2018

665-W28 Spreadsheet Applications for Decision Making

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Xavier University

INFO 665

Xavier University: Spreadsheet Applications for Decision Making
Spring 2018

Scheduled Meeting Time
Mondays 5:30-9:15pm 4/2 – 6/11 (No class 5/28)

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Instructor: Brett S. Stowell **Email:** stowellbs@xavier.edu **Phone:** 513/745-2922
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Office Hours: West Chester: Before and after class. Virtual: By appointment.
Text: Business Analytics 2e; Evans (978-0-321-99782-1)
The Goal; Goldratt (978-0-321-99782-1)
Good Strategy Bad Strategy; Rumelt (978-0307886231)

Williams College of Business Mission: "We educate students of business, enabling them to improve organizations and society, consistent with the Jesuit tradition."

My Vision: The concept of "unintended consequences" receives no more than a cursory review in most Business Analytics / Management Science courses. Unfortunately, Excel and other statistical packages (R, JMP, SAS, SPSS, etc.) will generate a result for inputs irrespective of the experimental design from which those inputs are derived. As managers, executives and practitioners you will be requesting, generating, and acting upon reports that use the tools we will learn this semester to transform some "glob" of data into information. Given the widespread availability of low-cost analytical tools and openly available data sets, not to mention the ongoing surge in retention of proprietary data, it is becoming more and more likely to see reports which seem to do all the "right" things yet through either intent, negligence, or user error come up with "wrong" answers. It is my hope that at the end of this course you will have a sufficient understanding of the subject matter to competently design and model optimization problems, and to proficiently critique models generated by others.

Course Description: This course blends elements of economics with statistical tools and operations management / project management concepts to arrive at an application of management science that equips the practitioner to model and optimize complex systems. Class time will be divided between lectures introducing concepts, practice sessions with class time devoted to hands-on application of the tools introduced, and real-world applications.

Course Materials: In addition to the text, you are responsible for materials posted on Canvas (http://canvas.xavier.edu). Homework assignments, supplemental reading, and other information will be posted regularly. Students without access to a PC running Excel should make use of the Virtual Lab for completing assignments, projects and exams. (http://www.xavier.edu/ts/students/Virtual-Desktop.cfm)

Grades: Your final grade will consist of two exams (50%), a final project (30%) and regular homework and cases (20%). Possible grades are A (95-100), A- (90-94.9), B+ (85-89.9), B(80-84.9), B- (75-79.9), C+ (70-74.9), C (65-69.9), F (Below 65). You must earn at least a "C" on each of the exams and the project to pass the class; the instructor will provide anyone receiving a failing grade an opportunity to demonstrate the required competency, replace the failing grade with a 65%, and thus pass the class. No other extra credit is available.

Due Dates: Due dates and test dates are firm. Students are expected to contact the instructor prior to an expected absence to make arrangements. Late assignments will receive no credit.

Academic Honesty: Do your own work. Review Xavier's Academic Honesty policy for more information.

Xavier University Policies: Xavier University policies regarding privacy rights, incomplete work and attendance, and academic honesty will be strictly enforced. Please see the current University catalog for more on these policies.

Tentative Course Calendar

Class	Topics Covered	Assignments Due
4/2	Introduction to Course Introduction to Xavier Library Introduction to Virtual Desktop Introduction to Reproducible Research Central Tendency (Evans p 97-100) Questions We Can Answer Using Statistics	
4/9	Data, Models & Problem Solving (Evans p 13-29) Descriptive Statistical Measures (Evans Ch 4) PRACTICE: Descriptive Statistical Measures (Evans Ch 4) EXAMPLE: Product Mix EXAMPLE: Facility Location EXAMPLE: Blending EXAMPLE: Network Modeling (PM / Nodes & Arcs)	Read *The Goal* Watch Goldratt Video
4/16	Probability Distributions and Data Modeling (Evans Ch 5) Sampling and Estimation (Evans Ch 6) EXAMPLE: Staff / Resource Scheduling EXAMPLE: Process Selection: Make vs. Buy / Outsource vs. Insource EXAMPLE: Transportation EXAMPLE: Production Planning	Final Project Topic HW 1 (See Canvas for details) Read *Good Strategy*
4/23	Statistical Inference (Evans Ch 7) Trendlines and Regression Analysis (Evans Ch 8) PRACTICE: Trendlines and Regression Analysis (Evans Ch 8)	HW 2 (See Canvas for details)
4/30	Spreadsheet Modeling and Analysis (Evans Ch 11) PRACTICE: Spreadsheet Modeling and Analysis (Evans Ch 11)	Final Project Proposal HW 3 (See Canvas for details)
5/7	Linear Optimization (Evans Ch 13) PRACTICE: Linear Optimization (Evans Ch 13)	HW 4 (See Canvas for details) Final Project Proposal Peer Review **EXAM 1 (Ch 1-8)**
5/14	Applications of Linear Optimization (Evans Ch 14) PRACTICE: Applications of Linear Optimization (Evans Ch 14)	HW 5 (See Canvas for details)
5/21	Integer Optimization (Evans Ch 15) PRACTICE: Integer Optimization (Evans Ch 15)	Optimization Model Submission HW 6 (See Canvas for details)
6/4	Nonlinear and Non-Smooth Optimization (Evans Ch 17/A) PRACTICE: Nonlinear and Non-Smooth Optimization (Evans Ch 17/A)	Final Project Draft Paper Submission (Optional) HW 7 (See Canvas for details)
6/11	Project Presentations	**EXAM 2 (Ch 11,13-15,17/A)** Final Paper Submission Final Project Oral Defense HW 8 (See Canvas for details)

Homework / Cases: Homework and solutions to be completed for student learning are provided for each learning objective. Students are encouraged to assist one another in the completion of homework and cases provided each student submits his or her original work for credit. All Homework / Cases are graded on a "reasonable attempt" basis; full credit is given if a student submits a "reasonable attempt" (in the sole estimation of the instructor) before the due date and resubmits based on feedback received in class, from the instructor, or from other students (on peer reviewed assignments). Assignments received late will receive credit only at the discretion of the instructor. Failure to resubmit after receiving feedback will result in your assignment being graded as submitted.

Exams: All examinations are to be completed at home. Class notes, Excel help files and the textbook are

appropriate resources to use while completing the exams. Assistance from any third party, except for the instructor, is prohibited.

Project: See the project addendum at the end of this document.

Learning Objectives: Students completing this course will be able to:

- Evaluate the veracity of reports, claims and decisions based on statistical evidence[1]
- Develop frameworks for utilizing appropriate analytical tools to locate and clarify problems
- Model, evaluate and optimize relevant systems[2]
- Communicate relevant findings to stakeholders.[3]

Final Project Guidelines

Overview

The Final Project involves identifying and modeling a real-world optimization problem. Each student will individually select an actual situation and use the concepts from class to define the problem, build an optimization model and solve it. Students are invited to select problems which are able to be fully solved with the available data and optimization techniques, or to select problems which are only able to be partially solved. In the latter case, students will be required to "wireframe" an overall solution while only modeling a reasonable[4] portion subject to data and class scope limitations.

Roadmap

The due dates listed on the Tentative Course Calendar for roadmap items are firm. You are encouraged to submit the topic, proposal and the sufficiency checkpoint early as these steps are intended to provide you with feedback for improving your project and are not graded.

- Project Topic Submission
    - Prior to beginning the project, you must submit one to three brief (1-3 sentence) description(s) of (the) optimization project(s) to be done. Answer the question, "Based upon the theory of constraints introduced in *The Goal,* where at work / in society / elsewhere do I see an opportunity to optimize a system or solve a problem using optimization?
    - For those in the workforce, work-based projects are often the most relevant. Check with managers / supervisors early and often for permission to access company data for a school project. Outside of datasets requiring security clearances, most data can be de-identified to a sufficient degree as to allow use in a class project. (I have allowed projects where we are evaluating "Item 38" without knowing anything else about it outside of its metrics.)
    - See examples in Evans Ch. 14 for common problems.
    - Students will (briefly) discuss topics in class for immediate feedback and group learning.
- Project Proposal (Peer Reviewed)
    - The Project Proposal should include a brief description of the system to be optimized, an influence or decision model (Evans pp. 20-22), and a list of available data or data to be gathered.
    - Students will peer-review at least two proposals.
- Sufficiency Checkpoint

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[1] MBA Learning Goals: Strategic Thinking and Leadership
[2] MBA Learning Goals: Critical Thinking
[3] MBA Learning Goals: Effective Written and Oral Communication
[4] In the sole opinion of the instructor.

    - Based on your APPROVED Project Proposal, you will submit the actual data you intend to use in developing your optimization model.
- Optimization Model Submission
    - Submit your optimization model with any comments for review.
- Final Paper Draft Submission (Optional) / Final Paper Submission (80% of Project Grade)
    - Your final paper should not exceed 1500 words (about 5 typewritten pages) excluding figures.
    - It should include a detailed description of the goals of the project and what was accomplished.
    - Efforts which did not produce desired results should receive a brief mention; projects which do not produce "useful" results should focus on the efforts expended and the optimization models which proved fruitless.
    - The paper should conclude with how the model could be improved with more data / better data / more time, etc.
    - Small tables and charts should be included in the body of the paper. Excel spreadsheets, large tables and any other model analysis should be included in appendices. Aside from the final paper and a separately submitted Excel workbook containing the optimization model, no other elements are required for submission. Appendices should serve the ends of the report as opposed to "bulking it up".
- Oral Defense (20% of Project Grade)
    - You will make a presentation of your paper before the class.
        - The presentation should include the problem solved and your findings. Plan on it being about 5 minutes; you will be cut off at 7.
        - Following the presentation the instructor and students will critique your findings. You must be ready to field questions and defend your project.
        - This is a presentation to a manager, governing body, etc. Academic work often focuses on process; this presentation should focus on result e.g. "In evaluating x I found y which indicates z."

Grading

The assignment in whole counts for 30% of your final grade in this class. Your grade on the Final Paper Submission will take into account:

- What you proposed and accomplished
- Key learnings
    - For models which do not "work" as intended, take-aways from failed model(s) should be discussed in greater detail than is required for "working" models
- Ideas for future improvement / expansion of the model
- Quality of the paper and adherence to size and composition requirements.

Your Oral Defense grade is based on the your ability to effectively communicate your findings, and your composure in fielding questions.

Well-written ¾ page papers (excluding figures or appendices) with on-point 3 minute presentations have received A/A- while longer papers/presentations have received lower grades. Quality over quantity.