ESI 6341: Introduction to Stochastic Optimization
ESI 6341 – Sections 12B7 & Web(100%)
Department of Industrial and System Engineering
University of Florida
Spring - 2018

CLASS: **CLASS TIMES**: T Periods 8-9 (3:00-4:55 PM), R Period 9 (4:05-4:55 PM)
          CLASS LOCATION: CSE E107

INSTRUCTOR:
Michelle Alvarado, Ph.D., Assistant Professor of Industrial and Systems Engineering
Office Hours: MW 11:00 AM – 12:00 PM in 474 Weil Hall, or by appointment
Office Number: 352-294-7731
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INSTRUCTOR:
Charles Hernandez
Office Hours: WF 3:00 PM – 4:00 PM in 406 Weil Hall, or by appointment
E-mail: cdhernandez@ufl.edu

COURSE CATALOG 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 AND CO-REQUISITES:
Basic knowledge of calculus, statistics, and linear programming.

TEXT BOOK:
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 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.

TOPICS:

Weeks	Dates	General Topic
Week 1	Jan 9/11	Introduction and Review (probability, random variables)
Week 2	Jan 16/18	Stochastic formulations; **Project Introduction**
Week 3	Jan23/25	Stochastic modeling: DEP, Recourse, EVPI, VSS
Week 4	Jan 30/Feb 1	Application Modeling and Solutions
Week 5	Feb 6/8	Application Modeling and Solutions; **Project Topic/Abstract Due**
Week 6	Feb 13/15	Two-stage recourse models
Week 7	Feb 20/22	Multi-stage models
Week 8	Feb 27/Mar 1	Chance-constrained models
Week 9	Mar 5-9	**Spring Break**
Week 10	Mar 13/15	Risk: VaR and CVaR
Week 11	Mar 20/22	Risk continued
Week 12	Mar 27/29	Decomposition: basic theory and history; **Project Draft Due**
Week 13	Apr 3/5	Decomposition: introduction to algorithms
Week 14	Apr 10/12	**Project Due;** Project Presentations*
Week 15	Apr 17/19	Project Presentations*
Week 16	Apr 24/26	Project Presentations*; **Reading Day**
Week 17	May 1/3	**Exam Week (no classes, no exam)**

CLASS ATTENDANCE AND RULES:
- Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation.
  (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance)
- University and Departmental guidelines will be applied to categorize excused and unexcused absences.
  - Students unable should notify the instructor of excused absences via email <u>IN ADVANCE</u> 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 eLearning throughout the semester
- On-Campus Students
  a. Class attendance is expected

b. Cell Phones MUST be turned off or placed on a silent mode. Texting during class time is not permitted nor condoned. It is expected that students will avoid surfing the internet, using phone apps, and checking e-mail during class to prevent distracting others.
c. For each class session, you should make effort be on time and participate.

ASSIGNMENTS:
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 either be submitted online or collected at the beginning of the class period in which they are due. Late, incomplete and/or unprofessionally prepared work is not acceptable. **No late assignments will be accepted in this course.**

Course Project: There will be one semester-long 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 draft, final report, and class presentation will be required for each project. Each student will be required to review and critique one other project (draft, final report, and presentation) and the review is also part of the course grade.

GRADES:

Name	Grade %	Date
Homework	50%	Various throughout semester
Project	40%	April 10
Project Reviews	10%	April 17

Grading Scale:

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 – 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 – 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

COURSE CONTENT AVAILABILITY:
The eLearning system will be used to disseminate course related material and turning in assignments during the semester. Specific details will be discussed in class.

COURSE EVALUATION:
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

STUDENTS WITH DISABILITIES:
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester, preferably the first week of the course.

ACADEMIC INTEGRITY:

UF Honor Pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*"

On all work submitted for credit by students at the university, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

UF students are bound by The Honor Pledge. The Honor 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 of this class.

(https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/)

No leniency is given for academic dishonesty or misconduct.

SOFTWARE USE:
Every student is expected to have access to a computer with optimization software.
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:
http://registrar.ufl.edu/catalog0910/policies/regulationferpa.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.
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> **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.
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> **Sexual Assault Recovery Services (SARS)**
> Student Health Care Center, 392-1161.
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> **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.
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> **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.
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> **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://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.
>
> **On-Line Students Complaints**: http://www.distance.ufl.edu/student-complaint-process.