CESUN Directors Roundtable

2nd International Engineering Systems Syposium

The Emerging Field of Engineering Systems: Achievements & Challenges

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Overview

- Challenges
- Characteristics
- Competencies
- Education
- Needs

- Rouse, Engineering Complexity
  Educating Designers of Complex Systems

Challenges

1. Energy
2. Water
3. Food
4. Environment
5. Poverty
6. Terrorism & War
7. Disease
8. Education
9. Democracy
10. Population

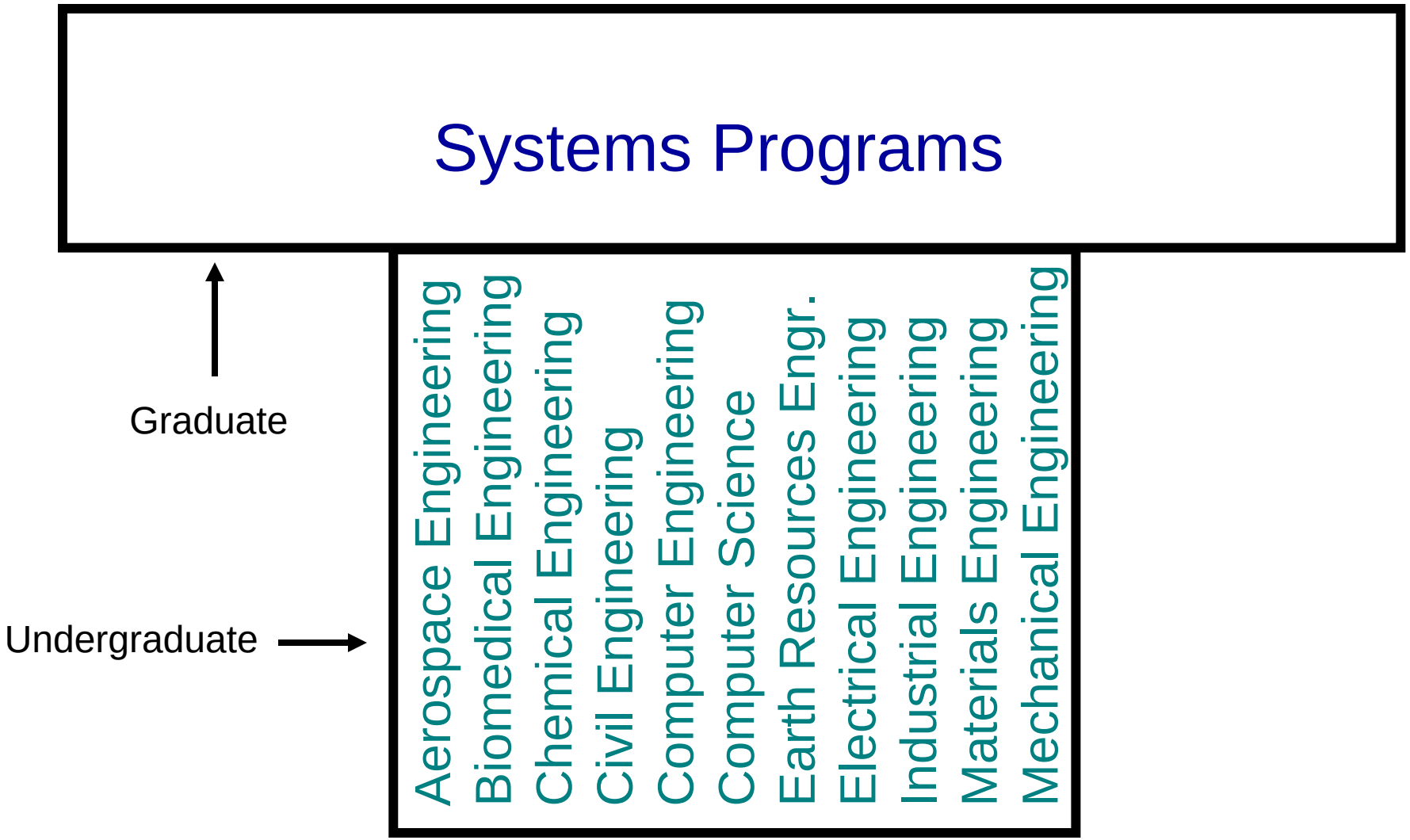
Characteristics

- Large-scale
- Multi-stakeholder
- Multi-attribute
- Public-private
- Adaptive
- Multi-agent
- Complex information sharing

Competencies

- Systems thinking
- Modeling, simulation & visualization
- Economic modeling & investment analysis
- Human & organizational systems
- System architectures
- Information systems
- Work & value processes
- Innovation & entrepreneurship
- Integration & evaluation

Interdisciplinary T



Systems Education

- Systems in undergraduate engineering
  - Surveyed all offerings
  - Systems thinking
  - Modeling, simulation & visualization
  - Economic modeling & investment analysis
  - Human & organizational systems
- Systems in graduate engineering
  - Surveyed all offerings
  - Much greater diversity than at undergrad level
  - MS in Enterprise Systems
  - PhD in Systems Science & Engineering

MS in Enterprise Systems@GT

- Systems Thinking - Formulating & Solving the Real Problems
- Enterprise Systems - Modeling, Simulation & Visualization of Complex Systems & Networks
- System Economics - Financial Modeling, Investment Analysis & Decision Making
- Enterprise Transformation - Understanding Organizations, Leading & Managing Change
- System Architecture - Analysis & Design of Enterprises for Delivery of Products & Services
- Enterprise Information Systems - Enterprise Agility, Data Mining & Business Intelligence
- Value Chain Management - Delivering & Managing the Flow of Value
- Enterprise Innovation - Collaboration, Entrepreneurship & Intrapreneurship
- Design & Management of Transformation Initiatives
- Transformation Project

PhD in Systems Sci. & Engr.@GT

- Theoretical Foundations of Systems Science & Engr
- Systems Modeling – From Biology to Economies
- Human & Organizational Systems
- Object-Oriented Modeling of Complex Systems
- Architectures – From Information Systems to Enterprises
- Stochastic Processes & Optimization
- Simulation – Event-Based, System Dynamics & Agents
- Statistical Modeling & Data Mining
- Decision Theory & Decision Support
- Economic Modeling & Financial Engineering

What Is Needed?

- Integrated program design
- Multi-disciplinary teaching teams
- Professors of Practice – inclusion of deep domain expertise
- Experiential learning
  - Internships in industry & government
  - Systems prototyping

Summary

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