

15.731 JA26 – Risk Management – Course Syllabus

Time:

January 9, 2026: 8:30 a.m. – 11:45 a.m.

January 9, 2026: 1:00 p.m. – 4:00 p.m.

January 10, 2026: 8:30 a.m. – 11:30 a.m.

January 10, 2026: 1:00 p.m. – 4:00 p.m.

Instructor:

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Teaching Assistant:

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Course Description:

Uncertainty and risk-management present fundamental challenges to managers and firms. Typically, firms have to manage various types of risk, particularly financial (e.g., asset allocation) and operational (e.g., supply chain and project management). This short course aims to expose students to several core analytical models and tools to identify, think about, analyze and manage risk. In particular, we shall discuss how to apply these concepts and tools in various real-life settings and application domains (e.g., data rich environments, financial markets, supply chains, natural disasters, healthcare and cybersecurity). The course will consist of four modules of approximately 2-4 hours each:

I. Operational Risk Management of Large Systems: Frameworks, models and mental pitfalls

In this module we will present a general framework to think about and manage operational risks within complex large systems. We will discuss its application in several different settings, such as natural disasters, financial operational risk, supply chain, and safety and quality control. In addition, the module highlights some common mental traps that could lead to major systematic risk management failures. Finally, we shall discuss the challenge of managing low-probability, high-impact risks.

Readings & Prep:

Students are expected to be *ready to discuss* in class the readings mentioned below:

- Barings Collapse (A): Breakdowns in Organizational Culture & Management, Harvard case
- Operational Risk Management, Mark D. Abkowitz (Wiley), Chapter 16: Hurricane Katrina

II. Systemic Risk Management in the COVID-19 pandemic

In this module we will address various issues related to measuring and assessing individual and systemic (population) risk through a discussion of public health policies during the COVID-19 pandemic. Among others, the module will highlight the importance of choosing the right risk metrics, measurement and cognitive biases and potential conceptual traps in understanding risk and assess the effectiveness of different risk mitigation strategies.

Readings & Prep:

Students are expected to be **ready to discuss** in class the readings mentioned below:

- **(Required)** Age-stratified infection fatality rate of COVID-19 in the non-elderly population by Pezzullo AM, Axfors C, Contopoulos-Ioannidis DG, Apostolatos A, Ioannidis JPA. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9613797/>
- **(Required)** Serious adverse events of special interest following mRNA COVID-19 vaccination in randomized trials in adults by Fraiman J, Erviti J, Jones M, et al. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9428332/>
- **(Optional)** Flaws and uncertainties in pandemic global excess death calculations by Ioannidis JPA, Zonta F, Levitt M. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10404446/>

Please prepare the question below before class:

- 1) Which of the following countries, US, UK, Germany, and Sweden, managed the COVID pandemic better? (You can add other countries that you feel did relatively well!)

Please prepare ONE of the questions below before class:

- 2) What metrics should guide the government management of a pandemic such as COVID-19? How well can they be measured?
- 3) What are relevant metrics to evaluate the risk-benefits of the COVID-19 vaccines? How well can they be measured?

III. Cybersecurity Risk Management

In this module we will discuss several new concepts and trends related to assessment of cybersecurity risks and related mitigation strategies. The module will be based on case studies and ongoing MIT research.

Readings:

Students are expected to be *ready to discuss* in class the readings mentioned below:

- Cyber Breach at Target (HBS Case) by Suraj Srinivasan, Lynn S. Paine, Neeraj Goyal
- The C-Suite and IT Need to Get on the Same Page on Cybersecurity

IV. Supply Chain Risk Mitigation Strategies

In this module we will discuss major risk domains that are typical to global systems/value chains, as well as some fundamental mitigation strategies. Through several short case studies, we will demonstrate the value of supply chain risk analytics and several risk management strategies and concepts (e.g., capacity planning, pooling, flexibility, sensing of irregular operations and multi-sourcing). We will also discuss various risk sharing and risk management strategies with partners, suppliers and contractors in the value chain. Examples from various industries, such as tech, retail, pharmaceutical and food will be discussed.

Readings:

Students are expected to be *ready to discuss* in class all of the readings mentioned below:

- Nissan Response to the COVID-19 Pandemic (HBS case) by Ananth Raman, William Schmidt and Ann Winslow
- http://www.cisco.com/c/dam/en_us/solutions/industries/docs/manufacturing/Cisco_Case_Study_AMR_10-0917.pdf

Upload to the course Canvas site by Friday, January 9, at 6:00 p.m. ET a 1-2 page analysis of one of the following questions:

- 1) What are the principles and key elements in Nissan's response to the COVID-19 Pandemic? Assess its effectiveness.
- 2) What are the principles of Cisco's approach to managing risks from their supply chains? What types of risks does it aim to monitor and mitigate?

V. Developing Personal Risk Management Playbook and Course Wrap-up

In this module the students will work in teams to develop a personal list of action items related to risk management in their current or future jobs.

Assignments:

For pass/fail:

- 1) Students are expected to read the mandatory pre-readings and are encouraged to read the other optional readings.
- 2) Students are expected to come prepared to class (see readings above) and be active and productive participants.
- 3) Each student should answer the assigned question in Module II and **submit the answers by Thursday, January 8, at 6:00 p.m. ET.**
- 4) Each student should answer the assigned question in Module IV and **submit the answers by Friday, January 9, at 6:00 p.m. ET.**

Optional:

After the course:

By **Sunday, February 1, at 5:00 p.m. ET** submit electronically a report of at most 6 pages (not including appendices) that describes analysis of a work-related risk management challenge demonstrating application of some of the concepts taught in the class. Those who are interested in this option should reach out to the instructor before the end of the course.

Grading:

P/D/F

Prerequisites:

It is highly recommended that students have taken 15.060/15.730 (Data, Models and Decisions) and either 15.734 or 15.761 (OPS Management). Exceptions can be made if students have sufficient prior knowledge. (We recommend that you contact the instructors if you are not sure whether you have the appropriate background.) In particular, some of the concepts that will be used in class are basic concepts in probability including conditional probability, queuing, linear and nonlinear optimization, pooling and process analysis.