Systems Engineering Certification Overview

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Christy Marzec

Source: http://www.incose.org/educationcareers/certification/
Introduction

Here’s what you’ll hear today …
An overview of the Systems Engineering Professional certification program by the International Council on Systems Engineering (INCOSE)

- Why INCOSE created the program
- What the benefits are
- How to get certified
- What to look out for (lessons learned)
What is Systems Engineering, anyway?

System Engineering is about seeing the bigger picture

- facilitating through process
- and inter-disciplinary involvement

.... to enable the realization of successful systems
What we envisioned .... isn’t quite what our customer wanted.
INCOSE’s mission is to

“Advance the state of the art and practice of systems engineering in industry, academia, and government”.
Setting the Standards

- International Council on Systems Engineering (INCOSE)
  - Improves systems engineering by creating a standard of measure of systems engineering capability
  - Since 2004, established a multi-level Professional Certification Program to provide a formal method for recognizing the knowledge and experience of systems engineers, regardless of where they may be in their career.
Benefits for You

- Formally recognizes your systems engineering capabilities
- Furthers your development as a systems engineer in the preparation for certification
- Participates in continuing education
- Provides a designation that can be a differentiator at your current job and future ones
- Is recognized across industry
Benefits for your company

- Certification provides an indicator of an individual's systems engineering capability as measured against a particular standard
- Establish a common systems engineering language
- A selling point and a discriminator for proposals
Office of the Under Secretary of Defense for Acquisition, Technology and Logistics - Systems and Software Engineering Website “What’s New” News Announcement:

- DoD Collaborates with INCOSE on New Certification Program for Systems Engineers Working on DoD Acquisition Programs (Posted Jul 2008)

Source: http://www.acq.osd.mil/sse/whatsnew/
More Citation...

- U.S. Department of Transportation Federal Highway Administration - Systems Engineering Guidebook for ITS Web Site:

  - Chapter 7: Capabilities and Best Practices in System Development

    - “Systems Engineering Technical Assistance [SETA] consultants or systems managers may not be currently considering any formal assessment to be performed. An internal assessment using continuous representation would be recommended. As an alternative, staff can demonstrate their expertise through professional certification programs like the INCOSE Certified Systems Engineering Professional [CSEP] and Project Management Institute [PMI] certification.”

Source: http://www fhwa dot gov/cadiv/segb/views/document/Sections/Section7/7.htm
How to get certified
Multi-Level Certification

Growth path

Certified Systems Engineering Professional (available since 2004)

Associate Systems Engineering Professional (available since 07/2008)

CSEP w/ US DoD Acquisition (available since 07/2008)

CSEP

ESEP

Expert Systems Engineering Professional (to be available in 2009)
Certification Requirements

Knowledge
- Pass exam

Experience
- Varies by level

Education
- Bachelors degree Or equivalent
- Or Substitute additional experience
Requirements

**Experience**
No experience or references required

**Education**
Minimum Bachelor's degree in a technical field

**Knowledge**
Pass Certification Examination (INCOSE SE Handbook v3.1)
Requirements:

Experience

Minimum of 5 years in multiple SE disciplines
SE References: Minimum of 3 advocates that recommend certification

Education

Minimum Bachelor's degree in a technical field or 10 years of experience with non-technical degree or 15 years of experience if no degree

Knowledge

Pass Certification Examination
(INCOSE SE Handbook v3.1)
Requirements:

Experience
- Minimum of 5 years in multiple SE disciplines
- SE References: Minimum of 3 advocates that recommend certification

Education
- Minimum Bachelor's degree in a technical field or 10 years of experience with non-technical degree or 15 years of experience if no degree

Knowledge
- Pass Certification Examination
  (INCOSE SE Handbook v3.1 and DoD Acquisition Guidebook Chapter 4)
**Requirements:**

- **Experience**
  - Minimum 20 years of significant SE experience with demonstrated accomplishments

- **Education**
  - Minimum Bachelor’s degree or equivalent in a technical field from an accredited institution

- **Knowledge**
  - Oral Presentation and Interviews (No Exam)

Note: Must be an INCOSE member
Application Process Option 1 (Sequential)

1. Submit Application
2. INCOSE Review Application
3. Pay test fee, Schedule and Take Test @ Prometric Test Center
4. Study INCOSE SE Handbook/DoD Acq Chp 4
Application Process Option 2 (Parallel)

1. **Submit Application**
2. **INCOSE Review Application**
3. **Study INCOSE SE Handbook**
4. **Pay test fee, Schedule and Take Test @ Prometric Test Center**
Application Components

- **Education**
  - Provide either a scanned copy of diploma or transcript

- **Experience**
  - List specific work experience
    - Specific type of SE discipline, duration and description of work
  - Max Depth: 3 years in any 1 area and 2 years in other areas
  - Max Breadth: 1 year in each of 3 areas and 2 years in other areas

- **References (Advocates)**
  - Current or former supervisors or coworkers (SE knowledgeable)
  - Cumulative coverage of the years of experience

- **Exam**
  - Computer-based test on the INCOSE Handbook / DoD Acquisition Guidebook Chapter 4

- **Fees**
  - Application and Exam fees vary by level and membership
Is there a TYPICAL SE?

- Systems Engineers come from all facets of engineering disciplines and provide a variety of functions.

Software  RF  Electrical  Mechanical

Planning  Requirements Analysis  Design  Test

...and more!
Applicable SE Experience

- SE Technical Disciplines
  - Design Development
  - Qualification, Verification, and Validation
  - Requirements Engineering
  - System Integration

- SE Management Disciplines
  - Baseline Control
  - Risk and Opportunity Management
  - Technical Effort Assessment
  - Technical Planning

- SE Support Disciplines
  - Process Definition
  - Quality Assurance
  - Specialty Engineering
  - Training
  - Tool Support
2.1 XYZ Program

- 2.1.1 Prepared systems engineering schedule, identified technical work required, expanded team from 5 to 12 members
  - (6 months at 50%) (Technical Planning = 3 months)

- 2.1.2 Defined, implemented and maintained program change control processes for both customer and program team. Chaired Change Control Board (CCB) meetings
  - (6 months at 50%) (Process Definition = 3 months)
  - (20 months at 20%) (Baseline Control = 4 months)
### Experience Summary Sample

<table>
<thead>
<tr>
<th>SE Work Areas</th>
<th>Total Months of Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical Planning</strong></td>
<td></td>
</tr>
<tr>
<td>1.4.3 (2), 2.1.1 (3) Total: 5 months</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>1.1.1 (6), 1.1.5 (4.8), 1.3.1 (2), 1.4.4 (3), 1.4.5 (2), 1.6.1 (10), 2.1.4 (12) Total: 39.8 months</td>
<td></td>
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<tr>
<td><strong>Baseline Control</strong></td>
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<tr>
<td>2.1.2 (4) Total: 4 months</td>
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<tr>
<td><strong>Technical Effort Assessment</strong></td>
<td></td>
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<tr>
<td>1.1.2 (1) Total: 1 months</td>
<td></td>
</tr>
<tr>
<td><strong>Architecture/Design Development</strong></td>
<td></td>
</tr>
<tr>
<td>1.1.3 (2), 1.1.4 (2), 1.4.1 (2), 1.4.4 (9), 1.6.2 (4), 1.6.3 (6), 2.1.5 (10), 2.2.1 (3), 2.3.1 (6), 2.3.2 (12) Total: 56 months</td>
<td></td>
</tr>
<tr>
<td><strong>Process Definition</strong></td>
<td></td>
</tr>
<tr>
<td>1.5.1 (6), 2.1.2 (3), 2.1.3 (4) Total: 13 months.</td>
<td></td>
</tr>
<tr>
<td><strong>Tool Support</strong></td>
<td></td>
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<tr>
<td>1.2.2 (1.6), 1.4.2 (1) Total: 2.6 months</td>
<td></td>
</tr>
<tr>
<td><strong>Training / Process Improvement</strong></td>
<td></td>
</tr>
<tr>
<td>1.2.1 (0.5), 1.6.6 (0.9) Total: 1.4 months</td>
<td></td>
</tr>
<tr>
<td><strong>Systems Integration</strong></td>
<td></td>
</tr>
<tr>
<td>2.3.1 (3) Total 3 months</td>
<td></td>
</tr>
<tr>
<td><strong>Specialty Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>1.6.4 (2), 1.6.5 (3) Total: 5 months</td>
<td></td>
</tr>
<tr>
<td><strong>Total for All Areas</strong></td>
<td></td>
</tr>
<tr>
<td>130.8 months</td>
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</tbody>
</table>
SE Certification: Exam Information

- Exam based on INCOSE SE v3.1 Handbook
- 120 questions in 2 hours
- Immediate Pass/Fail results provided
- 2 re-tests (3 tries total, each try at least 3 months apart) within one year of application submittal

- Same CSEP exam
- Plus 60 questions on DoD Acquisition Handbook Chapter 4 (additional 1 hour duration)
Sample Question 1

Which three of the following are approaches to handle risk: (7.17)

- Avoid the risk
- Challenge the risk
- Control the risk
- Hide the risk
- Transfer the risk
Sample Question 2

Which three of the following are basic test categories: (8.17)

- Development Test
- Acceptance Test
- Sample Test
- Qualification Test
- Unit Test
## Certification Fees

<table>
<thead>
<tr>
<th>Certification Level</th>
<th>Application Fees</th>
<th>Exam Fees per test taken</th>
<th>Renewal Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEP</td>
<td>$150</td>
<td>$80</td>
<td>$100</td>
</tr>
<tr>
<td>CSEP: Member</td>
<td>$300</td>
<td>$80</td>
<td>$100</td>
</tr>
<tr>
<td>CSEP: Non-member</td>
<td>$400</td>
<td>$80</td>
<td>$150</td>
</tr>
<tr>
<td>CSEP-Acq: Member</td>
<td>$350</td>
<td>$95</td>
<td>$125</td>
</tr>
<tr>
<td>CSEP-Acq: Non-member</td>
<td>$450</td>
<td>$95</td>
<td>$200</td>
</tr>
</tbody>
</table>
Life after certification…

What to do to maintain my Certification?

- Continue Professional Development
  - Professional Learning Activity
  - Professional Contributing Activity
- Maintain Professional Development Unit (PDU) Log
How to renew my certification?

- **ASEP**: Valid 5 years
- **CSEP**: Valid 3 years
- **CSEP (Acq)**: Renewed with CSEP

**Certification renewal Requirements:**

- Minimum of 120 Professional Development Units (PDUs)
- Renewal application and fee
- PDU log submittal
- Must renew prior to expiration; otherwise repeat the entire certification process
- Can carry forward maximum 30 “excess” PDUs
## PDUs for Certification Renewal

<table>
<thead>
<tr>
<th>Professional Learning Activity</th>
<th>PDU Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 College semester hour relevant to systems engineering</td>
<td>45 PDU</td>
</tr>
<tr>
<td>1 College quarter hour relevant to systems engineering</td>
<td>30 PDU</td>
</tr>
<tr>
<td>1 Continuing Education Unit (CEU) relevant to systems engineering</td>
<td>10 PDU</td>
</tr>
<tr>
<td>1 Professional Development Hour relevant to systems engineering</td>
<td>1 PDU</td>
</tr>
<tr>
<td>Professional Contributing Activity</td>
<td>PDU Credit</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1 hour of teaching of professional development coursework relevant to systems engineering</td>
<td>2 PDU</td>
</tr>
<tr>
<td>Authoring published papers, articles or books in any area relevant to systems engineering</td>
<td>10 PDU</td>
</tr>
<tr>
<td>1 hour of participation in professional and technical society working groups/management relevant to systems engineering</td>
<td>1 PDU</td>
</tr>
<tr>
<td>Patents in any area relevant to systems engineering</td>
<td>10 PDU</td>
</tr>
<tr>
<td>1 hour of professional development in coursework, seminars, or professional or technical presentation made at meetings, conventions, conferences, or exam preparation relevant to systems engineering</td>
<td>1 PDU</td>
</tr>
</tbody>
</table>
Lessons Learned

- Don’t underestimate the time it takes to do the application
  - Experience record in Application:
    - Detailed info to cover depth and width
    - Time-consuming to collate
  - Reference Endorsements
    - Contacting your references ahead of time to make sure they are willing to endorse
    - Have the time period covered

- Contact INCOSE to verify they have received your application and endorsements

- Study and read the Handbook thoroughly (and again right before the exam) – consider a study group

- During exam – go with your gut feeling!
SE Certification Links

- INCOSE Certification website

- How to Apply
  [http://www.incose.org/educationcareers/certification/howapply.aspx](http://www.incose.org/educationcareers/certification/howapply.aspx)

- Application form
  [http://www.incose.org/educationcareers/doc/Form_1.doc](http://www.incose.org/educationcareers/doc/Form_1.doc)
Certification is an accomplishment to be proud of.

Check it out…
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