Graduate Reference Curriculum for Systems Engineering (GRCSE)

NDIA, October 27, 2011

Dr. Dave Olwell; Dr. Art Pyster; Dr. Alice Squires;
Dr. Richard Freeman; Dr. Timothy Ferris

Authors of GRCSE

- 18 of the BKCASE authors
- Tim Ferris, UniSA, lead author
- Rick Adcock, John Brackett, JJ Ekstrom, Richard Freeman, Tom Hilburn, Nicole Hutchison, Peter Jackson, Naohiko Kohtake, Steven Mitchell, Dave Olwell, Daniel Prun, Art Pyster, Seiko Shirasaka, Alice Squires, Guilherme Travassos, Mary Van leer

Why GRCSE?

- Enable program developers and maintainers world-wide to improve existing graduate programs in SE from the viewpoint of universities, students, graduates, employers, and systems customers and users;

- Assist the development of new master's SE programs by providing guidelines on curriculum content and advice on how to implement those guidelines;

- Provide a framework to guide the deliberations of strategic advisory boards established to assist universities in the appropriate design of their programs;

- Support increased enrollment in SE programs by increasing the value of those programs to potential students and employers; and

- Assist in understanding the diversity of available SE educational programs and to assist prospective students and employers in gauging the suitability of a particular program for their individual purposes.

What is in GRCSE?

- ***Guidance for Constructing and Maintaining the Reference Curriculum:*** the fundamental principles, assumptions, and context for the reference curriculum authors

- ***Entrance Expectations:*** what students should be capable of and have experienced before they enter a graduate program

- ***Outcomes:*** what students should achieve by graduation

- ***Architecture:*** the structure of a curriculum to accommodate core material, university-specific material, and elective material

- ***Core Body of Knowledge:*** material that all students should master in a graduate SE program

Not specific courses. Not specific packaging. Adaptation and selective adoption expected and encouraged.

Scope
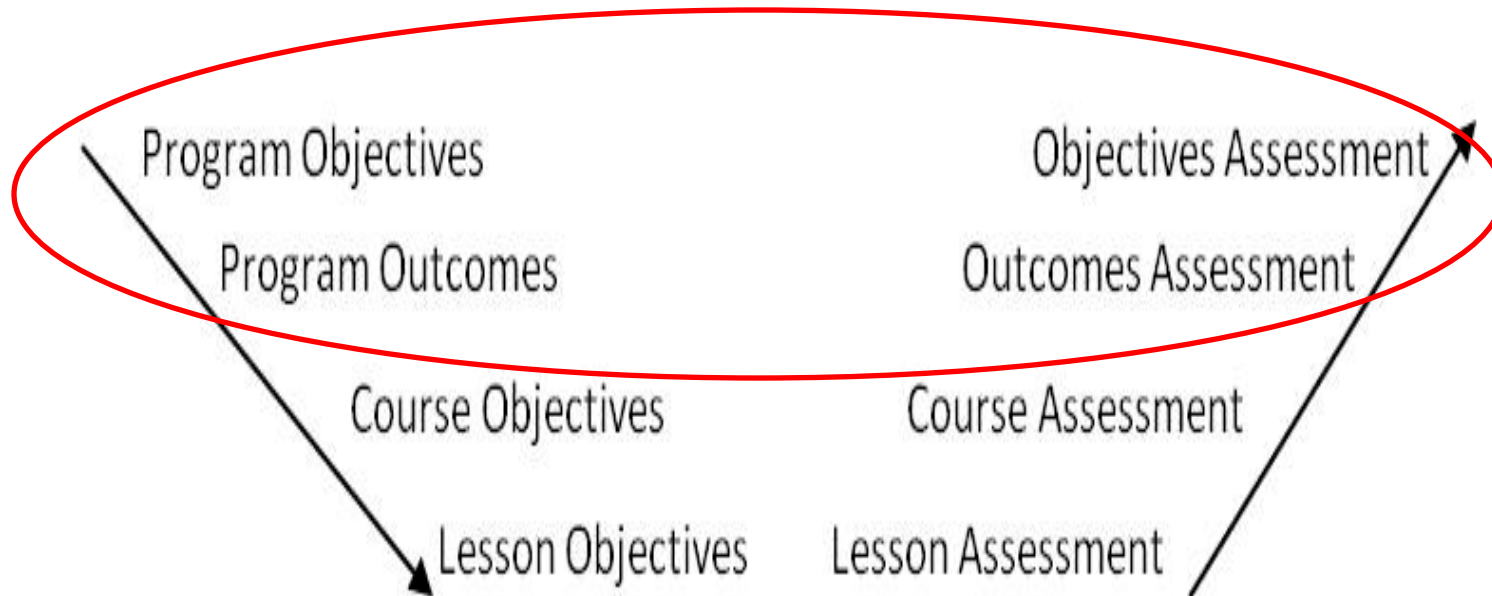
GRCSE Structure (V0.5)

Chapters

1. Introduction – explaining the foundations of GRCSE

2. Guiding principles – underlying principles

3. Objectives – description of the expected level of attainment of graduates 3-5 years after graduation. This results from education and experience together.

4. Outcomes – levels of attainment of graduates at the time of graduation. Directly linked to the education experience.

5. Entrance expectations – knowledge assumed of entrants to the program

GRCSE Structure (V0.5)

Chapters

6. Architecture – the design framework of the curriculum, to include core and specialization related materials.

7. CorBOK – the core body of knowledge, which is required of all graduates of any relevant program and graduates of particular specializations. This is expressed as levels of achievement using Bloom's taxonomy of educational outcomes.

8. Assessment - guidance to educators as to how to assess students as achieving course outcomes and for how to evaluate programs as effective in meet their goals.

9. Future maintenance – plans for maintaining GRCSE into the future.

GRCSE Structure (V0.5)

Appendices

1. Survey of existing programs.

2. Bloom's taxonomy - a guide to how Bloom's taxonomy has been used in GRCSE.

3. Mapping of CorBOK and outcomes.

4. Assessment – background information for chapter 8.

5. Competency based curriculum – discussion of issues in designing curriculum to achieve certain competencies.

6. Use cases and examples – use cases and examples provided to assist users in how to use GRCSE.
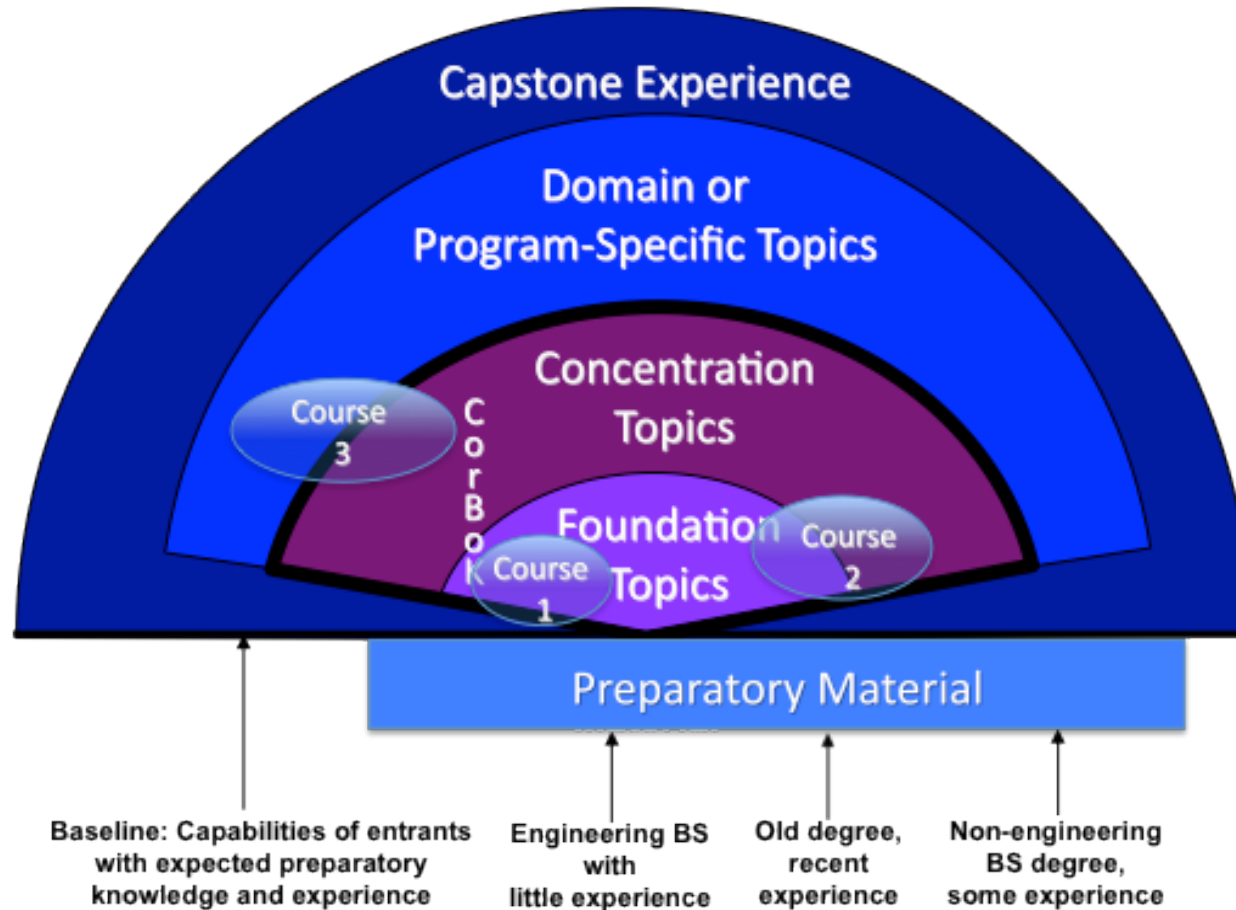
Not all paths considered…
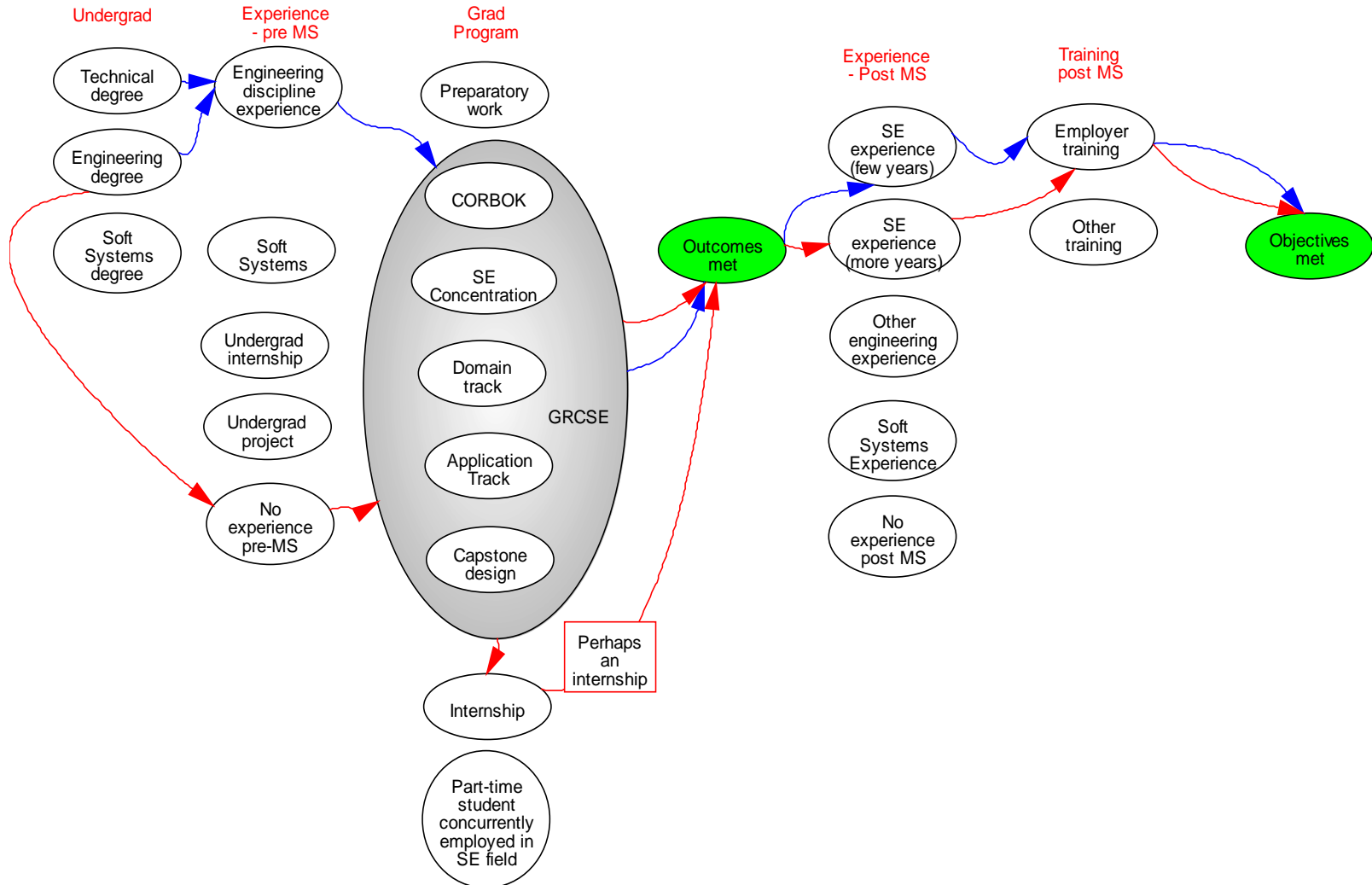
Architecture Graphic

Concentration areas

- Allows depth in SE areas
- Two initial concentration areas proposed: systems design and development, and systems engineering management.

CORBOK

- For each topic in the SEBOK, corresponding Bloom's level set.

- Constrained by design to half the time in a graduate program:

  – Balance is for specialization in domain, application, and depth.

  – Roughly 200 class contact hours

Table organization

Knowledge Area	Topic	SEBoK Part			%
		Foundation	SEM	SDD	%
These fields are cross-references to SEBoK Knowledge Areas and Topics.		Bloom level to be attained in foundation topics	Bloom level to be attained in concentration topics	Bloom level to be attained in concentration topics	% time to focus in each knowledge area for CorBoK

Representative entry

Part 2: Systems					
Knowledge Area	**Topic**	**Foundation**	**SEM**	**SDD**	**%**
Systems Overview	Topic: What is a System?	Comprehension			
	Topic: System Context	Comprehension			
	Topic: Overview of System Science	Comprehension			3%
	Topic: Systems Thinking	Comprehension			

Conclusion

- Version 0.50 will be released in December for world-wide review. Your feedback is invited.

- Version 1.0 will be released in December 2012.

- Stewardship of GRCSE will pass to INCOSE and IEEE-CS.

SEBoK 0.5 Wiki Outreach Sessions

- To help orient the community to the wiki delivery of the SEBoK, the BKCASE team has planned 3 outreach sessions
- Sessions will provide participants with:
  - An overview of the SEBoK
  - Instructions on the spirit and mechanics of review
  - An opportunity to ask general questions regarding the SEBoK
- Sessions to be held Nov 7-9
- For additional details or to register for a session, please email bkcase@stevens.edu