

GSwE2009: A New Set of Guidelines for Graduate Software Engineering Education

Mark Ardis
Stevens Institute of Technology
mark.ardis@stevens.edu

Massood Towhidnejad
Embry-Riddle Aeronautical University
towhid@erau.edu

Shawn Bohner
Rose-Hulman Institute of Technology
bohner@rose-hulman.edu

Art Pyster
Stevens Institute of Technology
arthur.pyster@stevens.edu

Dick Fairley
Software Engineering Management
Associates
dickfairley@gmail.com

Abstract

A new set of curriculum guidelines for graduate software engineering education has recently been published. In this panel those guidelines and two supporting companion reports will be presented to faculty interested in creating new programs or improving existing programs. Faculty who attend the panel will learn how to use the recommended curriculum architecture to customize their programs to meet their needs.

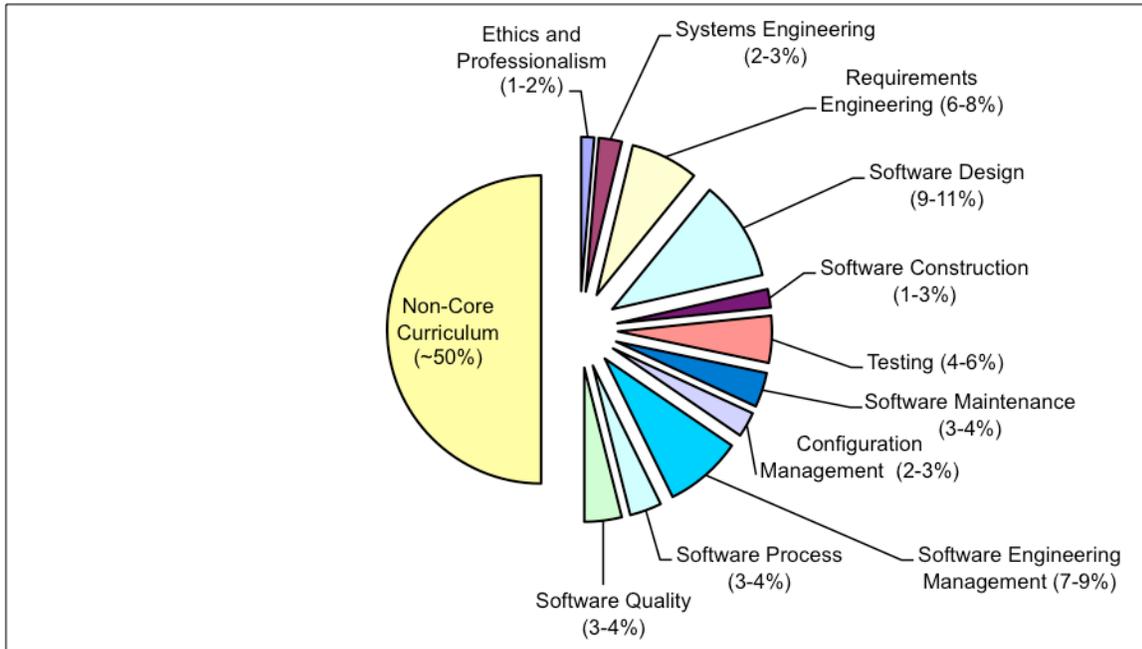
Panel Topics

Recently a coalition from academia, industry, government and professional societies published *Graduate Software Engineering 2009 (GSwE2009): Curriculum Guidelines for Graduate Degree Programs in Software Engineering* [GSwE2009]. An international cross-section of universities and companies helped build the model curriculum, which incorporates valuable feedback received from over 100 external reviewers. The last time such a comprehensive set of recommendations was released was in 1989 [Ardis and Ford 1989], when the Software Engineering Institute released curricular guidelines that were adopted by several universities across the country.

The ACM and the IEEE Computer Society have both agreed to sponsor the maintenance and evolution of *GSwE2009*. Additional support is being provided by the International Council on Systems Engineering (INCOSE), the U.S. National Defense Industrial Association (NDIA) Systems Engineering Division, and the Brazilian Computer Society (BCS).

Highlights of *GSwE2009* include: (1) a set of outcomes to be fulfilled by a student who successfully completes a graduate program based on the curriculum, (2) a set of student skills, knowledge and experience assumed by the curriculum as a starting point for the curriculum's outcomes, (3) an architectural framework to support implementation of the curriculum, and (4) a description of the fundamental or core skills, knowledge and experience to be taught in the curriculum to achieve the outcomes.

A core body of knowledge (CBOK) for the curriculum was developed from the Software Engineering Body of Knowledge (SWEBOK). It is expected that approximately half of a master's degree should consist of coursework covering CBOK. The remainder of the program should be devoted to electives, application domain courses and project work:

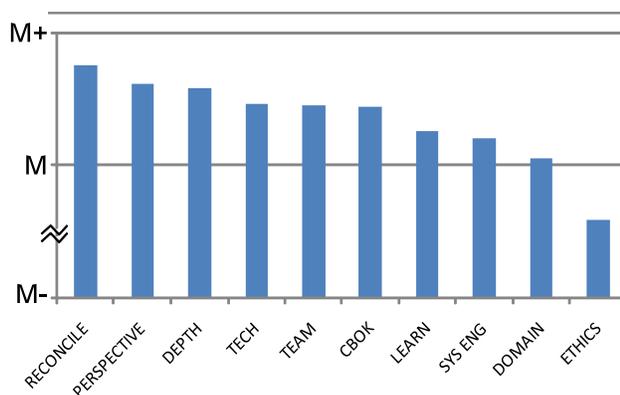


Two companion reports have been published to assist schools in using the guidelines. One report [GSWE2009 FAQ] answers frequently asked questions about implementation of graduate software engineering programs. The other report [GSWE2009 Comparison] provides a comparison of current programs to the *GSWE2009* guidelines. Both reports are available from the GSWE2009 website: www.gswe2009.org/

The comparison report describes work performed in collaboration with representatives of twelve software engineering programs, nine from North America. The focus was on comparison of the ten *GSWE2009* outcomes with the expected outcomes currently attained by up to three diverse, hypothetical, but typical, students from each program.

By the GSWE2009 guidelines, the programs examined clearly do a reasonable job of satisfying the outcomes to a “Medium” level, at least for the typical students described.

Average Outcome Fulfillment



Audience

This panel should be of interest to faculty who teach in graduate software engineering programs or wish to do so. We expect that attendees will span a broad spectrum of experience in this area. Indeed, we hope that the panel will provide a useful forum for discussions of best practices in graduate software engineering education and strategies for implementation of such programs.

Activities

This panel will provide an overview of *GSwE2009* and the two companion reports. A new graduate software engineering program that used *GSwE2009* in its planning and implementation will also be described. Audience members will participate in several ways: (1) by providing more questions and answers to implementation issues for graduate software engineering programs, (2) by providing useful feedback about the analyses of current programs and their relationship to *GSwE2009*, (3) by providing suggestions for more participation in the comparison survey, (4) by testing our assumptions about the expected backgrounds of students who enter this type of program, (5) by confirming (or rejecting) the standards for graduating student achievements that have been recommended in *GSwE2009* (6) by confirming (or rejecting) our claims that the curriculum architectural framework can be easily adapted to meet the needs of different types of programs.

In addition, we hope to engage audience members in a discussion of our plans for two workshops to be held in the summer of 2010. One workshop will assist faculty participants in the creation and implementation of new or modified graduate software engineering programs consistent with the *GSwE2009* recommendations. A second workshop will help department heads and other important university stakeholders learn what steps and resources are needed for the creation, maintenance and support of such programs.

The panelists have extensive and varied experience in software engineering practice, education and research; and they have all contributed to the effort to create *GSwE2009*.

Panelists

Mark Ardis (moderator) is a Distinguished Service Professor at Stevens Institute of Technology.

Shawn Bohner is a Professor of Computer Science and Software Engineering at Rose-Hulman Institute of Technology.

Position Statement: Rose-Hulman Institute of Technology's Department of Computer Science and Software Engineering is launching a new master's degree in software engineering in the Spring of 2010. The degree builds upon our undergraduate software engineering program and incorporates the *GSwE2009* guidelines, targeting largely working software professionals. Incorporating systems engineering into the curriculum provides a valuable edge for our students as the landscape of software systems increasingly entails interdisciplinary, model-based solutions rendered on hybrid computing platforms (e.g., traditional, parallel, reconfigurable, distributed).

Richard E. (Dick) Fairley is the founder and principal associate of Software Engineering and Management Associates, a training and consulting company.

Position Statement: The implementation Frequently Asked Questions (FAQs) for *GSWE2009* provide paired questions and answers for those contemplating implementation of graduate programs in software engineering and, in particular, for those contemplating adoption of the *GSWE2009* guidelines. Topics addressed by the current version of the FAQs include Planning, Internal Communication, Acquiring Resources, External Communication, Implementation/Execution, and Program Evolution. An overview of the FAQ volume will be presented and additional questions and answers that address implementation issues will be solicited from the attendees of the workshop.

Art Pyster is a Distinguished Research Professor at Stevens Institute of Technology and the Deputy Executive Director of the Systems Engineering Research Center.

Position Statement: Graduate education in software engineering has suffered from a lack of commonality in core knowledge that all programs teach and from a disregard for the increasingly tight coupling between systems engineering and software engineering. *GSWE2009* directly addresses both problems and should be a boon to students and employers throughout the world as graduate programs adopt it.

Massood Towhidnejad is a Professor of Software Engineering at Embry-Riddle Aeronautical University.

Position Statement: In the current version of the companion document, twelve universities have each conducted a comparison between their current graduate software engineering curriculum and the *GSWE2009* guidelines. As part of this comparison, they have evaluated the competence of their students as it relates to each outcome, and measured the difference between the time they entered the program and the time of their graduation. In this panel, we present an analysis of the data to date; we also discuss the support mechanism that is available for schools that are interested in conducting such comparisons.

References

[Ardis and Ford 1989]

M. Ardis and G. Ford, *SEI Report on Graduate Software Engineering Education*, CMU/SEI 89-TR-21, Software Engineering Institute, Carnegie Mellon University, June 1989.

[GSWE2009]

Graduate Software Engineering 2009 (GSWE2009): Curriculum Guidelines for Graduate Degree Programs in Software Engineering, Stevens Institute of Technology, September 2009, www.gswe2009.org.

[GSWE2009 Comparison]

Comparisons of GSWE2009 to Current Master's Programs in Software Engineering, Stevens Institute of Technology, November 2009, www.gswe2009.org.

[GSWE2009 FAQ]

Frequently Asked Questions on Implementing GSWE2009, Stevens Institute of Technology, November 2009, www.gswe2009.org.

[SWEBOK]

P. Bourque and R. Dupuis (Eds.), *Guide to the Software Engineering Body of Knowledge*, IEEE Computer Society Press, 2004.