AMS 341 Operations Research I: Deterministic Models, Fall 2022

Distance Learning

Instructor:  Estie Arkin, Math Tower P134B, 632-8363, esther.arkin@stonybrook.edu;

Office hours: We will use the official class meeting times to go over additional examples, review and questions. If you want to meet individually, please send me an email and I will be happy to set them up a zoom meeting. I also welcome questions by email.

Teaching Assistants: Vishwa Arasappan, vishwa.arasappan@stonybrook.edu office hours Tuesday 11:30am-1:30pm on zoom
Angel Li angel.li@stonybrook.edu office hours Monday and Wednesday 5-6pm,
Andreas Lietzau, andreas.lietzau@stonybrook.edu office hours Friday 10-12, in person.
Office hours will be online or in person; look for instructions on Blackboard.

Lectures: Monday, Wednesday 10:30-11:50, Pre-recorded modules will be available before class, please watch. The designated class time alternate between going over more examples, homework solutions and answer students questions, (so please try to “attend” live, if possible) and office hours to answer individual students questions or concerns.


Optional texts: There are many books on the subject, here is a very partial list: Applied Mathematical Programming, by Bradley, Hax, and Magnanti, Introduction to Operations Research, by Hillier and Lieberman, Linear Programming, by Chvátal, and Linear Programming and Related Problems, by Nering and Tucker.

Computing: LP’s can be solved by a many programs, you can choose to use whichever you’d like. The two options discussed in the textbook are Excel and Lindo.

Homeworks: Homework will be assigned weekly (approximately), posted on blackboard, to be turned in via blackboard, as a single PDF file, before the due date and time. Homework that does not meet these expectations will not be graded and will not receive credit. If you want to correct your submission (before the deadline) you may upload a revision. Only your last submission will be graded. There will be approximately 10 homework sets, equally weighted, and I will drop the lowest two scores before computing your average. Please note that due dates may be on different days of the week (due to holidays etc) so make sure you carefully check the due date.
Homework cover sheet: Homework 0 is a cover sheet (available on blackboard) which should be filled out and applies to all homeworks submitted by a student. A student that does not turn in the cover sheet (Homework 0) will get a score of zero on all homework assignments. Due date is October 3th.
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.

Exams: There will be two exams. Exam 1 will be during class, tentatively scheduled for Monday October 17 during class time. The second exam (final) is Wednesday December 14, 2:15-4:30pm, (80 minutes long) and is non cumulative. All exams are closed notes and book. Exam times are by NY (Stony Brook) time, and will be online, details will be posted on blackboard.
Grades: Your total average score will be computed based on 20% homework, 40% for each of the two exams. Please note that there will be **no extra credit** option. I will use your total average score to assign a letter grade; about 30% A's, 35% B's, 25% C's, and 10% D's and F's.

Course Outline: The following chapters will be covered: 1-2, 3, 4 Sections 1-9, 11-13, 5 Sections 1-3, 6 Sections 4-8, Transportation and Assignment problems (Chapter 7 Sections 1-3, 5), CPM (Section 8-4), Integer programming (Chapter 9 Sections 1-4, 8) and Dynamic Programming (Chapter 13[VW] 18[W], Sections 1-2, 4-5).

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.
**Student Accessibility Support Center Statement:** If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

**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 http://www.stonybrook.edu/commcms/academic_integrity/index.html

**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.

**Technical Needs (Hardware and Software):** The following list details a minimum recommended computer set-up and the software packages you will need to access and use:

- **Hardware:**
  - PC (Windows 7, 8, or 10) or Macintosh (OS X/macOS 10.10 or higher).
  - 4 GB RAM.
  - A high-speed internet connection. Note that public WiFi (e.g., Starbucks) and internet service provider hotspots (e.g., optimumwifi or xfinitywifi) are **not recommended**.
  - Printer and scanner. A cell phone or tablet camera can do the scanning, with apps such as Office Lens or CamScanner (there are many others).
  - Speakers (either internal or external) or headphones. **Headphones are strongly recommended** to reduce the risk of feedback during communications.
  - Microphone (either internal or external).
  - WebCam or other camera (interfacing with your computer) for producing video.

- **Software (additional tools may be needed).** **Remember to use your Stony Brook email or NetID** when configuring specialized software:
  - An up-to-date Internet browser, such as Chrome, Firefox, Explorer/Edge (Windows), or Safari (macOS). A complete list of supported browsers and operating systems can be found on the My Institution page when you log in to Blackboard.
  - PDF viewer, such as Adobe Reader.
  - Zoom. Stony Brook has a site license for Zoom; you can find information on downloading, installing, and using Zoom at [https://it.stonybrook.edu/services/zoom/students](https://it.stonybrook.edu/services/zoom/students).
  - Respondus LockDown browser and Monitor, for taking quizzes and exams. Stony Brook has a site license for these packages; see [https://download.respondus.com/lockdown/download.php?id=772113517](https://download.respondus.com/lockdown/download.php?id=772113517).

**Technical Assistance:** If you need technical assistance at any time during the course or to report a problem with Blackboard you can:

- Visit the Stony Brook University Student Help Desk Page, [http://www.stonybrook.edu/helpme](http://www.stonybrook.edu/helpme)
- Phone:
- (631) 632-2358 (technical support and Blackboard issues)
- (631) 632-9800 (client support, wifi, software and hardware)

• Create a ticket at http://service.stonybrook.edu.

Students who need assistance with their personal devices can contact DoIT’s service desk at (631) 632-9800 or submit an online request. For more information, visit: https://it.stonybrook.edu/students