Keywords: Systems Engineering, Continuing Education, Asynchronous learning, online courses, virtual laboratory

george.bollas@uconn.edu
Phone: 860-486-3355
http://www.utc-iase.uconn.edu/

Industry-focused curriculum in Model-Based Systems Engineering

George M. Bollas

UTC Institute for Advanced Systems Engineering

University of Connecticut

UTC Institute for Advanced Systems Engineering
UNIVERSITY OF CONNECTICUT

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Why?

The mission of the UTC-IASE curriculum is to train the engineer of the next decade: the one who is not constrained by disciplines, bridges the gap between theory and application in the field of systems engineering and can transform and disrupt industrial engineering practices. The UTC-IASE program of UConn aims to produce these “2020 engineers” at a substantial capacity by adoption of a bold, scalable, interdisciplinary, and modular approach to graduate STEM education that focuses on the application of theory, modern computational methods, state-of-the-art software tools on complex industrial systems.

Objectives:

- Merge concepts, principles and language across STEM disciplines (Electrical, Mechanical, Environmental, Chemical, Statistics and Mathematics)
- Align graduate education with research on systems engineering
- Follow a modular and individualized methodology to curriculum offering, by expanding upon multimedia-based curriculum dissemination methods exercised in a variety of industry-inspired application examples
- Outreach to globally distributed students in partnership with industry to engage a large population of students and professional engineers
- Create evidence-based, experiential education artifacts in educational projects that promote team learning, problem solving, interaction and collaboration.

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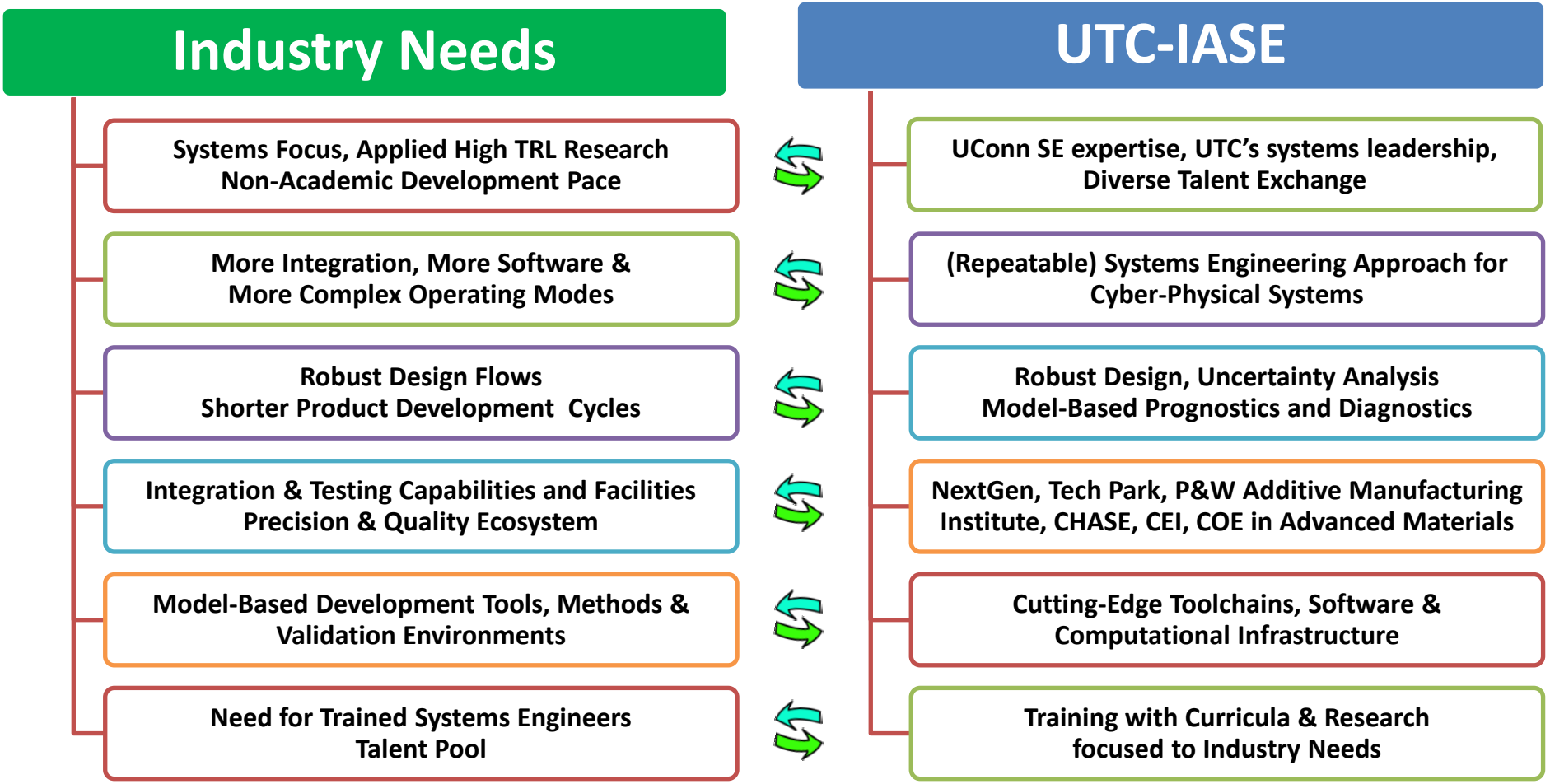
How?



Industry- Driven/Oriented/Focused/Engaged

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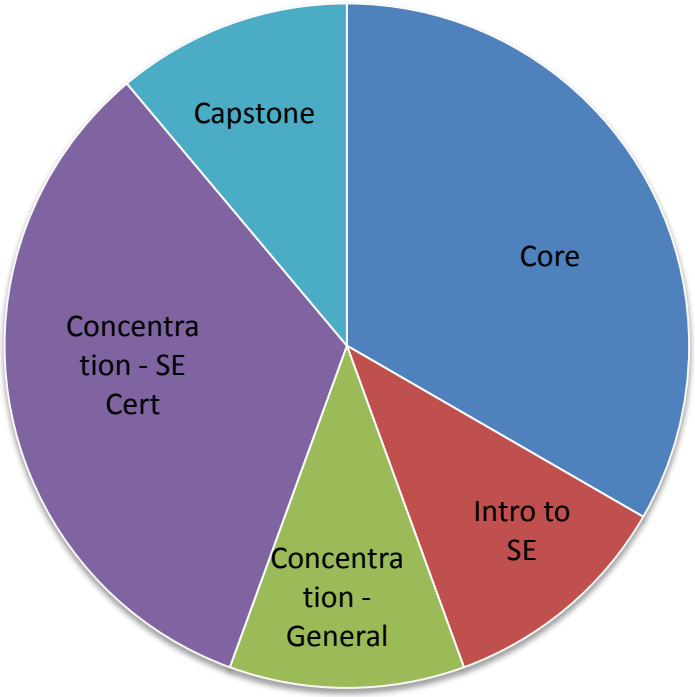
When?

Master of Engineering and Certificate Programs in Advanced Systems Engineering

Running since 2014
Open to professional engineers and UConn graduate students



System Design	Controlled Systems	Embedded Systems
SE5101: Foundations of Physical Systems Modeling		SE5301: Embedded/ Networked Systems Modeling Abstractions
SE5102: Uncertainty Analysis, Robust Design and Optimization	SE5202: Foundations of Control	SE5302: Formal Methods
SE5103: Design Flows for Robust Design	SE5203: Design Flows for Control and Verification	SE5303: Design Flows for Embedded/Networked Systems
SE5195: Capstone Project	SE5295: Capstone Project	SE5395: Capstone Project

History:

- 8 courses
- ~ 15 capstone projects
- ~ 15 professionals / certificate
- ~ 50 students / year
- ~ 15 Instructors

Future:

~ 30 PhD students / year
~ ?00 online students / year
~ 100 professionals/BU/yr

coursera

IACET AUTHORIZED PROVIDER

"*The graduate certificate program at UCONN provided design techniques and tools that I did not have and that became useful to me in my job now. It also gave me the opportunity to apply what I learned in a hands-on fashion with real project work—this deepened my learning of the subject matter.*"

Earl Lavallee
(UTAS employee)

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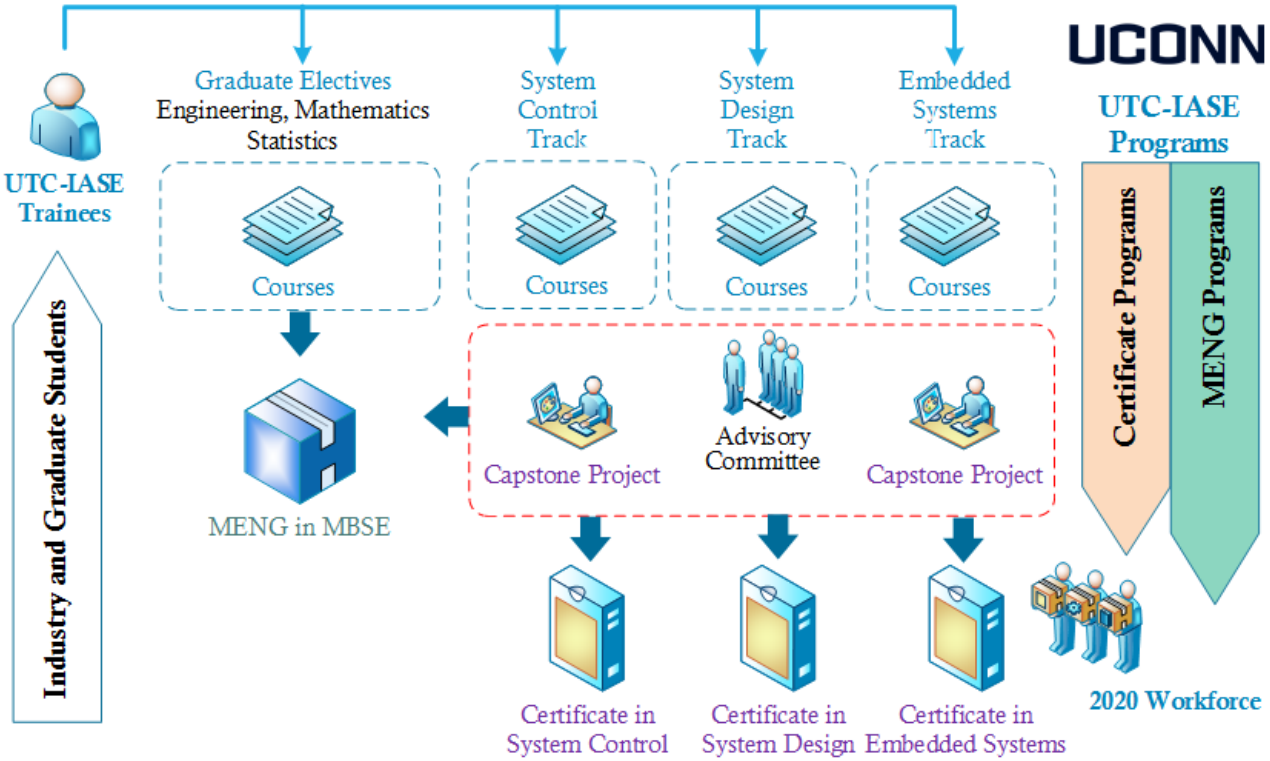
Where?

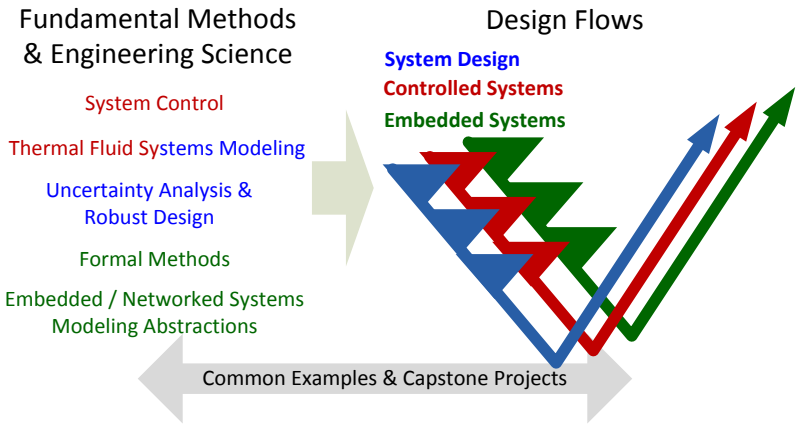
3 UConn Certificates

- System Control
- System Design
- Embedded Systems

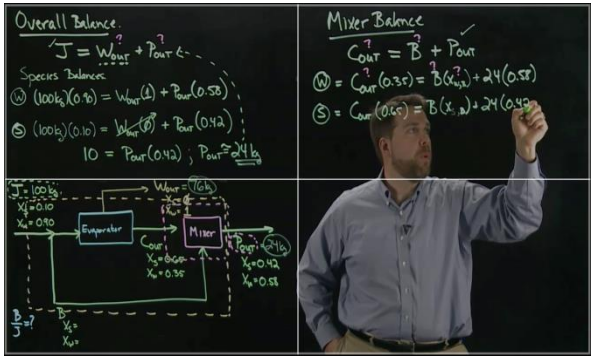
Extension to MEng Program

Shared co-advised Capstone Design Project





- Asynchronous
- Online
- Modern
- Engaging
- Feasible



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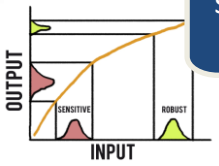
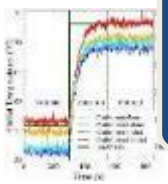
What?

ADVANCED SYSTEMS ENGINEERING

CHALLENGES	COMPONENTS
increasing complexity and reliance on software	modeling, model-based analytical tools and techniques
increasing extensibility (systems evolve)	platform-based, modular, extensible architectures for products
variability in manufacture and environment (wider supplier base, expanding operational envelopes)	robust design
operational reliability	prognostics and diagnostics





Advanced Systems Engineering brings together model based engineering and interdisciplinary themes into a requirements and architecture centric environment where new levels of systems understanding can be achieved

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What?

- Requirements Formalization
- Model Abstraction & Model Checking
- Formal Methods & Control Logic
- System Modeling Language
- Requirements Modeling
- System Life Cycle Analysis
- Computer Architecture

Requirements
Formalization
Architecture

Modeling
Simulation
Verification

- High-fidelity Modeling & Model Reduction
- Machine Learning
- Robust Design under Uncertainty
- Model Checking
- Thermal/Mechanical/Electrical Systems
- Cyber-Physical Systems
- Robotics

Uncertainty
Anomaly
Diagnostics

Optimization
Control
Supervision

- Embedded Systems
- Distributed Sensor Networks
- Smart Grid Security
- Fault Detection & Isolation
- Data- & Physics-Based Diagnostics
- Error Propagation & Impact Analysis
- Data & Video Analytics

- Buildings & HVAC Systems
- Aerospace Systems
- Additive manufacturing
- Resilient & Robust Control Design
- Supervisory & Model-Predictive Control
- Fault Accommodation & Reconfiguration
- Information Fusion & Sensor Selection

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Prognosis?

- Impact Documentation
  - University SETs
  - Monthly Surveys
  - Student Testimonials
  - Industry Management Feedback
- Scale-up planned through offering at 3 levels
  - MEng Program and Certificates
  - MOOCs
  - Customized (applied) Industry short course series
- What challenges are you currently facing?
  - Balancing workload expectations and requirements
- What advice would you like from others at FOEE?
  - Commonality in Industry needs and gaps?
  - How to balance workload while sufficiently train engineers?