Engineering Systems Doctoral Seminar ESD.83-- Fall 2009

Class 13
Faculty: Chris Magee and Joe Sussman
"Guest": Professor Magee

Class 13 overview

- ☐ Welcome, Overview and Introductions (5 min.)
- ☐ Dialogue with Prof. Magee (45 min)-- Redaction provided by Don MacKenzie
- ☐ Discussion of ESD.83 faculty-provided theme-related paper led by Fernando de Sisternes (approximately 30 min)
- ☐ Break and student evaluations (30 minutes)
- ☐ ESD.83 Integration and Wrap-up (Sussman/Magee)
- ☐ Next Steps-- Party (tonight) and Individual Interviews (tomorrow)

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Class 13, December 9, 2009 Integration and Wrap-up

☐ BRIEF review of learning summaries

☐ Discussion--Some "big questions"-- we'll get to as many as we can…..

Learning Summary-- Macro categories

- ☐ Individual conceptual transformation
- ☐ Learning as a social process
- ☐ Engineering Systems as a field of study
- ☐ Representations, models, frameworks and methods
- ☐ Transition to dissertation research

Some repeating themes

- ☐ Prof. Little-- his insights about modeling-- balancing simplicity and completeness (aka abstractness vs. detail)
- ☐ Historical roots assignment
- ☐ The micro-macro question (the impact of micro actions on macro behavior)
- ☐ Boundaries (aka demarcation)
- ☐ The taxonomy of descriptive, normative, prescriptive
- ☐ The importance of being stupid

Some repeating themes II

- ☐ The induction/deduction cycle
- ☐ Observations/data--what is our laboratory?
- ☐ Snow (the person, not the weather--or the colloquial term)
- ☐ Visualization
- ☐ Is there something fundamentally new in ES? What is our identity?

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"Big Questions" about the ESD dissertation

- ☐ The ESD dissertation
  - ■ What is the difference between an ESD dissertation and a high-end McKinsey consulting report?
  - ■ What makes a dissertation appropriate (or inappropriate) for ESD?
  - ■ How does the choice of dissertation topic differ, depending on if I am going to pursue an academic or non-academic path beyond the doctorate?

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More Big Questions

- ☐ What came first, the problem or the method?
- ☐ What is "rigor"?
- ☐ What are "predictive" models?
- ☐ What might the field of engineering systems evolve to by 2020?
- ☐ How might one use the 5-step (Magee) research process
  - ■ If thesis is about design of something
  - ■ Or the current understanding is only qualitative
  - ■ Or observation opportunity is limited
  - ■ Is it possible to be cumulative?

A Research Process 3

1. Development of conceptual understanding (qualitative framework)
2. Development of quantitative model
3. Observe (system)
4. Analyze observations
5. Generalize or simplify/complicate model
- ☐ Research styles (1,2,3,4,5 repeat; 1,3,5 repeat; 1/3, 2/4, 5/1; 3, 4, 1, 2; etc.)
- ☐ Are there "not so good" styles?

Learning objectives

- ☐ Basic Literacy
- ☐ Inter-disciplinary capability
- ☐ Historical roots
- ☐ ES and observations, data sources and data reduction
- ☐ Critical analysis
- ☐ Links across domains
- ☐ Scholarly Skills
- ☐ Social Objectives

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More Learning objectives-- after the fact

- ☐ A style of thought and approach
- ☐ A respect for the views of others
- ☐ The art of constructive criticism
- ☐ Recognizing there can be value even in flawed work
- ☐ Learning the value of historical narrative and the value of scenarios, a narrative of the future

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My Favorite Quotes of the Semester I

☐ The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. (Anderson, More is Different)

My Favorite Quotes of the Semester II

☐ The key point is that we are increasingly building engineered systems, that because of their inherent complexity have the potential for behaviors that are impossible to predict in advance... it isn't just hard; it isn't a question of taking more into account or thinking more deeply-- it is impossible to predict all of their behaviors (Wulf, Great Achievements and Grand Challenges)

That's all, folks!

See you tonight and tomorrow

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