

USF - Department of Industrial and Management Systems Engineering
ESI 6491 Linear Programming and Network Optimization
Fall 2015

1 COURSE CONTACT

- Class Meetings: M W 9:30–10:45 AM, ENB 228
- Course Website: <https://usflearn.instructure.com/courses/1067187> (CANVAS via MyUSF)
- Instructor: Dr. Changhyun Kwon
 - E-mail: chkwon@usf.edu
 - Office Location: ENC 2506
 - Office hours: M W 1:00–2:00 PM, or by appointment

When you email the instructor, you need to include **your name** and the **course number**. Please state “ESI 6491” explicitly in the subject of your email messages.

2 COURSE DESCRIPTION

This course will be an intensive study of Linear Programming (LP) and Network Optimization problems. LP deals with the problem of minimizing or maximizing a linear function in the presence of linear equality and/or inequality constraints. Both the general theory and characteristics of LP optimization problems as well as effective solution algorithms and applications will be addressed. The course is a good one for students who are planning to apply Operations Research (OR) tools in all areas of application in the public and private sectors including production or manufacturing problems, service/logistics related problems, and various problems involving network flows as well as to learn an optimization software tool.

3 PREREQUISITES

- Knowledge of (or willingness to learn) a computer programming language such as MATLAB, C/C++, Java, Python, and Julia. This course will particularly emphasize [the Julia Language](#).
- Knowledge of linear algebra, calculus, and basic mathematical concepts such as sets, functions, vectors, matrices, etc.

4 TOPICS COVERED

- Nature and examples of LP problems
- Review of Linear Algebra and Convex Analysis
- The Simplex Method
- Duality and Sensitivity
- Dantiz-Wolfe Decomposition
- Robust Linear Optimization
- Network Flow Problems
- Network Simplex Method

- Transportation Problem
- Assignment Problem
- Max Flow Problem
- Shortest Path Problem
- Robust Shortest Path Problem

5 OPTIMIZATION SOFTWARE

This course involves homework assignments that require optimization software. In particular, the students will learn how to use [The Julia Language](#) with the [Gurobi Optimizer](#).

Students are encouraged to install Julia and Gurobi on their own computer. Students need to access the following web document, for installation help and example codes: <http://stom.chkwon.net/julia/>

6 REQUIRED TEXTBOOK

- Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali, *Linear Programming and Network Flows*, John Wiley & Sons, 4th Edition, 2010.

7 OTHER REFERENCES

- Linear Programming in General
 - *Introduction to Linear Optimization* by Dimitris Bertsimas, John N. Tsitsiklis and John Tsitsiklis (1997)
 - *Linear Programming* by James P. Ignizio and Tom M. Cavalier (1993)
 - *Linear Programming* by Vasek Chvatal (1983)
 - *Linear Programming: Foundations and Extensions* by Robert J Vanderbei (2007)
 - *Linear and Nonlinear Programming* by David G. Luenberger and Yinyu Ye (2008)
- Network Optimization
 - *Network Optimization: Continuous and Discrete Models* by Dimitri P. Bertsekas (1998)
 - *Network Flows: Theory, Algorithms, and Applications* by Ahuja, Magnanti and Orlin (1993)
- Modeling
 - *Model Building in Mathematical Programming* by H. Paul Williams (2013)
- The Julia Language
 - *Getting started with Julia Programming Language* by Ivo Balbaert (2015)

8 GRADING

- **25% Homework Assignments.** You must work on the homework problems independently. You are allowed to discuss with other fellow students, but you must present the idea independently, and state the names of the students with whom you discussed. The allowed discussion does NOT include reading other students' writings.
- **25% Mid-term Exam I.** Scheduled on September 30, in class.

- **25% Mid-term Exam II.** Scheduled on November 2, in class.
- **25% Final Exam.** Scheduled on December 7, 12:30pm–2:30pm, classroom.

9 ACADEMIC HONESTY AND INTEGRITY

Academic integrity is the foundation of the University of South Florida Systems (USF System) commitment to the academic honesty and personal integrity of its university community. Academic integrity is grounded in certain fundamental values, which include honesty, respect and fairness. Broadly defined, academic honesty is the completion of all academic endeavors and claims of scholarly knowledge as representative of ones own efforts. Knowledge and maintenance of the academic standards of honesty and integrity as set forth by the university are the responsibility of the entire academic community, including the instructional faculty, staff and students. The final decision on an academic integrity violation and related academic sanction at any USF System member institution shall affect and be applied to the academic status of the student throughout the USF System, unless otherwise determined by the independently accredited institution

Resources:

- USF Regulation 3.027:
<http://regulationspolicies.usf.edu/regulations/pdfs/regulation-usf3.027.pdf>
- Tutorial: <http://usfweb2.usf.edu/ethics/splash.html>

Sactions include:

- Reduction or no credit given
- A make-up assignment at a more difficult level
- Required attendance in a non-credit workshop or seminar on ethics
- Failing grade for the assignment
- Failing grade for the course, which may be an F or FF on the internal transcript
- Suspension from the university for one semester
- Permanent academic dismissal from the University with the designation of “Dismissed for Academic Dishonesty” to be placed permanently on a students external transcript
- More serious violations of academic integrity may be referred to the Office of Students Rights and Responsibilities as a student conduct violation

One simple rule: If you fail to meet the USF policy and the instructor’s policy for academic honesty and integrity, you will at least receive ‘F’, and it is possible that you are suspended or expelled from the university.

10 EXAMPLES OF ACADEMIC DISHONESTY

Academic dishonesty includes, but is not limited to, the following:

- *Previously submitted work.* Submitting academically required material that has been previously submitted—in whole or in substantial part—in another course, without prior and expressed consent of the instructor.
- *Plagiarism.* Copying or receiving material from any source and submitting that material as ones own, without acknowledging and citing the particular debts to the source (quotations, paraphrases, basic ideas), or in any other manner representing the work of another as ones own.

- *Cheating.* Soliciting and/or receiving information from, or providing information to, another student or any other unauthorized source (including electronic sources such as cellular phones and PDAs), with the intent to deceive while completing an examination or individual assignment.
- *Falsification of academic materials.* Fabricating laboratory materials, notes, reports, or any forms of computer data; forging an instructors name or initials; resubmitting an examination or assignment for reevaluation which has been altered without the instructors authorization; or submitting a report, paper, materials, computer data, or examination (or any considerable part thereof) prepared by any person other than the student responsible for the assignment.
- *Misrepresentation of documents.* Forgery, alteration, or misuse of any University or Official document, record, or instrument of identification.
- *Confidential academic materials.* Procurement, distribution or acceptance of examinations or laboratory results without prior and expressed consent of the instructor.
- *Selling academic assignments.* No person shall sell or offer for sale to any person enrolled at the University at Buffalo any academic assignment, or any inappropriate assistance in the preparation, research, or writing of any assignment, which the seller knows, or has reason to believe, is intended for submission in fulfillment of any course or academic program requirement.
- *Purchasing academic assignments.* No person shall purchase an academic assignment intended for submission in fulfillment of any course or academic program requirement.

11 STUDENTS WITH DISABILITIES SERVICES

If you have a disability and may require some type of instructional and/or examination accommodation, please inform me early in the semester so that we can coordinate the accommodations you may need. If you have not already done so, please contact the Students with Disabilities Services office. The website is at: <http://www.usf.edu/student-affairs/student-disabilities-services/>