NPRE 461
PROBABILISTIC RISK ASSESSMENT

CREDIT

3 undergraduate hours / 4 graduate hours
* Counted as a Technical Elective in NPRE & several Departments

PREREQUISITES

MATH 241 (or equivalent). Credit or concurrent registration in STAT400 (or equivalent) is recommended. This course is a prerequisite for "NPRE561: Advanced Risk Analysis for Technological Systems" course offered in Springs.

INTRODUCTION

This course covers multidisciplinary theories and techniques of risk, safety, and reliability of complex systems. It encompasses state-of-the-art methodologies in Probabilistic Risk Assessment (PRA). Topics include:

➢ Probability and Statistics for Risk Analysis
➢ Systematic Risk Scenario Modeling
➢ Hardware Reliability Modeling in Risk Analysis
➢ Bayesian Analysis
➢ Uncertainty Analysis
➢ Human Error Modeling in Risk Analysis
➢ Failure Causal Modeling
➢ Risk Importance Ranking
➢ Data Analytics
➢ Risk-Informed Regulation
➢ Treatment of Failure Dependencies

* Software codes for risk analysis will be utilized for assignments.

MULTIDISCIPLINARY AUDIENCE

Probabilistic Risk Assessment provides input for risk-informed decision-making for design, operation, and regulatory oversight in diverse high-consequence industries such as nuclear power, aviation, space, chemical processes, oil and gas, healthcare.

MEETING TIME & LOCATION

TR 2:00 PM - 3:20 PM; FALL 2021
Location: The course is offered both online and in-person (at 2036 Campus Instructional Facility).

GRADING

- Undergraduate (Section PR1): Homework (40%), Take-Home Midterm Exam (25%), Take-Home Final Exam (35%), Term Paper (optional; for extra credit).
- Graduate (Section PR4): Homework (30%), Take-Home Midterm Exam (20%), Take-Home Final Exam (30%), Term Paper (20%).

READING MATERIALS

- A set of slides, reports, and articles.
- Mohammad Modarres, Mark P. Kaminskiy, and Vasiliy Krivtsov, "Reliability Engineering and Risk Analysis: A Practical Guide, Third Edition", CRC Press Taylor & Francis Group, 2016.

INSTRUCTOR BIO:

Zahra Mohaghegh is an Associate Professor in the Department of Nuclear, Plasma, and Radiological Engineering (NPRE) and an affiliate with the Beckman Institute for Advanced Science and Technology, Graduate School of Information Sciences, and the Illinois Informatics Institute at the University of Illinois at Urbana-Champaign (UIUC). Dr. Mohaghegh is a member of the Board of Directors of the International Association for Probabilistic Safety Assessment and Management (IAPSAM). She established the Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory (http://soteria.npre.illinois.edu/) at NPRE to advance risk science and applications. SoTeRiA is a multidisciplinary research laboratory that has a proven track record of developing scientific and innovative approaches for risk assessment, risk management, and risk-informed policy making and regulation. SoTeRiA's research contributes to improving safety in technological systems such as commercial nuclear power plants while reducing the cost of operations.