Fall 2019

EM 602-851: Management Science

Cai

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EM 602-851 Management Science

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It is the responsibility of students to read and understand the course syllabus. Students enrolled in this course agree to all terms specified in the syllabus.

Instructor:
Dr. Cai
Associate Professor
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Email: cai@njit.edu

Online Office Hours:
6:30 - 7:30 pm on Thur (via WebEx)
In-person Office Hours:
Wed: 4:30 - 5:30 pm
Office: MEC 308

Course Website on Moodle: `https://njit2.mrooms.net/course/view.php?id=30696`

Course Description: This is a graduate level course on management science (MS), a discipline that facilitates managerial decision making by applying a scientific approach to problems with quantitative factors. MS applies Operations Research (OR) methodologies and techniques to solve complex, real-world problems in various fields such as services, manufacturing, and supply chain. Topics covered in this course include Linear Programming (LP) Formulation, Network Models, Applications of Linear Programming in Marketing, Finance, and Operations Management, The Simplex Method, Sensitivity Analysis, Duality, Inventory Models, and Queueing Models. The overall learning outcomes include formulating mathematical models, solving solutions using Excel Solver, developing solutions using classical optimization techniques, and interpreting optimal solutions.

Course Prerequisite: Undergraduate level of calculus, linear algebra, and probability.

Required Textbook: *An Introduction to Management Science: Quantitative Approaches to Decision Making* by Anderson et al. 15th Edition. Cengage, 2018. ISBN: 9781337406529.

Required Hardware and Software:

- A personal computer equipped with a webcam.

- Excel with its built-in Solver.

  - *What is the Solver used for in this course?* The Solver is used to solve linear programs.

  - *How to install the Solver add-in?* Click here for directions on how to load the Solver add-in in Excel.

- The Respondus Lockdown Browser.

– *What is the Respondus Lockdown Browser?* It is a proctoring application that assists with the academic integrity of online exams. It prevents students from printing, copying, going to another URL, or accessing other applications during an exam. When a Moodle exam requires that LockDown Browser be used, students will not be able to take the exams with a standard web browser (Chrome, Safari, Firefox, etc.).

– *What role does the Respondus LockDown Browser play during an online exam?* It will access the student's webcam to record him/her during an online exam. The webcam can be built into the student's computer or can be the type that plugs in with a USB cable.

– *What role does the Respondus LockDown Browser play after an online exam?* It analyzes the recorded videos to catch violations of academic integrity. Click here to see the NJIT's Academic Integrity Code.

– *How does the Respondus LockDown Browser work?* Click here to watch a video to get a basic understanding of LockDown Browser and the webcam feature.

– *How to install the Respondus LockDown Browser?* For instructions on installing and using the LockDown Browser, click here.

In order to take this course, students must agree with the following: 1) use the Respondus Lockdown Browser and the webcam on their personal computers to take the exams; 2) use their webcams to (i) record pictured IDs issued either by NJIT or a state/local government, (ii) take pictures of their faces, and (iii) scan their environments at the beginning of each exam, and 3) be recorded by the webcam during the entire exams. Students who refuse to use the Respondus Lockdown Browser and the webcam during the entire exams will receive zeros on their exams.

Courseware Issues: The Office of Digital Learning manages all courseware, such as Moodle, Respondus and Webex. When encountering any technical issue with any courseware (even during an exam), submit a ticket to the IST Service Desk using this website: `https://servicedesk.njit.edu/CherwellPortal/IST?_=4a2ae959`. The Office of Digital Learning, after receiving a ticket, will assign a representative to help resolve the technical issue. Please note that the instructor has neither the admin right nor the in-depth knowledge to help students with technical issues.

Course Delivery via Moodle: This course will be primarily conducted online using Moodle. Recorded lectures, lecture notes, homework assignments, and exams are disseminated via Moodle. Students are expected to spend a minimum of 6 hours per week on coursework and assignments.

Office Hours via WebEx: Office hours are conducted online via WebEx. At the beginning of the semester, the instructor will send a Webex meeting invite to all students using their NJIT registered email addresses. Though students only receive this meeting invite once, the meeting invite is for a weekly office hour throughout the semester. Students are

responsible to check their emails and save the meeting invite for use throughout the semester.

During office hours, the instructor will answer any questions students may have. Office hours are <u>NOT</u> mandatory. Students who cannot attend the office hours may ask their questions via email. The instructor will answer emails during normal business hours: Monday - Friday between 8 am and 5 pm. Please allow 24 hours for a response.

Communication Method: Important information, comments, corrections, and updates about the course will be posted on Moodle. Students are responsible to check the course webpage on Moodle regularly.

Communication Etiquette: Communication via email or online discussions with the instructor and with each other is expected to be <u>professional</u>. The instructor will <u>NOT</u> answer emails or questions posted on online discussions that are not professionally formatted and stated. The following links provide examples of professional email etiquette: `https://www.math.uh.edu/~tomforde/Email-Etiquette.html` and `https://www.wikihow.com/Email-a-Professor`.

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is the responsibility of students to protect their educational investment by knowing and following the academic code of integrity policy, which can be found at: `https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf`.

Please note that it is the instructor's professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. Students who have questions about the code of Academic Integrity should contact the Dean of Students Office at dos@njit.edu.

Homework Assignments: Homework assignments are intended to help students learn the topics and keep up with the pace of the course. Deadlines are set so feedbacks, such as homework solutions and grades, can be provided in a timely manner. Homework assignments and deadlines will be posted on Moodle.

- **Submission Policy**: Students may choose to either type up their answers to the homework problems or scan their hand-written answers. All students must submit homework assignments via Moodle. Only two file formats are accepted: pdf and excel spreadsheets. A maximum of two files, one in pdf and another in xlsx (excel spreadsheet), are allowed. The cutoff submission time is set at 11:30pm of the due date. Late submissions via Moodle or submissions via email will NOT be graded and will receive zero points.

- **Solutions:** Homework solutions will be posted on Moodle after the submission deadline. In order to receive full points, students must meet the criteria specified in each homework assignment. The instructor will check whether the criteria specified are met. The instructor will <u>NOT</u> grade the assignments based on the accuracy of students' work. Students are responsible to compare their work to the homework solutions and ask questions during office hours or via email.

- **Grading**: Due to various (health, work, religion, etc.) reasons, students may need to miss a few homework submissions. The lowest three homework scores will be dropped in the calculation of the course grade. As a result, missing up to three homework assignments will NOT negatively impact students' course grades.

- **Collaboration:** Group learning is an effective learning strategy even in an online learning environment. Students are strongly encouraged to collaborate with (at most two) of their classmates. However, every student must type/write up the solution or create his/her own Excel spreadsheet. Be sure to include the following sentences at the top of the homework: "*I collaborated with (Student's name) and (Student's name) on this homework.*" or "*I worked alone on this homework.*" Students will receive a <u>zero</u> if they (1) fail to include one of the previous two sentences, or (2) copy their classmates' work or electronic file.

Midterm and Final Exams: Two midterm exams and a final exam are scheduled, see Table 1 for exam dates. Because some students work full-time Monday to Saturday, all exams are scheduled on Sunday afternoons, between 2pm and 5pm.

- To ensure academic integrity, multiple versions of the exams will be used. All exams are administered online. Further, all students are required to use the *Respondus Lockdown Browser* with webcams during the exams.

- The exams are comprehensive (or cumulative), closed book, and closed notes. Students may bring a calculator and blank sheets of paper. Students must show these items during the Respondus' environment check step. No other electronics (cell phones, tablets, computers, smart devices, etc.) are permitted.

- Students found cheating on the exams, as defined in the NJIT's Academic Integrity Code, will receive a grade of F, and be reported to the Dean of Students.

Make-up Exam Policy: No make-up exams will be administered without formal approval from the Dean of Students. Typical reasons that will <u>NOT</u> grant a make-up exam include, but not limited to, (1) work matters, (2) planned vacations and other events, (3) lack of preparation, or (4) misinformation. Students who cannot complete the exams because of automatic updates of personal computers, poor internet connects, etc. will <u>NOT</u> receive time extensions or make-up exams. They will also not be allowed to submit answers after the exams.

To properly report absence of a midterm or a final exam, the student must do the following:

- Contact the Dean of Students at dos@njit.edu <u>before</u> the exam and provide necessary documentation to support the student's reason for missing an exam. In order to protect students' privacy, do <u>NOT</u> copy the instructor on the email (see Student Privacy for reasons).

    – Students who have incapacitating illness or emergencies that prevent them from contacting the Dean of Students before or during the exams must notify the Dean of Students within 72 hours of the missed exams.

- If circumstances warrant a makeup exam, the Office of Dean of Students will email a formal notice to the instructor. The instructor will then notify the student the date and time of the makeup exam. Students cannot pick the date.

Student Privacy: The following paragraph is cited from the NJIT Academic Policies and Procedures:

> The university continues to make every effort to protect students' academic and personal information. Moreover, maintaining the confidentiality of students' medical information is a legal and ethical duty, as defined by federal and state laws and regulations, and by the courts. Whenever students have a situation that affects their academic standing, it should be brought to the Dean of Students. This includes medical or psychological documentation to support a student's claim. Students should not bring such information to their instructors, nor should it be requested by a faculty member. The Dean of Students has a physician and staff psychologists to evaluate such information to verify its legitimacy. The Dean of Students will then notify the faculty member(s) if a student has a legitimate absence and will ask that the student receive consideration in making up any missed course work or exam. This process ensures confidentiality of students' information and, just as important, consistency in dealing with such matters.

Course Grade Calculation: A weighted average grade will be calculated using the following weights:

HW Assignments*	Midterm Exam 1	Midterm Exam 2	Final Exam	Total Weights
20	25	25	30	100

*There are 10 homework assignments (including a practice exam) total, and the lowest 3 homework scores will be dropped.

Mapping from the course grade to Letter Grade:

Course Grade	85%-100%	75%-84%	65%-74%	55%-64%	45%-54%	Below 44%
Letter Grade	A	B+	B	C+	C	F

Incomplete ("I") grade: The "I" grade is only given in rare instances when a student who would normally have completed the course work but who could not do so because of extenuating circumstances. When a student invokes extenuating circumstances for an "I" grade, the student must contact the Dean of Students first. The Dean of Students will be making the determination of whether extenuating circumstances exist or not and will be notifying the instructor accordingly.

Please note that except for cases determined by law, the instructor is NOT required to accommodate student requests even when extenuating circumstances are certified by the Dean of Students. Therefore, the Incomplete grades will only be granted when ALL of the following conditions are satisfied:

- There is a written statement from the Dean of Students certifying the student's circumstance qualifies for an Incomplete.

- The student has completed at least 70% of all coursework when requesting an "I" grade.

- The instructor and the student are able to come to an agreement before the final grade due date (Dec 22, 2019), in writing, on the exact work to be completed and the date by which it must be submitted.

When giving a grade of "I", the instructor will notify the student (and copy the Department Chair and the Dean of Students), in writing, of the exact work to be completed and the date by which it must be submitted. If the specified work is not submitted by the specified date. The "I" grade will be automatically changed to a "F" grade in the next regular semester.

Modifications to Syllabus: The syllabus is subject to change. Students will be notified by the instructor should any modifications or deviations from the syllabus occur.

Table 1: Tentative Schedule and Learning Outcomes

Week	Topic	Textbook Chapters	Learning Outcomes	HW#: due date
9/3-9/8	Overview of MS	Ch1	Develop a general understanding of the MS/OR approach to decision-making.	HW1: 9/8
	Intro to LP	Ch2	Formulate a LP problem with four components; Solve a LP problem with two decision variables using the graphical solution procedure.	HW2: 9/15
9/9-9/15	Network Models	Ch6	Convert problems to transportation and/or assignment models; Solve LP problems using Excel; Interpret solutions.	HW3: 9/22
9/13	Students Remain In This Course After this date Agree To ALL Terms Specified In This Syllabus			
9/14	W Grades Posted for Course Withdrawals			
9/16-9/22	Applications of LP models	Ch4	Formulate problems in marketing, finance and operations management as LP problems; Solve LP problems using Excel; Interpret solutions.	HW4: 9/29
9/23-9/29	Midterm Exam 1 Review	Ch2, Ch6, Ch4	Topics covered: LP Formulation; Network Models; Applications of LP models	practice exam: 9/29
10/6	Midterm Exam 1 via Respondus Lockdown Browser, 2-5 pm			

10/7-10/13	Simplex Method	Ch17	Convert an LP to its Standard Form; Perform Simplex iterations using tableau.	HW5: 10/20
10/14-10/20	Sensitivity Analysis	Ch3, Ch18.1	Revise the initial and the final Simplex tableau when either a RHS value or an objective function coefficients is changed in the original LP; Compute the range of feasibility of a RHS value and the range of optimality of an objective function coefficient.	HW6: 10/27
10/21-10/27	Midterm Exam 2 Review	Ch2, Ch6, Ch4, Ch17, Ch3, Ch18.1	Topics covered: LP Formulation; Network Models; Applications of LP models; The Simplex Method; Sensitivity Analysis.	
11/3	**Midterm Exam 2 via Respondus Lockdown Browser, 2-5 pm**			
11/4-11/10	Duality	Ch18.2	Find the Dual of any Primal problem; using the Dual to identify the Primal solution	HW7: 11/17
11/11	Last Day To Withdrawal			
11/11-11/17	Inventory Models	Ch10	Set up an EOQ and an Economic Production Lot Size models to minimize the cost of an inventory system; Determine how much and when to order decisions.	HW8: 11/24
11/18-11/24	Thanksgiving Recess - No new topics or office hours			
11/25-12/1	Queueing Models	Ch 11	Compute operating characteristics of a single-server or a multi-server queuing model; Perform economic analysis of a system with waiting line(s).	HW9: 12/8

12/2-12/8	Final Exam Review	Ch2, Ch3, Ch4, Ch6, Ch10, Ch11, Ch17, Ch18	Topics covered: LP Formulation; Network Models; Applications of LP models; The Simplex Method; Sensitivity Analysis; Duality; Inventory Models; Queueing Models.	
12/15	**Final Exam via Respondus Lockdown Browser, 2-5 pm**			
12/22	Final Grade Posted			