O'Neill School of Public and Environmental Affairs
SPEA V348 Management Science

Instructor: Ruodan Zhang; rz3@iu.edu [Please email me through Canvas Inbox]; SPEA 412
Teaching Assistant: Madeline Miller; millmade@iu.edu

Class Meeting: MW 04:00-05:15PM; PV A335
Office Hours:
>   Ruodan Zhang: M 02:30-03:30PM at SPEA 412; or by appointment
>   Madeline Miller: TBD at SPEA 412

Course Description: Introduction to management science models and methods for policy analysis and public management. Management science offers insights that can be used to inform personal decision making, or to understand complex contemporary issues. The topics include decision analysis, linear programming (including goal programming, transportation and assignment problems), forecasting, etc. Computer-based applications are included. Prior familiarization with computers is recommended, though not required. The course objectives are (1) to understand what a model is and why it is useful; and (2) to learn quantitative techniques for modeling and decision-making.

The class uses Microsoft Excel as the modeling environment. Spreadsheets are one of the most widely used software packages. Management Science (MS) techniques can be easily demonstrated and implemented using Microsoft Excel. In turn, experimentation in spreadsheet environments improves students' intuitive understanding of MS tools. In addition, students gain extensive hands-on experience with Excel, something employers are looking for.

Learning Outcomes: By the end of the semester, you should be able to solve management problems using mathematical models.

It means that after successful completion of this course, you should be able to:
1. Understand and differentiate various types of management problems: linear programming, integer programming, network flow modeling, goal programming, decision-making under uncertainty, and forecasting;
2. Implement modeling techniques using Microsoft Excel;

3. Construct and solve management problems with modeling logic:
   a. Set up the model
   b. Analyze graphs
   c. Conduct sensitivity analysis
   d. Interpret modeling results.

Course Material
Required eText: Bernard W. Taylor III. (2016). *Introduction to Management Science*, 12th Edition. Pearson.

Other resources: Wayne L. Winston and S. Christian Albright. (2016). *Practical Management Science*, Mason, OH: Thomson South-Western.
   The Microsoft support blog has some useful tutorials – https://support.office.com/en-US/article/Excel-2016-Training-11af2a19-c46d-4b53-916d-f1597ba2b2ae

Prerequisites
An introductory statistics course, such as SPEA-K300/MATH-M025/MATH-M118, is a formal prerequisite for this course. In addition, students are expected to have a firm grasp of algebra and some experience with Microsoft Excel. Students need to at least know how to create formulas in Excel.

Course Requirements:
Homework (10 problem sets)	40 points
Two In-Class Exams	20 points
Cumulative Final Exam	30 points
Attendance / In-class Activities	5 points
Participation and Reading Quizzes	5 points
Optional: Extra problems	-
Total points	*100*

Grading Scale
Your final grade in the course is determined in accordance with the table below.

97 - 100% = A+	87 - 89% = B+	77 - 79% = C+	67 - 69% = D+
93 - 96% = A	83 - 86% = B	73 - 76% = C	63 - 66% = D
90 - 92% = A-	80 - 82% = B-	70 - 72% = C-	60 - 62% = D-

Homework
There will be 10 problem sets, each with 4 points. All problem sets must be submitted individually through Canvas. **No late submission or email submission is accepted.**
   Homework/Exam Grading Rubric (Applicable to most Excel problem sets)

Task	*Requirement*	*Point*

Parameters	Identify all parameters	0.5
Decision variables	Identify all decision variables, highlight/color the decision cells	0.5
Objective function	Identify the problem objective and show the way leading to it, highlight/color the objective cell	0.5
Constraints	Set up all constraints in Solver	0.5
Structure and range names	Structure be legible and logical; create and use range names	0.5
Optimization	Use Solver to optimize the solution; must show range names wherever applicable	0.5
Interpretation	Interpret the solution accurately, and if applicable, justify the decision	0.5
Sensitivity analysis	Conduct sensitivity analysis as the problem asks	0.5

Optional: Ungraded problems
In order to enhance students' learning experience, there will be about 10 extra ungraded problem sets for students to practice after class. Submission is optional. These problem sets will not be graded and do not count towards the final grades. Students are welcome to ask for solutions or request specific types of practice questions.

Two In-Class Exams
Two midterm in-class exams consisting of multiple-choice, true/false tests and problems will cover all previous materials including slides and textbook chapters. Both exams are one-hour-long and open-book. No late submission is allowed.

All students must work individually and submit their work through Canvas by the end of the exam session. The exam aims at testing students' basic understanding of spreadsheet modeling, sensitivity analysis, and their ability to work on Excel Solver for optimization problems individually.

The instructor reserves the right to adjust the scores of the exam (up) if class scores are not normally distributed. No makeup exam is granted. The exam has to be individual work. Any kind of collaboration is prohibited. Report to the instructor if anyone asks you for collaboration, comparing, or copying answers. Plagiarism can lead to 0 points for the midterm exam or a grade of F for the class (please read the Academic Integrity policies).

Cumulative Final Exam
The final exam is a five-day-long, take-home, open-book exam. No late submission is allowed. The problems will cover all previous materials including slides and textbook chapters. The instructor reserves the right to adjust the scores of the exam (up) if class scores are not normally distributed. No makeup exam is granted. The exam has to be individual work. Any kind of

collaboration is prohibited. Report to the instructor if anyone asks you for collaboration, comparing, or copying answers. Plagiarism can lead to 0 points for the final exam or a grade of F for the class (please read the Academic Integrity policies).

Attendance and In-class Activities

Attendance is essential for you to succeed in this class. There is no penalty for the first absence, and you will receive 1 point off for each subsequent unexcused absence. The instructor respects your family emergency, religious belief, and your health. You must notify the instructor prior to missing a class. The instructor reserves the right to deduct a full letter grade from the course grade for four or more unexcused absences.

There will also be 5 in-class tasks (worksheet or in-class group projects) throughout the semester. You will receive 1 point off for each missing submission.

Please keep in mind that job interviews are not an excuse for missed assignments, classes, or exams. You must be responsible for your own schedule. Makeup assignments or quizzes are granted in the case of a justified emergency situation (e.g. an official note from a doctor, priest, minister, rabbi, etc.).

Participation and Reading Quizzes

Students must be respectful of their classmates and the professor in the classroom, or will be asked to leave the class. Disruptive behavior will not be tolerated. Such students will also be asked to leave the class. It is within the discretion of the instructor to determine what constitutes disrespectful and disruptive behavior. In this regard, please note that cellphone use is prohibited during the class session. Please use your cellphone to log into your IU accounts prior to each class session. You will receive 1 point off each time you are found using the lab computer or your cellphone for activities unrelated to the class. The instructor reserves the right to increase a student's grade for extraordinary class participation that includes responding to questions, utilizing office hours, and adding significantly to the intellectual dialogue in the classroom.

There will also be 5 reading quizzes on Canvas. You must complete all of them by the due dates to receive full points on Participation and Reading Quizzes. You will receive 1 point off for each missing reading quiz.

Estimated Out-of-class Workload (16 weeks)

Activity	Description	Hours per activity	Total (Hours)
Reading Assignments	Approximately 30 pages per week	1	16
Reading Quizzes	5 reading quizzes	0.5	2.5
Problem Sets	10 problem sets	2	20
Optional Ungraded Problems	Approximately 10 sets	2	20 (optional)
Study Hours for Exams	3 exams	6	18
Final Exam	Take-home exam	10	10
Estimated Workload		**4.16~5.41 out of class hours/week**	

Classroom and Office Hour Technology

Please bring your own laptop to class.

In order to facilitate the lecture, we use Zoom to share screens and conduct class activities. Students need to join the meeting using the following details:

Class meeting ID: 901-847-936
Class meeting link: https://IU.zoom.us/j/901847936

O'Neill School expectations of civility and professional conduct

The O'Neill School takes matters of honesty and integrity seriously because O'Neill is the training ground for future leaders in government, civic organizations, health organizations, and other institutions charged with providing resources for the public, and for members of society who are vulnerable and who are lacking in power and status. Precisely because O'Neill graduates tend to rise to positions of power and responsibility, it is critical that the lessons of honesty and integrity are learned early. If you have not done so, you should read the *O'Neill Student Honor Code*, which can be accessed at
https://oneill.indiana.edu/doc/undergraduate/ugrd_student_honorcode.pdf.

O'Neill requires that all members of its community – students, faculty, and staff – treat others with an attitude of mutual respect both in the classroom and during all academic and nonacademic activities outside the classroom. A student is expected to show respect through behavior that promotes conditions in which all students can learn without interruption or distraction. These behaviors foster an appropriate atmosphere inside and outside the classroom:

- Students are expected to attend class regularly and to be prepared for class.
- Students must be punctual in their arrival to class and be present and attentive for the duration of the class. Eating, sleeping, reading the newspaper, doing work for another class, wandering in and out of the classroom, and packing up or leaving class early are not civil or professional behaviors.
- Students must abide by the course policy regarding use of electronic devices in the classroom.
- Students must responsibly participate in class activities and during team meetings.
- Students must address faculty members, other students, and others appropriately and with respect, whether in person, in writing, or in electronic communications.
- Students must show tolerance and respect for diverse nationalities, religions, races, sexual orientations, and physical abilities.
- Students must not destroy or deface classroom property nor leave litter in the classroom.

Academic Integrity
O'Neill faculty do not tolerate cheating, plagiarism, or any other form of academic dishonesty. If you have not done so, you should read the IUB *Code of Student Rights, Responsibilities, and*

Conduct, which can be accessed at http://www.iu.edu/~code/code/index.shtml so you will be sure to understand what these terms mean and what penalties can be issued for academic dishonesty. Academic dishonesty can result in a grade of F for the class (an F for academic dishonesty cannot be removed from the transcript). Significant violations of the Code can result in expulsion from the University.

Incompletes
The grade of Incomplete used on the final grade reports indicates that the work is satisfactory as of the end of the semester but has not been completed. The grade of Incomplete may be given only when the completed portion of a student's work in the course is of passing quality. Instructors may award the grade of Incomplete upon a showing of such hardship to a student as would render it unjust to hold the student to the time limits previously fixed for the completion of his/her work. (http://policies.iu.edu/policies/categories/academic-faculty-students/academic-student-affairs/incompletes.shtml)

Late Withdrawal
Withdrawal after the automatic withdrawal period requires approval by the instructor and relevant Program Director, and must be based on dire circumstances relating to extended illness or equivalent distress (IU Enrollment and Student Academic Information Bulletin). Requests to drop due to a failing grade will not be approved. You must be passing the course at the time of withdrawal. Contact your advisor or the appropriate Program Director if you want to petition for late withdrawal.

Class Schedule:

WEEK	DATE	TOPIC	TAYLOR CHAPTER	OUTCOMES AND LEARNING
1	August 26	Introduction, Syllabus, Class Technology, Logistics	1	Knowledge Survey
	August 28	Break-even Analysis	2	
2	September 2	Labor Day: NO CLASS		
	September 4	Linear Programming: Model Formulation and Graphic Solution	2	Due before class: Reading Quiz 1
3	September 9	Linear Programming & Spreadsheet Modeling Basics	3	
	September 11	Excel Solver & Spreadsheet Modeling	3	
4	September 16	Excel Solver & Spreadsheet Modeling: Sensitivity Analysis	4	
	September 18	Linear Programming Models: Product Mix	4	
5	September 23	Linear Programming Models: Investment	4	PS1 due

	September 25	Linear Programming Models: Blending; SolverTable	4	
6	September 30	Linear Programming Models: Review	4	PS2 due
	October 2	In-class Exam 1		Exam 1
7	October 7	Linear Programming Models: Data Envelopment Analysis	4 Canvas	PS3 due Due before class: Reading Quiz 2
	October 9	Linear Programming Models: Data Envelopment Analysis	4 Canvas	
8	October 14	Integer Programming: Workforce Scheduling	5	PS4 due
	October 16	Integer Programming Binary Models	5 Canvas	
9	October 21	Transportation and Network Flow	6	PS5 due Due before class: Reading Quiz 3
	October 23	Transportation and Network Flow: Transshipment, Assignment	6	
10	October 28	Transportation and Network Flow: Shortest Route	6	PS6 due
	October 30	Transportation and Network Flow: Maximal Flow	6	
11	November 4	Transportation and Network Flow: Review	6	PS7 due
	November 6	Goal Programming	9	
12	November 11	Goal Programming, Analytical Hierarchy Process	9	PS8 due
	November 13	Analytical Hierarchy Process	9	
13	November 18	Decision Analysis	12 Canvas	PS9 due
	November 20	In-class Exam 2		Exam 2
14	November 25	NO CLASS		
	November 27	NO CLASS		
15	December 2	Decision Analysis: Bayesian, Prospect Theory	12 Canvas	Due before class: Reading Quiz 4
	December 4	Forecasting	15	Due before class: Reading Quiz 5
16	December 9	Forecasting Regression analysis	15 Canvas	PS10 due

	December 11	Course review		
	December 11	Final Exam Starts		6:00PM
17	December 16	Final Exam Ends		6:00PM

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The above schedule is subject to limited change in the event of extenuating circumstances.
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Additional Information:

1. Counseling and Psychological Services For information about services offered to students by CAPS: http://healthcenter.indiana.edu/counseling/index.shtml.

2. Disability Services for Students For information about support services or accommodations available to students with disabilities, and for the procedures to be followed by students and instructors: http://studentaffairs.iub.edu/dss/.

3. Sexual Harassment. As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.
If you are seeking help and would like to speak to someone confidentially, you can make an appointment with:
  i.   The Sexual Assault Crisis Service (SACS) at 812-855-8900
  ii. Counseling and Psychological Services (CAPS) at 812-855-5711
  iii. Confidential Victim Advocates (CVA) at 812-856-2469
  iv. IU Health Center at 812-855-4011

For more information about available resources:
http://stopsexualviolence.iu.edu/help/index.html. It is also important to know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist. I encourage you to visit http://stopsexualviolence.iu.edu/help/index.html to learn more.