

ESI 6341: Introduction to Stochastic Optimization

Sections CAMP(27237), 1FE2(27239)

Class Periods: MWF Period 7 (1:55 PM – 2:45 PM)

Location: CSE E122

Academic Term: Spring 2022

Instructor:

Michelle Alvarado, Ph.D., Assistant Professor, Dept. of Industrial and Systems Engineering

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Office Number: (352) 294-7731

Office Hours: Tuesday 9 pm (Zoom), Wednesday 3-4 pm (Zoom/Office), or by appointment

Course Description

Introduction to Stochastic Optimization is intended as a first introductory course for graduate students in such fields as engineering, operations research, statistics, mathematics, and business administration (in particular, finance or management science). (3 credits)

Course Pre-Requisites / Co-Requisites

Basic knowledge of calculus, statistics, linear programming, and computer programming.

Course Objectives

This is an introductory course to stochastic programming. The objective of the course is to help students build knowledge and intuition in decision making under uncertainty, including:

- 1) Modeling of uncertainties;
- 2) Changes that uncertainties bring to the decision process;
- 3) Difficulties related to incorporation of uncertainties into optimization models;

Stochastic programming, also known as optimization under uncertainty, has contributions from many disciplines such as operations research, mathematics, economics, statistics, and finance. Stochastic programming approaches have been successfully used in a number of areas such as manufacturing, transportation, telecommunications, healthcare, energy, finance, agriculture/forestry, etc. This course will cover a broad overview of the applications, basic theory, modeling, and solution methods of this vibrant field. This course is suitable for students with knowledge of linear programming, probability, statistics, and programming. This course has a research level orientation and will require students to review literature on stochastic programming.

Materials and Supply Fees

Additional Course Fees: \$57.99

Recommended Textbooks and Software

Introduction to stochastic programming. Birge, John R., and Francois Louveaux. Springer Science & Business Media, 2011. ISBN-13: 978-1461402367. ISBN-10: 1461402360

A variety of handouts will be provided in class or online to supplement the required text.

Course Schedule

Weeks	Dates	General Topic
1	Aug 24/26	Introduction, Probability & Random Variables
2	Aug 29/31, Sep 2	Stochastic modeling formulations: expected, fat, scenario, recourse
3	Sept 7/9	Software Tutorials: AMPL, CPLEX, LaTeX, Beamer
4	Sept 12/14/16	Software Tutorials cont'd, More Modeling Practice (CEP)
5	Sept 19/21/23	Value of Stoch. Soln (VSS), Expected Value (EV)
6	Sept 26/28/30	Recourse and Convexity Theory
7	Oct 3/5	Kelley's Method
8	Oct 10/12/14	Bender's Decomposition (Mini-Project 1)
9	Oct 17/19/21	Chance-Constrained Models and Covering (Mid-Term Exam)
10	Oct 24/26/28	Multi-stage models (Financial Planning)
11	Oct 31, Nov 2/4	L-Shaped Method (Mini-Project 2)
12	Nov 7/9	Risk: VaR and CVaR
13	Nov 14/16/18	Benders/L-Shaped Extensions (Final Project)
14	Nov 21	Project Work Week
15	Nov 28/30, Dec 2	Project Work Week
16	Dec 5/7	Project Work Week
17	Wed, Dec 14, 10 am – 12 pm (Final Project Presentations)	

Attendance Policy, Class Expectations, and Make-Up Policy

- Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.
- University and Departmental guidelines will be applied to categorize excused and unexcused absences.
 - Students unable should notify the instructor of excused absences via email IN ADVANCE of the planned absence; in emergency situations the notification should occur before the next scheduled lecture.
 - Regardless of whether an absence is excused or unexcused, students are responsible for any coursework missed as a result of the absence. As most assignments will be posted in advance, students should have sufficient time to complete and submit these assignments in spite of excused activities/absences, unless otherwise discussed and approved by the professor.
- Off-Campus (EDGE) Students
 - Are expected to watch all video recordings
 - Are encouraged to interact with questions and comments on the course via email or Canvas throughout the semester
- On-Campus Students
 - In-person class attendance is expected
 - For each class session, you should make effort be on time and participate.
 - Avoid surfing the internet, texting, using phone/tablet apps, and checking e-mail during class to prevent distracting yourself.

Course Communication:

- Important communication from the course instructor will be posted on the CANVAS “Announcements” page.
- Canvas messaging is the preferred method of communication for the instructor. Please give the instructor 48 hours to respond to questions. You are highly encouraged to “bump” the messages to the instructor’s attention if you have not received a response within 48 hours.

Evaluation of Grades

- Exam:** There will be one mid-term take-home exam. The mid-term will cover Modules 1-6 and any supplementary material presented during this time frame. There will not be a final exam

Mid-Term Exam	Take-Home Exam	Thursday, October 20-Friday, October 21
Final Exam	N/A	N/A

- Homework:**

- 5 homework assignments will be given periodically throughout the semester.
- Homework will be submitted online via Canvas.
- All due dates will be set to 11:59 PM on the date in which they are due.
- Late homework assignments will be accepted for 24 hours after the due date with a 20% deduction.
- Incomplete and/or unprofessionally prepared work is not acceptable.

- Mini-Projects:** There will be 2 mini-projects beginning around the mid-point of the semester. Students will work in small teams to code two decomposition algorithms (Benders and L-Shaped) that will be learned in the course. Baseline source code will be provided to get your team started and each mini-project will have approximately 2-3 weeks for completion.

Mini-Project 1	Bender's Decomposition	Due: Monday, October 31
Mini-Project 2	L-Shaped Algorithm	Due: Friday, November 18

- Project:** There will be one major project at the end of the course. Students will work in small groups to model an interesting real-life practical problem of their choice using stochastic programming, formulate and solve the problem, conduct computational experiments, and perform a solution analysis. Students will be encouraged to work on problems from their thesis/dissertation areas and/or internship experiences as their project topic. A project proposal, video presentation, and final report will be required. More information on the final project requirements will be provided in class and on Canvas.

<i>Name (Number)</i>	<i>Grade %</i>
Homework (5)	30%
Mid-Term Exam (1)	20%
Mini-Projects (2)	25%
Final Project (1)	25%
	100%

Grading Policy

Percent	Grade	Grade Points
93.0 - 100.0	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 - 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 - 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	S	0.00

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/state-authorization-status/#student-complaint>.