RUTGERS
Rutgers Business School

26:711:555 Stochastic Programming
Fall 2026, Wed. 12—2:50
1WP-502

Office hours: Livingston & online

Dr. Andrzej Ruszczynski
100 Rockefeller Rd, room 5182
Livingston Campus
rusz@rutgers.edu
www.rusz.rutgers.edu

Course Description

This course covers the modeling, analysis, and solution of optimization problems under uncertainty. Topics include expected-value optimization, chance constraints, stochastic dominance, and coherent risk measures. Two-stage and multistage stochastic programs are treated in depth, with applications to machine learning, finance, and operations management.

Course Materials

Course notes will be posted on Canvas. There is no required textbook; the following references provide additional background:

- A. Shapiro, D. Dentcheva, A. Ruszczyński: *Lectures on Stochastic Programming* (3rd ed.), SIAM, 2019.
- D. Dentcheva, A. Ruszczyński: *Risk-Averse Optimization and Control: Theory and Methods*, Springer, 2024.

Learning Goals and Objectives

This course develops competence in the following areas:

- Modeling of decision problems under uncertainty, including risk modeling.
- Analysis of stochastic optimization problems.
- Development and implementation of solution methods.
- Applications of stochastic optimization in operations management, finance, and machine learning.

Upon successful completion of the course, students will be able to:

1. Identify, formulate, and analyze stochastic optimization problems.
2. Design efficient solution methods tailored to problem structure.
3. Implement solution algorithms and critically interpret computational results.

These competencies are developed through:

1. Modeling assignments.

2. Optimization assignments.
3. Probabilistic analysis and simulation assignments.

The programming examples in class will be implemented in Python, but the students are free to use any programming language.

Prerequisites

There are no formal prerequisites, but solid preparation in multivariate calculus and probability theory is expected.

Academic Integrity

All students are responsible for adhering to the Rutgers Academic Integrity Policy. Violations will be reported and pursued without exception. On all assignments and examinations, students must sign the Rutgers Honor Pledge:

> "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment."

Written assignments will be screened using AI and plagiarism detection software.

Attendance and Preparation

Regular attendance is expected of all students. Absences should be reported in advance at the university absence portal. If an absence is due to religious observance, a Rutgers-approved activity, illness, or a family emergency, please notify me by email with documentation within three days.

In the event of a weather emergency, consult the campus home page; classes will be held whenever the campus is open.

Students are expected to arrive on time, remain for the full session, and come prepared. For each 3-hour class meeting, a minimum of **six hours** of preparation outside class is expected. Active participation is essential for learning.

Classroom Conduct

Cell phone use is not permitted during class. Please refrain from eating and drinking in the classroom.

Grading Policy

Course grades are determined as follows:

- Homework assignments: **60%**
- Final project: **40%**

Grade thresholds: A ≥ 90%, B+ ≥ 80%, B ≥ 70%, C+ ≥ 60%, C ≥ 50%. Scores below 50% are failing.

Final grades are not subject to negotiation. If you believe a grading error has been made, submit a written explanation within one week of receiving your grade, specifying the precise error and

providing supporting documentation. Grades will be corrected only when a genuine error has occurred; they cannot be adjusted on the basis of personal circumstances or consequences.

Course Schedule

Date	Topic	Due
Sep. 2	Modeling uncertainty and risk. Examples	
Sep. 9	Chance constraints: modeling and convexity theory	
Sep. 16	Numerical methods for chance-constrained optimization	Assignment 1
Sep. 23	Two-stage stochastic programming: basic properties and optimality conditions	Assignment 2
Sep. 30	Decomposition methods for two-stage problems	
Oct. 7	Multistage (dynamic) stochastic programming	Assignment 3
Oct. 14	Decomposition methods for multistage problems	
Oct. 21	Risk-averse optimization: basic models	Assignment 4
Oct. 28	Optimization of risk measures	
Nov. 4	Stochastic dominance constraints	Assignment 5
Nov. 11	Dynamic risk measures and time consistency	
Nov. 18	Stochastic iterative algorithms	Assignment 6
Dec. 2	Stochastic iterative algorithms. Learning	
Dec. 9	Introduction to risk-averse learning	Assignment 7

Support Services

Students requiring accommodation for a **disability** should obtain a Letter of Accommodation from the Office of Disability Services.

Military **veterans** and active-duty service members may obtain support through the Office of Veteran and Military Programs and Services.

Students in need of **mental health** services are encouraged to contact Rutgers Counseling and Psychological Services (CAPS).

Students in need of **physical health** services may contact Rutgers Health Services.

Legal services and academic support are also available through the university.