total course duration spans one week, with approximately 20–25 hours of instruction.

How This Course is Different from Other Systems Engineering Courses:

This course is designed as a practical and complete introduction to systems engineering for professionals working on complex technical projects. It does not focus only on theory or project management; instead, it connects systems thinking with real engineering activities such as requirements development, architecture design, interface control, integration planning, verification, validation, and technical reviews.

The course is different because it gives participants a structured view of the full system life cycle, from stakeholder needs and mission objectives to system transition and operational support. It also includes practical workshops, case studies, and exercises that help participants apply systems engineering tools directly to real project situations.

The course is especially valuable for organizations that need to reduce technical risk, improve requirements quality, control interfaces, manage system complexity, and ensure that delivered systems meet operational needs.

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Training Course Categories

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- Agribusiness & Food Security Training Courses
- Aviation Management and Operations Training Courses
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- Communication and Public Relations Training Courses
- Crisis Management and Business Continuity Training Courses
- Data Analytics Training and Data Science Courses
- Digital Government & Public Service Training Courses
- Education and Learning Development Training Courses
- Environment & Sustainability Training Courses
- Facilities and Real Estate Training Courses
- Finance and Accounting Training Courses
- Governance, Risk and Compliance Training Courses
- Healthcare Management Training Courses
- Heritage Conservation and Museum Management Training Courses
- Hospitality and Tourism Training Courses
- Human Resources Training and Development Courses
- IT Security Training & IT Training Courses
- Leadership and Management Training Courses
- Legal Training, Procurement and Contracting Courses
- Maintenance Training and Engineering Training Courses
- Marketing, Customer Relations, and Sales Courses
- NGO, Humanitarian and Development Management Training Courses
- Occupational Health, Safety and Security Training Courses
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- Personal & Self-Development Training Courses

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- Shipping, Maritime and Ports Training Courses

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