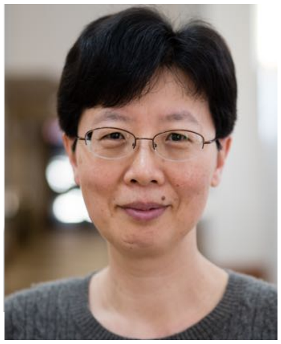
# CHEMICAL ENGINEERING

SEMINAR SERIES




## JIN WANG

**Monday, May 08, 2017**

Walt & Virginia Woltosz Professor,
Chemical Engineering
Auburn


# Systems Engineering Approaches to the Study of Complex Biological Systems and Industrial Processes


**ABSTRACT:** Biological systems and large-scale industrial processes share many similarities at the systems level: they both consist of many individual components; they both have built-in feedback control/regulation mechanisms; and the properties of the overall systems are determined by the complex interaction among different components. Their complex nature makes the integrative systems approaches essential in understanding, controlling and optimizing these systems. As a result, many process systems engineering principles and techniques have been extended into the emerging field of systems biology.

However, despite their commonalities at the system level, large-scale industrial processes and biological systems have their unique characteristics and challenges that existing systems approaches cannot fully address. In this talk, our most recent progress in two research areas (metabolic network modeling and process systems engineering) will be presented. For biological systems, one specific challenge we aim to address is how to effectively utilize genome-scale metabolic network models (GEM) (e.g., how to extract biologically meaningful information from them). The solution we developed is a system identification based approach where we use the GEM as a high fidelity simulator to conduct optimally designed in silico experiments. We will use a xylose fermenting yeast, scheffersomyces stiptis, as the model system to illustrate our developed approach. For large-scale industrial processes, one of our focuses is process monitoring. The specific challenge we aim to address is how to effectively handle process nonlinear dynamics, non-Gaussianity, frequent process changes driven by manufacturing on-demand, without the heavy computational burden of available nonlinear methods. The solution we developed is a new multivariate statistical process monitoring framework named statistics pattern analysis (SPA) and we will use the benchmark Tennessee Eastman Process to demonstrate the effectiveness of the new framework.

**BIOGRAPHY:** Dr. Jin Wang is Walt and Virginia Woltosz Endowed Professor in the Department of Chemical Engineering at Auburn University. She obtained her BS and PhD degrees in chemical engineering (specialized in biochemical engineering) from Tsinghua University in 1994, and 1999 respectively. She then obtained a PhD degree (specialized in control engineering) from the University of Texas at Austin in 2004. From 2002 to 2006 she was a development engineer and senior development engineer at Advanced Micro Devices, Inc. During her tenure at AMD, her R&D yielded 13 patents granted by USPTO. In addition, she received several high profile corporate awards for being instrumental in developing effective advanced control solutions.
Dr. Wang joined Auburn University in 2006 as B. Redd Assistant Professor. She was promoted to Associate Professor in 2011, and full professor in 2016. The central theme of her research is to apply systems engineering, in particular, control engineering principles and techniques to understand, predict and control complex dynamic systems, including both industrial processes and microbial organisms. Her current research focus is metabolic network modeling and analysis, as well as the validating experimental research. Her research is funded by various US federal and state funding agencies including NSF, USDA, Department of Education and Department of Transporation, as well as private foundations.

**RECEPTION 3:30 • LECTURE 4:00 – 5:00**
**PHYSICS ASTRONOMY BLDG. PAA A118**

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