MATH 333 Operations Research

SEMESTER (Spring 2018)

PROFESSOR/CLASS INFORMATION

Dr. Shieu-Hong Lin

(Course) Title: Operations Research
Term: Spring, 2018
Location: Lim 041
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Course Code/#: MATH 333
Class Days/Time: MW 10:30-11:45am
Credit Hours/Units: 3
Office Location: Lim 137
Meetings with Professor: Make Appt via Email
Admin Assistant: Jerrianne Smith, x4741
Dept. Website: http://csci.biola.edu

Class Website: http://csci.biola.edu/math333/

COURSE DESCRIPTION

Mathematical foundations of model building, optimization, linear programming models, game theoretic models.

COURSE ALIGNMENT WITH PROGRAM LEARNING OUTCOMES

MATH 333 Operations Research: Computer Science majors with the Computer Science concentration need to take either MATH 321 or this upper-division course in their junior or senior year of the program. Successful completion of this course (see next section) will prepare students to demonstrate a developing proficiency toward the accomplishment of PLO: analysis, modeling, and problem solving.

COURSE OBJECTIVES AND STUDENT LEARNING OUTCOMES

By the completion of this course including class participation, class assignments (referred to as "Tasks"), class readings and group interaction, the following objectives and learning outcomes will be assessed and demonstrated:

IDEA Objective #4: Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course (Essential emphasis).

STUDENT LEARNING OUTCOMES (The learner will demonstrate that he or she has satisfactorily fulfilled IDEA Objective #4 by being able to):

- Able to develop mathematical programming models for various optimization problems drawn from transportation planning, business, and other fields and solve the problems using the AMPL modeling language and available solvers.
- Able to analyze and solve various strategic behavior and decision-making sample problems drawn from social networks, economics, and other fields based on key concepts in game theory and strategic thinking such as dominance, Nash equilibrium, stability, and backward induction for analysis.

REQUIRED TEXTS

- Prajit K. Dutta. *Strategies and Games: Theory and Practice*. MIT Press, 1999. (Required)
- Robert Fourer, David M. Gay, and Brian W. Kernighan. *AMPL: A Modeling Language for Mathematical Programming*. Cengage Learning, 2002. (online)
- R. Vanderbei. *Linear Programming: Foundations and Extensions*. Springer 2001. (online)

LEARNING TASKS (Assignments) & ASSESSMENT (Grading)

Description and Weighting of Assignments:

Task 1: Weekly Reading Report

Due Date: Tuesday of the week **(14 assignments)**
Weighting: 14%
Possible Points: 4 points for each assignment.
Description:
For each reading assignment, the student needs to finish the reading on time and submit the following information online as a report.

Effort (2 points):
Record the information such as (i) a numerical amount of time he/she spent for the reading, (ii) a numerical percentage regarding the percentage of stuff in the reading actually read and understood, and (iii) whether the student has come to the class this week.

Reflection on the reading (2 points):
The student need to put down 1 to 2 paragraphs of his/her thoughts about the reading such as new insight you gained, interesting things encountered, questions of things you don't understand, and so forth.

Assessment:
For the effort part,

the student is expected to **(i)** have attended the class this week at least once (0.5 point), and **(ii) have either** gained a good understanding of 80% or more of the contents **or** have spent at least three hours in the reading (1.5 points).

For the reflection part,
the student is expected to show substantial evidence of understanding or effort of trying to understand the contents in the reading.

Task 2: Homework Assignment
Weighting: 36%

Description:

For each homework assignment,
carefully check the submission instructions and you will be instructed specifically whether **(i)** you should only submit your work online under Canvas **or (ii)** you should only write done the problem solving steps and the answers on paper and bring them to Dr. Lin in person or leave them in his mailbox by the due date.

Integrity rules for homework assignment:

- **Peer discussion is encouraged**: Peer discussion is encouraged to cultivate an open learning environment in the class, but you should carefully read the guidelines below to avoid any dishonest behavior and never step over the guidelines explicitly described in the following.
- **Never copy the work done by others**: Any copy-and-paste of work done by others is viewed as cheating and you will get 0 points for the assignment.
- **Never pass your finished work to others**: Peer discussion of the homework and working together using the board or on paper is acceptable for the problem solving purpose and for the explanation of ideas. But you should never pass around your finished work (electronically or on the board or on paper) to others except for the TA and the instructor. Violating this rule is viewed as cheating in the class and the provider will receive 0 points for the assignment.
- **Demonstrate the credibility of your authorship of the work**: When you submit your own work for points, you should make sure that you are able to explain your work and reconstruct the work from scratch without any outside help when requested. If you are not able to do that on your own when requested, you will get 0 points for the assignment and there will be an investigation.
- **Consequence of cheating in the class**: Cheatings end in 0 points for the assignments followed by discipline actions described in the student handbook.

Assessment: We'll grade each problem based on the following general guidelines.

If the problem solving steps, proofs, or explanation are required, but nothing is presented except for the final answer, no points given.

If the approach is generally correct but there are mistakes in the problem solving steps, proofs, or explanation that are required,

- deduce 25% of the points for each minor mistake and
- deduce 75% of the points for each major mistake.

Task 3: Exams (Tests)

Weighting: 50%

Description: We plan to have a test/quiz every 2-3 weeks after a major subject area is explored.

CLASS INFORMATION

Late policy

- **Penalty for late submission within 2 days after the due date**:
  For the written homework, you should write done the problem solving steps and the answers on paper and bring them to Dr. Lin in person or leave them in his mailbox by the due date. You will get a deduction of 20% of total points for being late if they are submitted within 2 days of the due date.
- **No submission accepted more than 2 days after the submission due date**: No submission will be accepted more than 2 days after the submission due date, except for extremely exceptional situations such as a serious disabling health problem with evidence from the doctors.

Computation of Final Grade:

Weekly Reading Report	14 %
Homework Assignments/Presentation	36%
Exams	50 %
Total	**100%**

Final grades will be awarded on the following point system:

A	93%
A-	90%
B+	87%
B	84%
B-	80%
C+	77%
C	74%
C-	70%
D+	67%
D	64%

D- 60% to pass class

GENERAL INFORMATION

The GPA System used by the University Registrar's Office is:

A = 4.0	B = 3.0	C = 2.0	D = 1.0
A- = 3.66	B- = 2.66	C- = 1.66	D- = 0.66
B+ = 3.33	C+ = 2.33	D+ = 1.33	F = 0.0

Tentative Schedule

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Week 1 Introduction to linear programming
Weeks 2-3 Simplex method and duality
Week 4 Introduction to strategic form games
Week 5 Dominant strategies
Week 6 Mechanism Design
Week 7 Iterative elimination
Week 8 Nash equilibrium
Week 9 Cournot duopoly
Week 10 Social Optimality
Week 11 Mixed strategies
Week 12 Zero-sum game
Week 13 Introduction to extensive form games
Week 14 Backward induction and it applications
Week 15 Subgame equilibrium

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