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Rutgers Business School – Newark & New Brunswick

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Fundamentals of Optimization for Supply Chain Management
Fall 2017

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Lectures

Friday 1:30 – 4:20 PM, Room 1WP-528

Office Hours

Before and after class, or by appointment; Room 1WP-970
TA (Phat Luong, phat.luong@rutgers.edu): Tuesday 11 AM – 12 PM, Room 1WP-955B

Course Overview

This course introduces some classical optimization problems in supply chain management and related fields, and covers related modeling and solution techniques to model, evaluate, and solve these problems. The course is targeted at graduate students in the areas of supply chain management, marketing science, and operations management. Upon completion, students are expected to

1. understand and identify some classical structures of supply chain optimization problems and their latest developments;
2. master fundamental modeling and optimization techniques to model, solve and analyze problems arising in supply chain management; and
3. prepare themselves for advanced research in their research areas.

Textbooks

1. F. S. Hillier and G. J. Lieberman, *Introduction to Operations Research*, McGraw-Hill, 2010 (9th edition), ISBN 978-0-07-337629-5. (Abbreviated as *HL*)
2. R. L. Rardin, *Optimization in Operations Research*. Prentice Hall, 1997. ISBN: 0-02-398415-5. (Abbreviated as *RR*)
3. Y. Collette and P. Siarry, *Multiobjective Optimization: Principles and Case Studies*, Springer, 2004. ISBN: 3-540-40182-2. (Abbreviated as *CP*)

Prerequisite

Basics of linear algebra, calculus, and probability.

Course Administration

The course is structured as a combination of lectures, class discussions, and course projects. All class-related material (lecture presentations, homework assignments, etc.) will be posted on Blackboard (http://blackboard.rutgers.edu). Additional visual material and demos may be shown in some classes. Class attendance is expected. Students are responsible for assignments or policies that are announced in class or in material handed out in class, whether or not students attend the class.

Homework Assignments

Homework assignments and their due dates will be announced and posted on Blackboard. Penalty for late submission within one week is 30% of the points allocated to the assignment. Unless a documented reason is produced for unusual circumstances, late submissions will not be accepted more than one week late.

Term Project

The purpose of the term project is to help students better understand the course topics. There are two options for the project: students can (1) model and solve a problem in their domain of research, and present the work, or (2) present one paper which is chosen by the student and approved by the instructor. The former is strongly encouraged and preferred. For either option, the grade will be determined by the quality and workload of the project, as well as the presentation.

Exams

There are two open book exams, midterm and final. There will be no make-up unless a special event out of your control (e.g., a medical emergency) happens and prevents you from attending the exams. In such cases, you must notify the instructor as soon as you can and provide necessary documentations.

Grading

Homework	30%
Term Project	20%
Midterm Exam	25%
Final Exam	25%
Total	100%

The grade of each category and the final numerical grade will be posted on Blackboard. The final letter grade is based on the ranking of your final numerical grade. It will be posted on REGIS (Rosters & Electronic Grading Information System).

There is no extra credit. Your final grade is not subject to negotiation. If you believe there is a grading error, inform the instructor as soon as possible, and provide all due supporting documentation. No grade adjustment will be made based on consequences.

Tentative Course Schedule

Week	Topic	Recommended Reading
1	Course Overview and Modeling Essentials ▪ Successful optimization/OR stories in SCM ▪ Basic concepts: model formulation, solution and validation	HL, Ch 1, 2; RR, Ch 2.1–2.3, 3.1
2	Linear programming (LP) ▪ LP formulation ▪ Graphical representation and solution ▪ Applications in product mix, operations planning and workforce scheduling	HL, Ch 3.1–3.5; RR, Ch 4.3, 4.4
3	Solving LPs ▪ The simplex method ▪ Duality theory ▪ Sensitivity analysis	HL, Ch 4, 5.1, 6;
4	Special LP problems ▪ Transportation problems ▪ Assignment problems ▪ Applications in distribution, and production scheduling	HL, Ch 8
5	Network Flows ▪ Shortest-path problems and logistics ▪ Maximum flow problems and distribution network design ▪ Minimum cost flow problems and distribution network operations ▪ Project management and critical path method	HL, Ch 9; RR, Ch 9.1, 9.3, 9.5, 9.7
6	Dynamic Programming (DP) ▪ Principle of DP ▪ Backward induction ▪ Applications in distribution, production planning and scheduling	HL, Ch 10
7	Midterm Exam	
8	Integer Programming (IP) ▪ IP formulation ▪ Applications in facility location, supply chain network design, and dispatching	HL, Ch 11.1–11.4; RR, Ch 11.5, 11.6
9	Solving IPs ▪ Combinatorial optimization ▪ Branch-and-bound algorithm ▪ Useful IP modeling tricks	HL, Ch 11.5–11.8; RR, Ch 12.1–12.4
10	Multiobjective Optimization ▪ Basic concepts ▪ Preemptive optimization and weighted-sum method Nonlinear Programming (NLP) ▪ Applications in product mix, transportation, and portfolio selection ▪ Bisection method and Newton's method	RR, Ch 8.1–8.3; HL, Ch 12.1–12.4
11	Metaheuristics ▪ Tabu search ▪ Simulated annealing ▪ Genetic algorithm ▪ Traveling salesman problem	HL, Ch 13
12	Simulation ▪ Different types of simulation ▪ Generation of random variates ▪ Simulation optimization	HL, Ch 20
13	Term Project Presentation	
14	Final Exam	

Academic Integrity

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. All suspected incidents of academic misconduct will be referred to an Academic Integrity Facilitator for investigation. If you have any doubt what constitutes a violation of academic integrity, please visit http://academicintegrity.rutgers.edu and http://www.business.rutgers.edu/ai for more details.

Please note that Rutgers University, in conjunction with Rutgers Business School, has established an Honor Code as follows, and this pledge automatically extends to all students.

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

Support Services

The following is a list of support services available at Rutgers. Please start your consultation process as soon as possible if there is a need.

- If you need accommodation for a disability, obtain a Letter of Accommodation from the Office of Disability Services (https://ods.rutgers.edu).
- If you are a military veteran or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services (http://veterans.rutgers.edu).
- If you are in need of mental health services, please consult Rutgers Counseling and Psychological Services – New Brunswick (http://rhscaps.rutgers.edu) or Rutgers University – Newark Counseling Center (http://counseling.newark.rutgers.edu).
- If you are in need of physical health services, please use our readily available services at Rutgers Health Services – New Brunswick (http://health.rutgers.edu) or Newark (http://health.newark.rutgers.edu).
- If you are in need of legal services, please use our readily available services at Rutgers Student Legal Services (http://rusls.rutgers.edu).

If you are in need of additional academic assistance, please use our readily available services at Rutgers University – New Brunswick Learning Center (https://rlc.rutgers.edu), Newark Learning Center (http://www.ncas.rutgers.edu/rlc) or Newark Writing Center (http://www.ncas.rutgers.edu/writingcenter).