



Operations Research

MATH 333

Spring 2019

COURSE DESCRIPTION

MATH 333 Operations Research: This course focuses on mathematical foundations of model building, optimization, linear programming models, game theoretic models.

PROFESSOR/CLASS INFORMATION

Dr. Shieu-Hong Lin

Course Title: Operations Research
Term: Spring, 2019
Location: Lim 041
Office Phone: 562 903-4741
Office Hours: MW 1:30-3:30pm T Th 3:00-5:00pm
E-Mail: shieu-hong.lin@biola.edu
University Website: www.biola.edu
Course Code/#: MATH 333

Class Days/Time: MW 10:30-11:45am
Credit Hours/Units: 3
Office Location: Lim 137
Meetings with Professor: Reserving a slot by email in advance is encouraged
Admin Assistant: Jerrienne Smith, x4741
Class Website: <http://csci.biola.edu/math333/>

DISABILITY SERVICES

Disability Services exists to assist any student who thinks he or she may need such assistance. Students desiring accommodations for this class on the basis of physical learning, psychological and/or emotional disabilities are to contact The Learning Center that houses both learning assistance and disability services. The Learning Center is located in the Biola Library, Upper Level, Room U-137, and this department can be reached by calling 562.906.4542 or by dialing extension #4542 if calling from on campus.

BIOLA UNIVERSITY MISSION STATEMENT

TRUTH. TRANSFORMATION. TESTIMONY.

The mission of Biola University is biblically-centered education, scholarship, and service; equipping men and women in mind and character to impact the world for the Lord Jesus Christ.

COURSE ALIGNMENT WITH PROGRAM LEARNING OUTCOMES

MATH 333 Operations Research: Computer Science majors in the Computer Science Standard 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 #1: 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:

- develop mathematical programming models for optimization problems drawn from transportation planning, business, and other fields and solve the problems using the AMPL modeling language and available solvers.
- analyze strategic behaviors for decision-making 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.

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:

REQUIRED TEXTS & STUDY RESOURCES

Required Textbooks, Web sites, other media and technology sources (Each of the following texts and/or study resources are required and will be used in this course):

- Prajit K. Dutta. *Strategies and Games: Theory and Practice*. MIT Press, 1999.
- 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)

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 month after a major subject area is explored.

CLASS INFORMATION

Class Attendance and Attendance Policy:

Include a brief paragraph explaining your philosophy about attendance and detailing your specific policy—how many absences without penalty, excused absences, tardies, etc.

Assignments:

- **Penalty for late submission within 2 days after the due date:**
You may 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 doctor.

Incomplete Grade:

A temporary mark of "IN" (Incomplete Grade) will be issued in special cases when approved by the Associate Provost of Academic Administration for undergraduate students or the dean of the respective graduate school. "IN" grades course assignments are normally completed no later than five weeks after the end of the term. In the event of the inability of a student to complete the coursework by the approved deadline, the Office of the Registrar will assign the grade which the student has earned by the end of term.

To read more about Biola's policies and procedures regarding absences, view <https://studenthub.biola.edu/undergraduate-student-handbook-absences-attendance>

Academic Honesty:

Biola University is committed to ethical practice in teaching, scholarship, and service. As such, plagiarism and other forms of academic dishonesty will not be tolerated. Please see the undergraduate/graduate student handbook and/or the departmental/program/school policy on academic honesty. It is imperative that you present all written, oral, and/or performed work with a clear indication of the source of that work. If it is completely your own, you are encouraged to present it as such, taking pleasure in ownership of your own created work. However, it is also imperative that you give full credit to any and all others whose work you have included in your presentation via paraphrase, direct quotation, and/or performance, citing the name(s) or the author(s)/creator(s) and the source of the work with appropriate bibliographic information. To do otherwise is to put oneself in jeopardy of being sanctioned for an act or acts of plagiarism that can carry serious consequences up to and including expulsion from the university.

To read more about Biola's policies and procedures regarding academic integrity, view <https://studenthub.biola.edu/undergraduate-student-handbook-academic-integrity>.

Another helpful resource is Plagiarism.org.

Non-Discrimination Policy:

As Christian scholars we are keenly aware of the power of language, and believe in treating others with dignity. As such, it is important that our language be equitable and prejudice free. Good writing and speech do not make unsubstantiated or irrelevant generalizations about personal qualities such as age, disability, economic class, ethnicity, marital status parentage, political or religious beliefs, race, sex, or sexual orientation. Respectful use of language is particularly important when referring to those outside of the religious and lifestyle commitments of those in the Biola community. By working toward precision and clarity of language, we mark ourselves as serious and respectful scholars, and we model the Christ-like quality of invitation.

Avoid the use of stereotypes or terminology that demeans persons or groups based on age, disability, ethnicity, gender, race, language or national origin. Avoid drawing attention to irrelevant identifiers of race or gender. Avoid gender-specific language when referencing people in general. Avoid terms that assume the universality of human experience, and in particular presume the normativity of the socially dominant group.

Confidentiality and Sexual Misconduct:

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a responsibility in my role as a faculty member to share information I hear regarding sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, and gender/sex-based discrimination with the Title IX Coordinator and/or the Campus Safety Response Team. Confidential resources available to students on campus include the Biola Counseling Center (562-903-4800) and the Student Health Center (562-903-4841). Both the Title IX Coordinator and the Campus Safety Response Team understand the sensitive nature of these situations and can provide information about available on and off-campus resources, such as counseling and psychological services, medical treatment, academic support, university housing, safety measures and other forms of assistance. More information about confidential resources on and off-campus, additional resources, and the University's Sexual Misconduct Policy is available at <https://www.biola.edu/title-ix>.

Additional University and/or Department Policies:

All university and departmental policies affecting student work, appeals, and grievances, as outlined in the Undergraduate Catalog and/or Department Handbook will apply, unless otherwise indicated in this syllabus.

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

COURSE CALENDAR

While the course calendar is intended to provide you with an overview of the semester's schedule, the professor reserves the right to make adjustments to the schedule to responsively meet the needs of this class.

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
