AMS 341: Operations Research I: Deterministic Models

Fall 2024

Instructor

> **Name:** TAN CAO, *Associate Professor.*
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> 🕐 **Office Hours:** *Monday, Tuesday, Wednesday,* and *Thursday* 2:00-3:00 PM.
> **Lectures:** TUESDAY and THURSDAY 12:30 PM-1:50 PM.
> **Prerequisite:** AMS 210 or MAT 211.

Teaching Assistants

- **Name:** Hojoon Choi
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  Office Hours: *Tuesday* and *Thursday* 11:00 AM-12:00.

Textbook

Primary Text:

- *Operations Research: Applications and Algorithms* by Wayne L. Winston, fourth edition [W].

Computing

Use Excel or Lindo for solving LPs as discussed in the textbook. Other software options are also acceptable.

Course Components

Homework

- Assigned weekly, approximately 10 sets.

- Submit via Brightspace as a single PDF before the due date and time.

- No late homework will be accepted. (Reminder- the 2 lowest scores will be dropped.) You may discuss homework problems with other students taking the course, with the TA, and with the instructor. But the work that you turn in should always be your own write-up, and you should show that you personally understand everything

that you write. Please make certain that your writing is neat and clear, and that you have expressed your reasoning, not just the final answer.

Grade Weighting

- Attendance: 5%

- Homework Assignments: 35%

- Exam 1: 15%

- Exam 2: 15%

- Final Exam: 30%

Grade Scale

Approximately 30% A's, 35% B's, 25% C's, and 10% D's and F's. No extra credit options.

- A: [93,100]
- A-: [90,93)
- B+: [87,90)
- B: [83, 87)
- B-: [80, 83)
- C+: [77,80)

- C: [73,77)
- C-: [70,73)
- D+: [67, 70)
- D: [63, 67)
- D-: [60, 63)
- F: [0,60)

Course Outline

Week	Date	Lecture	Topics
Week 1	Tuesday 08-27-2024	Lecture 1	1.1, 1.2, 1.3
Week 1	Thursday 08-29-2024	Lecture 2	3.1, 3.2
Week 2	Tuesday 09-03-2024	Lecture 3	3.3, 3.4
Week 2	Thursday 09-05-2024	Lecture 4	3.5, 3.6*, 3.7*, 3.8*, 3.9*
Week 3	Tuesday 09-10-2024	Lecture 5	3.10, 3.11, 3.12
Week 3	Thursday 09-12-2024	Lecture 6	4.1, 4.2
Week 4	Thursday 09-19-2024	Lecture 7	4.4, 4.5
Week 4	Tuesday 09-24-2024	Lecture 8	4.6, 4.7
Week 5	Thursday 09-26-2024	Exam 1 Review	
Week 5	**Tuesday 10-01-2024**	**Exam 1**	
Week 6	Tuesday 10-08-2024	Lecture 9	4.8, 4.9
Week 6	Thursday 10-10-2024	Lecture 10	4.11, 4.12, 4.13
Week 7	Tuesday 10-15-2024	Lecture 11	4.14, 4.15
Week 7	Thursday 10-17-2024	Lecture 12	5.1, 5.2
Week 8	Tuesday 10-22-2024	Lecture 13	5.3, 5.4*
Week 8	Thursday 10-24-2024	Lecture 14	6.1, 6.2, 6.3
Week 9	Tuesday 10-29-2024	Lecture 15	6.4, 6.5
Week 9	Thursday 10-31-2024	Lecture 16	6.6, 6.7, 6.8
Week 10	Tuesday 11-05-2024	Exam 2 Review	
Week 10	**Thursday 11-07-2024**	**Exam 2**	
Week 11	Tuesday 11-12-2024	Lecture 17	6.9, 6.10, 6.11
Week 11	Thursday 11-14-2024	Lecture 18	7.1, 7.2, 7.3
Week 12	Tuesday 11-19-2024	Lecture 19	7.4*, 7.5
Week 12	Thursday 11-21-2024	Lecture 20	8.1, 8.2, 8.3, 8.4
Week 13	Tuesday 11-26-2024	Lecture 21	9.1, 9.2, 9.3
Week 13	Thursday 11-28-2024	Lecture 22	9.4, 9.8
Week 14	Tuesday 12-03-2024	Lecture 23	18.1, 18.2, 18.3
Week 14	Thursday 12-05-2024	Lecture 24	18.4, 18.6*, final exam review

Table 1: Class Schedule with Dates

The Final Exam will be given on **Tuesday 12-10-2024 from 12:30 to 3:00 PM**.

Learning Outcomes

1. Become familiar with the many optimization problems arising in diverse settings that can modeled as linear programs, and construct mathematical models for an array of such optimization problems.

   - Maximizing income subject to supply constraints;
   - Minimizing costs subject to minimum requirements;
   - Scheduling problems;
   - Short-term and long-term financial planning problems;
   - blending problems;
   - multi-period planning problems.

2. Learn the simplex algorithm and use it to solve linear programs

   - putting linear programs in standard form with slack and excess variables;
   - finding an initial basic feasible solution (using big M or two-phase simplex for min problems);
   - choosing which variable enters and which variable leaves the basis;
   - handling unbounded and infeasible problems.

3. Apply sensitivity analysis to optimal solutions

   - shadow prices and reduced costs;
   - range for objective function coefficients and right-hand sides;
   - connections to the dual linear programs and complementary slackness.

4. Learn and use specialized algorithms for solving network problems:

   - transportation problems;
   - assignment problems;
   - critical path problems.

5. Demonstrate an understanding of integer programs and how to solve them.

   - model various discrete optimization problems as integer programs;
   - solve integer programs using a branch-and-bound strategy.

6. Demonstrate an understanding of dynamic programming and solution techniques.

   - model a class of discrete optimization problems as dynamic programs;
   - solve simple dynamic programs using a sequential solution technique.

Policies and Statements

Tardiness

Tardiness disturbs other students, disturbs me, and puts you at a disadvantage for doing well in the class. On the rare occasion that you are tardy, please come in quietly and take a seat in the back.

Attendance Policy

1. All students of SUNY Korea are required to attend every class.

2. Unexcused absences will affect seriously the student's final grade in the course.

3. If a student has over 20% unexcused absence (6 days), the student's final course grade will be an 'F'. Example:

   (a) If the class is a 150 minute class, and is held once a week, the 4th unexcused absence of a student will lead to an F grade of the course.

   (b) If the class is a 75 minute class, and is held twice a week, the 7th unexcused absence of a student will lead to an F grade of the course.

   (c) If the class is a 50 minute class, and is held three times a week, the 10th unexcused absence of a student will lead to an F grade of the course.

   (d) In Intensive English Course (IEC), if a student misses the class more than 40 hours in a semester, the student will receive an F grade on the course.

4. Students should report the reason of absence to the instructor in advance, or immediately after the absence.

5. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.

6. The instructor of the course reserves the right to excuse absences.

7. The course instructor may excuse the absence if the submitted documentation fulfills the conditions below.

   (a) Extreme emergencies (e.g. death in the family)

   (b) Severe medical reasons with doctor's note (Not a slight illness)

   (c) Very important events (e.g. national conference, official school event)

8. At the end of semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

Code of Conduct

Since every student is entitled to full participation in class without interruption, all students are expected to be in class and prepared to begin on time. All cell phones or other devices that make noise must be turned off and out of sight when you enter the classroom. Disruption of class, whether by talking, noisy devices, eating in class or other inconsiderate behavior, will not be tolerated. Students who violate these rules will be asked to leave the classroom and will not be allowed to return until they have spoken privately with me.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at this link.

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Religious Holidays

(from the online Academic Calendar): Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

Accommodations for Disabilities

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.
In addition, this statement on emergency evacuation is often included, but not required: Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and One-Stop Service Center.

Course Evaluations

Stony Brook University values student feedback in maintaining the high quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of- the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the link to access the course evaluation system.

Tips for Success

- Attend classes, participate actively, and start assignments early.

- Use recall and test yourself frequently.

- Alternate problem-solving techniques and take breaks.

- Focus, avoid distractions, and get enough sleep.

Commit yourself to the class on day one. If you devote ample time to working on homework, reading the textbook and your notes, and thinking about the concepts we are learning, you will learn this material and you will learn it well. You will build a strong foundation for future math and science classes, as well as good study and organizational habits, which will be essential throughout your university studies. You have the ability to reach success if you commit yourself to excellence. Moreover, you do not have to reach success alone. Get to know your classmates, and learn with and from each other. Come to see me whenever you have questions.