SoTeRiA
Socio-Technical Risk Analysis

NPRE 498/598:
ADVANCED RISK ANALYSIS

CREDIT
3 undergraduate hours / 4 graduate hours

PREREQUISITES
- **Undergradute:** NPRE 498-PR1 Probabilistic Risk Assessment or NPRE 498-RA1 Intro to Socio-Technical Risk Analysis or Permission of the Instructor.
- **Graduate:** Graduate class standing.

INTRODUCTION
It offers a comprehensive and in-depth review of advanced methods for Probabilistic Risk Analysis (PRA). Topics include:

- Fundamental theories of risk modeling
- Risk scenario development
- Model uncertainty
- Parameter uncertainty
- Uncertainty propagation (e.g., Method of Moment, Monte Carlo)
- Bayesian updating

- Data analysis
- Hardware reliability
- Human error modeling
- Risk importance ranking
- Precursor analysis
- Expert elicitation and aggregation
- Next generation PRA methods and tools

Software codes for risk analysis, uncertainty treatment, and Bayesian analysis will be utilized.

MULTIDISCIPLINARY AUDIENCE
While the examples will primarily focus on the nuclear power domain, the course will also cover current advancements in risk analysis of other complex systems (e.g., chemical processing, space, aviation, civil infrastructure, healthcare, and oil and gas).

MEETING SCHEDULE & LOCATION
Tu. and Th. 1:30 - 3:20pm; Fall 2015
100H Talbot Laboratory

GRADING
- **Undergraduate:** Homework (35%), Midterm exam (30%,), Final exam (35%), Term Project (optional; for extra credit).
- **Graduate:** Homework (20%), Midterm exam (20%), Final exam (25%), Term project (35%).

READING MATERIALS
- A set of notes, slides, reports, and articles
- Modarres, M., 2006, Risk Analysis in Engineering: Techniques, Tools, and Trends, Taylor & Francis
- Bedford, T., Cooke, R., 2001, Probabilistic Risk Analysis: Foundations and Methods, Cambridge University Press
- Lee, J., McCormick, N. 2011, Risk and Safety Analysis of Nuclear Systems, John Wiley & Sons

INSTRUCTOR BIO: Zahra Mohaghegh is currently an Assistant Professor in the Department of Nuclear, Plasma, and Radiological Engineering (NPRE) and an affiliate to the Department of Industrial and Enterprise Systems Engineering, Beckman Institute for Advanced Science and Technology, Graduate School of Library and Information Science, and Illinois Informatics Institute at the University of Illinois at Urbana-Champaign. She is a recipient of the 2015 Dean's Award for Excellence in Research from the College of Engineering, the George Apostolakis early-career award in risk assessment, and the Zonta International Award for her contribution to modeling large-scale complex systems. Professor Mohaghegh is the director of the Socio-Technical Risk Analysis (SoTeRiA) laboratory (http://soteria.npre.illinois.edu) at UIUC. Her areas of research include: Probabilistic Risk Assessment; Probabilistic Physics of Failure; Big Data Analytics for Risk Assessment; Systems Reliability; Predictive Causal Modeling of Failure Mechanisms; Risk-Informed Decision Making and Regulation; Human Reliability; and Organizational Influences on Technical System Risk.

SOTERIA.NPRE.ILLINOIS.EDU