NSF-CRCD: Combined Research and Curriculum Development in Information-Centric Systems Engineering

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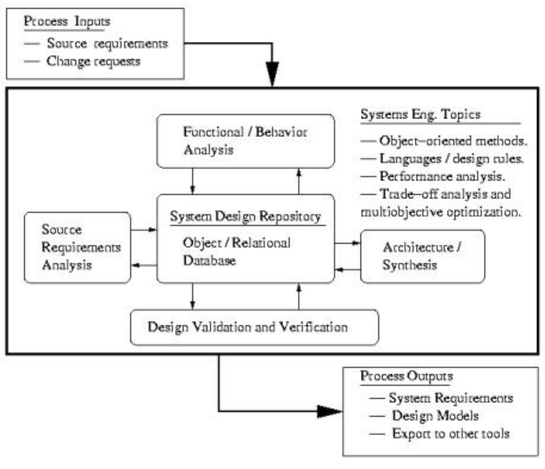
Challenges Ahead for Systems Engineering

Research and education in systems engineering is critical because of: (1) rapid changes in technology; (2) market pressures for fast time-to-market; (3) increasing pressure to lower costs; (4) increasing higher performance; (5) increasing complexity of systems and products; (6) increased presence of embedded information and automation systems, and (7) failure due to a lack of systems engineering. The key challenges addressed by this research include:

- Synthesis from modular components.
- Support for team development.
- Growing importance of information driven systems.
- Large volumes of heterogeneous data.

Elements of Information-Centric Systems Engineering

Our Vision. Our vision for systems engineering research and education lies in the use of information representations, models, and advanced techniques for manipulating information. The adjacent figure shows the activities and processes that will be important to "Information-Centric Systems Engineering."



Key Technical Areas. Object modeling of systems; system requirements and specification; trade-off analysis; validation and verification; object-relational databases.

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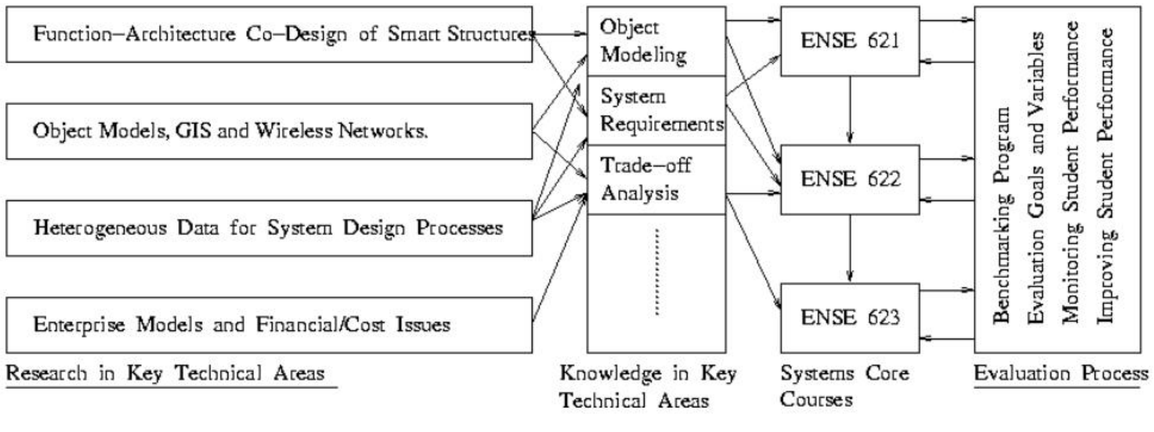
Linking Key Technical Areas and Methodologies in Curriculum Development

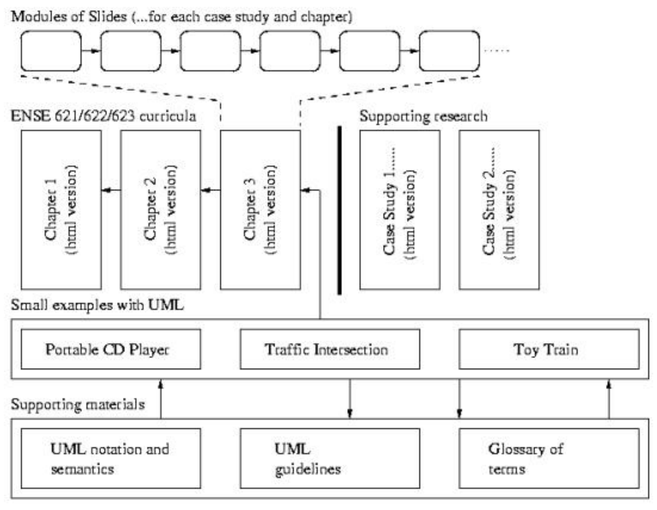


Systems Engineering Core Curricular

- **ENSE 621 : Systems Engineering Modeling and Analysis.** Students learn how to articulate and refine the goals of a complex engineering system through use cases, scenarios, and requirements generated by scenarios. This lead to simplified models of system structure, system behavior, measures of effectiveness and trade-off analysis.
- **ENSE 622: Systems Engineering Requirements, Design and Trade-Off**. Students learn about requirements engineering, requirements traceability, interface- and component-based design, and methods for decision and multi-objective trade-off analysis.
- **ENSE 623: Systems Validation and Verification**. This course will explore the benefits of making validation and verification an integral part of system design.

Web-Based Architecture for Presentation of NSF-CRCD Content

Large quantities of curricular materials are organized into a layered approach for teaching object modeling of systems with UML. The framework includes: low-level support materials for UML notation and semantics, small examples for how UML can be used to describe small systems, detailed tutorial materials for class handout, and slide presentations linked into the lower-level content.



Click-and-Drop Editor for Web-based Systems Engineering