

Course Syllabus: PPD 587 – Fall2024

Risk Analysis (4 Units)

Catalogue Description

Concepts of risk analysis, risks in engineered systems, environmental risks, security risks, methods of risk analysis, fault trees and event trees, quantification of probabilities, use of data, models, and expert judgments; risks and decisions, interlinking risk analysis with risk management; applications to homeland security decisions.

Instructor – Ali R. Nowroozi, Ph.D.

Office: N/A
Office Hours: Thursdays 5:00 pm to 6:00 PM (in person, with appointment),
or any other time with appointment (on Zoom)
e-mail: nowroozi@usc.edu

Class Time and Location

Class Time: Thursdays 6:00 pm to 9:20 PM
Location: Dr. Joseph Medicine Crow Center– Room 154 ([DMC154](#))

Readings

I will provide selected readings and handouts for the course. For the first class, please skim through the following three handouts posted on the first session module on the course site (Bright Space):

- 1.1. “*Probabilistic Risk Analysis*” in the book by Bedford and Cook.
- 1.2. “*Fukushima accident was preventable*” - Costas Synolakis & Utku Kanoglu
- 1.3. “*Lessons from Risk Analysis: Terrorism, Natural Disasters, Technological Accidents*”

We will revisit all three in the next few sessions. So, no need to read them in detail at this point. You just want to get the big picture and better understand the objectives of this course and our approach to learning them.

Overview

This class is an introduction to risk analysis in several fields, including engineering risk analysis, environmental risk analysis, financial risk analysis, health risk analysis, and terrorism risk analysis. Many examples come from the environment, sustainability, and security areas. Students will be introduced the concepts and methods of risk analysis and to software tools and procedures that help the implementation of risk analysis. Students will also learn how to strategize and lead a team of professional to apply risk analysis in real world settings by conducting a risk analysis project in teams. The projects are typically selected by the team members and can be either retrospective (e.g. the Fukushima Accident case) or prospective (e.g. effectiveness of a certain borders security improvement initiative). A list of potential projects will be discussed at the 3rd session.

Objectives

- Understand the basic concepts of risk analysis and the relationship between probability theory and modeling, risk analysis, and decision analysis
- Understand how to use probability, probabilistic modeling and probabilistic simulation for risk analysis
- Learn how to use the basic tools of risk analysis – fault trees, event trees, decision trees, influence diagrams, and probabilistic simulation
- Learn how to use basic software tools of risk analysis – TreePlan; Sensit, SimVoi, and Crystal Ball
- Learn how to use expert judgment in risk analysis
- Understand the issues of using risk analysis in decision making, especially in regulatory settings
- Understand risk management, including risk communication, implementation, and monitoring of risk management strategies

Class Format

The class will be primarily in an interactive lecture format, mixed with selected in-class exercises. Students are expected to have completed the readings (usually one or two papers) prior to the class for which they are assigned. In addition, small groups of students will conduct a risk analysis project and present progress reports throughout the class. The last class will be devoted to final presentations of the projects, which will be considered as your final exam. There are no exams in this course. An optional final exam opportunity may be provided for students who want to improve their grades.

Assignments and Grades

Grades will be assigned based on the following breakdown:

| Mode of effort / Evaluation | Assignment Deliverables | Total Points | Points Breakdown |
|---|--|--------------|------------------------|
| Individual / Individual | homework & Case Studies | 50 | 5 @ 10 points each* |
| Small Team / Group | Presentations (intro, progress, final) | 30 | 3 @ 10 points each |
| <u>In</u> Class / <u>In</u> Team individual | Participation (class & project) | 20 | Instructor's judgement |

The final letter grade will be based on your total point score both in absolute terms (out of 100) and in terms of the rank of a student's scores in the class.

** The 5th assignment will be optional and, if you choose to take it, will only improve your grade. If you do not take it, your total homework & Case Studies grade will be rescaled by a factor of 50/40 = 1.25*

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Class Schedule

| DATE | TOPIC | ASSIGNMENTS | ASSIGNMENTS DUE |
|---------------------------------|---|---------------|-----------------|
| Session #1: Aug 29 | Introduction, class overview, Risk Analysis, and its brief history. Real life examples and application in different industries | | |
| Session #2: Sep 05 | Identifying risk; types of risk models, different “trees”, from “possibilities” to “Probabilities” | Assignment #1 | |
| Session #3: Sep 12 | Review case studies as examples Term Project explanation | | |
| Session #4: Sep 19 | Brief Review of Probability and Statistics | | Assignment #1 |
| Session #5: Sep 26 | Decision and event tree approaches to risk analysis; examples, software packages | Assignment #2 | |
| Session #6: Oct 03 | Teams’ Presentations: Term project Proposals | | Assignment #2 |
| No Session Oct. 10 - Oct. 11 | FALL RECESS | | |
| Session #7: Oct 17 | Probability distributions; discrete and continuous | Assignment #3 | |
| Session #8: Oct 24 | Dealing with multiple criteria, sensitivity analysis | | Assignment #3 |
| Session #9: Oct 31 | Introduction to Probabilistic Simulation, fitting distributions, modeling dependencies | Assignment #4 | |
| Session #10: Nov 07 | Presentation of projects: Progress & Results | | Assignment #4 |
| Session #11: Nov 14 | Risk assessment in a social context, risk governance | Assignment #5 | |
| Session #12: Nov 21 | Real Life Applications – Possible Guest Talk | | |
| Session #13: Nov 28 | Real Life Applications – Possible Guest Talk | | Assignment #5 |
| Session #14: Dec 05 | Final Presentations | | |
| No Session Dec, 06 – Dec. 10 | STUDY DAYS | | |
| DEC. 12, 2024 | Official Final Exam Date (Optional Exam) In Accordance with USC Final Examinations Schedule Guideline: https://classes.usc.edu/term-20243/final-examinations-schedule/ | | |

Disability Services and Programs Statement

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered by DSP to me as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. – 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Academic Integrity Standards

Students are required to review USC's academic integrity standards in the SCAMPUS (www.usc.edu/departments/publications/SCAMPUS/gov). Violations of any of the academic integrity standards set by the University can have serious consequences.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

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Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. dps.usc.edu