

ESI 6341: Introduction to Stochastic Optimization

Sections 1HYB(27867), CAMP(30665), 1FE2(30668)

Class Periods: T Period 6-7 (12:50 PM – 2:45 PM), R Period 6 (12:50 PM – 1:40 PM)

Location: WEB

Academic Term: Spring 2021

Instructor:

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

Email Address: alvarado.m@ufl.edu

Office Hours: Zoom, Monday 9 pm – 10 pm, and Thursday 10 am – 11 am

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, and linear 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	Jan 12/14	Introduction and Review (probability, random variables)
2	Jan 19/21	Stochastic modeling formulations: expected, fat, scenario, recourse
3	Jan 26/28	Software Tutorials: AMPL, CPLEX, LaTeX, Beamer
4	Feb 2/4	Modeling (CEP), Value of Stochastic Solution (VSS), Expected Value (EV)
5	Feb 9/11	More on Recourse and Convexity Theory
6	Feb 16/18	Kelley's Method
7	Feb 23/25	Chance-constrained models and Covering

8	Mar 2/4	Bender's Decomposition (Mini-Project 1 assigned)
9	Mar 9/11	Multi-stage models (Financial Planning)
10	Mar 16/18	L-Shaped Method (Mini-Project 2 assigned)
11	Mar 23/25	Risk: VaR and CVaR
12	Marc 30/Apr 1	Benders/L-Shaped Extensions (Project assigned)
13	Apr 6/8	Project Work Week
14	Apr 13/15	Project Work Week
15	Apr 20	Project Work Week
16	Mon, Apr 26, 7:30-9:30 am (Project Due Date; Final Exam Slot - tentative)	

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

F2F Course Policy in Response to COVID-19 (applies to 1HYB(27867) section only)

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

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
 - a. Are expected to watch all video recordings
 - b. Are encouraged to interact with questions and comments on the course via email or Canvas throughout the semester
- On-Campus and Hybrid Students
 - a. Class attendance is highly encouraged via Zoom
 - b. For each class session, you should make effort be on time and participate.
 - c. Keep Zoom audio on mute unless asking a question, responding, or presenting.
 - d. Avoid surfing the internet, texting, using phone/tablet apps, and checking e-mail during class to prevent distracting yourself. I recommend placing your phone and/or tablet across the room to avoid distractions while attending class or watching videos.
 - e. For more class rules and expectations, via the “Netiquette Guidelines” posted on the course website.

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

Homework: Roughly 5 homework assignments will be given periodically throughout the semester.

- Note that not all homework will be graded. One or more problems may be randomly selected and graded.
- 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. Incomplete and/or unprofessionally prepared work is not acceptable. No late assignments will be accepted in this course.

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

Project: There will be 1 major project during the course. Each student will model an interesting real-life practical problem(s) 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 (optional) appendix will be required. Each student will be required to review and critique one other project and the review is also part of the course grade.

Late homework assignments will be accepted for 24 hours after the due date with a 20% deduction.

<i>Name (Number)</i>	<i>Grade %</i>	<i>Number</i>
Homework (~5)	40%	Various throughout semester
Mini-Projects (2)	30%	TBD (Mid-March)
Project (1)	25%	TBD (Early April)
Project Reviews (1)	5%	Apr 26 at 11:59 pm

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:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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/>.

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/policies/student-honor-code-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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.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: <http://www.counseling.ufl.edu/cwc>, 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](mailto:title-ix@ufl.edu), 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 Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.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://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.