Spring 2020

SoTeRiA
Socio-Technical Risk Analysis

NPRE 561:

Advanced Risk Analysis for Technological Systems

Credit

4 graduate hours

Prerequisites

Any one of the following courses: NPRE 461, NPRE 457, CEE 491, SE 411. Or equivalent background in Probability and Statistics.

Introduction

It covers advanced topics of Probabilistic Risk Assessment (PRA) and Risk Management such as:

- Fundamental Theories of Risk Modeling
- Risk Scenario Development
- Precursor Analysis
- Uncertainty Modeling
- Common Cause Failures
- Bayesian Analysis
- Human Reliability Analysis
- Expert Elicitation and Aggregation
- Simulation-Based PRA
- Probabilistic Physics of Failure
- Bayesian Belief Network
- Homogeneous & Non-Homogeneous Data Analysis
- Risk-Informed Regulation

*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

MW 10:00 - 11:50 AM - Spring 2020
203 Transportation Building

Grading

Homework (25%), Participation and Quizzes (10%), Take-Home Midterm Exam (15%), Take-Home Final Exam (20%), Term Project (30%).

Reading Materials

- A set of slides, reports, and articles
- Modarres, M., 2006, Risk Analysis in Engineering: Techniques, Tools, and Trends, Taylor & Francis

Instructor Bio

Zahra Mohaghegh is currently an Assistant Professor in the Department of Nuclear, Plasma, and Radiological Engineering and an affiliate to the Department of Industrial and Enterprise Systems Engineering, Beckman Institute for Advanced Science and Technology, Graduate School of Information Science, Computational Science and Engineering, and the Illinois Informatics Institute at the University of Illinois at Urbana- Champaign (UIUC). She serves as the Principal Investigator of a National Science Foundation (NSF) grant (2015-2020) for big data analytics in PRA, a Department of Energy (DOE) Nuclear Energy University Program (NEUP) grant (2017-2020) for Enterprise Risk Management (ERM), and a second DOE NEUP grant (2019-2022) for advancing the Integrated PRA (I-PRA) algorithm for the deployment of new technologies. She also serves as a Chief Scientific Investigator and representative of the United States for the International Atomic Energy Agency (IAEA) Coordinated Research Project (2018-2021) for assessing pipe failure rates in advanced water-cooled reactors. Dr. Mohaghegh was the recipient of the 2016 American Nuclear Society Mary Jane Oestmann Professional Women's Achievement Award, the 2016 Engineering Council Award for Excellence in Advising, the 2015 Dean's Award for Excellence in Research, the George Apostolakis early-career award in risk assessment, and the Zonta International Award for her contribution to modeling large-scale complex systems. Dr. Mohaghegh is the director of the Socio-Technical Risk Analysis (SoTeRiA) laboratory (http://soteria.npre.illinois.edu) at UIUC and can be reached by email at zahra13@illinois.edu.

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