STAFF SUMMARY SHEET

TO ACTION SIGNATURE (Surname), GRADE AND DATE
1 DFCS sig David Hadfield, 06/21/2012
2 DFER approve CIV 22 MAR 12
3 DFCS action Steve Hadfield
4
5

SURNAMES OF ACTION OFFICER AND GRADE
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SUSPENSE DATE

SUBJECT
Clearance for Material for Public Release

USAFA-DF-PA-201

DATE 20120321

SUMMARY

1. PURPOSE. To provide security and policy review on the document at Tab 1 prior to release to the public.

2. BACKGROUND.
   Author: Steve Hadfield
   Title: Integrating Security and Software Assurance Concepts and Mindsets in an Undergraduate Computer Science Curriculum
   Circle one: Abstract Tech Report Journal Article Speech Paper Presentation Poster
   Check all that apply (For Communications Purposes):
   
   [] CRADA (Cooperative Research and Development Agreement) exists
   
   [] Photo/Video Opportunities [] STEM-outreach Related [] New Invention/Discovery/Patent
   Description: Invited talk at the Software Assurance Forum, Mclean, VA
   Release Information:
   Previous Clearance information: (If applicable): N/A
   Recommended Distribution Statement: (Distribution A, Approved for public release, distribution unlimited.)

3. DISCUSSION. None.

4. VIEWS OF OTHERS. The Department Research Director has reviewed this paper and recommends it for public release.

5. RECOMMENDATION. Sign coord block above indicating document is suitable for public release. Suitability is based solely on the document being unclassified, not jeopardizing DoD interest, and accurately portraying official policy.

STEVEM. HADFIELD
Associate Professor

1 Tab
Presentation for approval

AF IMT 1768, 19840901, V5
PREVIOUS EDITION WILL BE USED.
Integrating Software Assurance and Secure Programming Concepts and Mindsets into an Undergraduate Computer Science Program

Striving to Achieve the Goals of the SEI/CERT Software Assurance Curriculum Project (Undergraduate)

Steve Hadfield
U.S. Air Force Academy, Department of Computer Science

Realization

In an outcome-based curriculum, some outcomes need to be purposefully developed across courses and years.

Result

A retrospective, outcome-based look at an existing curriculum (Felder & Brent)
Key Cross Curricular Initiative

| Software Engineering Discipline | • Needs Analysis, Requirements Elaboration, Design  
|                                | • Testing Rigor, Quality Assurance |
| Ethical, Legal, Social Issues  | • Moral Frameworks & Decision Making  
|                                | • Ethical Codes (IEEE, ACM, Software Engineering) |
| Research Skills                | • Literature Review, Framing/Scoping Topics, Hypotheses  
|                                | • Investigation, Support of Conclusion, Reporting |
| Communications Skills          | • Oral Presentations  
|                                | • Written Communications |
| Team Work                      | • Team Building, Team Maintenance  
|                                | • Pair Programming, Four-Five Member Team Dynamics |
| Security & Software Assurance  | • Secure Programming  
|                                | • Cyber Security |

Security & Software Assurance

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<th>SEI/CERT SwA Curriculum</th>
<th>USAFA Computer Science</th>
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<td>Computer Science I</td>
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Security & Software Assurance Initiative

Sophomore Year

- Computer Science I - Intro to Programming
  - Input interpretation validation, array bounds checking
  - Integer overflow, error/exception handling, file I/O issues

- Computer Science II - Data Abstraction
  - Pre- and post-conditions, more advanced debugging
  - Testing & debugging techniques, reinforce CS I topics

- Computer Organization & Architecture
  - Data type overflow, divide-by-zero, round-off error
  - Stack overflows

Security & Software Assurance Initiative

Junior Year

- Programming Paradigms
  - Memory allocation/deallocation, termination conditions
  - Stack/buffer overflows and protections, type safety

- Operating Systems
  - Deadlock issues, race conditions, system calls
  - Signals, file system security

- Databases & Web Programming
  - Defense against SQL injection attacks
  - Cross site scripting attacks

- Networks
  - Secure protocols, wireless encryption, Man-in-the-Middle attacks
  - Adversarial view of protocols, network access control
Security & Software Assurance Initiative
Senior Year

- Languages & Machines (compilers & language theory)
  - Type checking mechanisms, array bounds checking mechanisms
  - Translation to machine language

- Computer Security & Information Warfare
  - Security & threat models
  - Range of security strategies and techniques

- Software Engineering I
  - Security requirements, security analysis of system design, risk management
  - Formal test plans, procedures, reports
  - Integration, system, regression, smoke, stress, security testing

- Software Engineering II
  - Introduction to Formal Methods
  - Reengineering & forward engineering

Software Assurance & Security for ALL

Algorithmic Reasoning

- Input Validation
- Exception Prevention
- Requirements Analysis
- Incremental Build/Test

Cyber Security

- Information Security
- Cryptography
- Cyber Warfare & Crime
- Offensive Cyber Ops
- Defensive Cyber Ops
Enrichment Activities
Interdisciplinary Courses

- Cyber Law
- Cyber Security Policy & Politics
- Information & Cyberspace Operations

Enrichment Activities
Defensive Competitions

- Cyber Patriot: www.uscyberpatriot.org
- www.nationalcsdc.org/
- Collegiate Cyber Defense Competition
- Cyber Defense Exercise
Vectors

Professionals
- Comp Sci, Info Sys, Info Tech, MIS
- Curricular & pedagogical resources

General Awareness
- Personal awareness & defense
- Bigger issues – enterprise, national, global

Specialization
- Defense is the 'hard job'
- Funding for developing experts

Questions?

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