Course Syllabus
T55.ETEM.505.01, Decision Analysis and Optimization, Fall 2019
Master of Engineering Management
The Henry Edwin Sever Institute | James McKelvey School of Engineering
Washington University in St. Louis

COURSE OVERVIEW
This course will expand your ability to analyze and present complex business situations by leveraging key data. Decision-making in today’s complex world requires advanced analytical methods and tools, including mathematical modeling and quantitative techniques using powerful tools for forecasting, operations, production and logistics. Emphasis will be placed on model formulation, interpretation, and presentation rather than on algorithms.

INSTRUCTOR OVERVIEW
Allen R. Miller
allen.miller@wustl.edu
I am currently serving as the Deputy Director of Logistics for the 635th Supply Chain Operations Wing at Scott AFB IL. I conduct enterprise-wide supply chain analysis to provide improved, rapid support across the warfighting spectrum. I conducted my doctorate research on reducing errors in supply chain processes via changes in behavioral operations.

DISCLAIMER
This syllabus is the guide for our course together. However, there may be circumstances requiring modifications to this syllabus. Any changes to requirements or graded elements will be communicated to the class prior to implementing the change.

LEARNING OBJECTIVES
• Understand decision analysis and optimization tools.
• Gain experience conducting decisional analysis rapidly for decision makers.
• Identify decision variables and formulate real-world problems into a decision-analysis model.
• Categorize a problem into a family of optimization problems to determine applicable tools.
• Use Excel to turn data into visual information.
• Interpret results and present recommendations based on analysis.
• Practice teamwork and presentation skills.

CLASS MEETING
• Time: Thursday 6:00 – 9:00 PM
• Location: Urbauer, Room 210
CLASS TEXTS / MATERIALS / TOOLS

**MindTap Unlimited:** This class will offer Cengage MindTap Unlimited to augment the required textbook below. This option will allow you to obtain a digital and rent a physical version of the book. Details on subscribing to MindTap will be posted as an announcement on Canvas.


**Required Supplemental Book:** The Algorithmic Leader: How to Be Smart When Machines Are Smarter Than You | Mike Walsh; ASIN B07MTNYK32

**Required Software:** This course uses Analytic Solver Platform (ASP) for Excel. You will be provided a course code and purchase options (most students pay for one term access for $25). You will need ASP for the majority of homework assignments.

**Required Articles:** Articles will be posted to the course via Canvas.

**Recommended:** The Goal: A Process of Ongoing Improvement | Eliyahu M. Goldratt; ASIN: B002LHRM2O

### GRADE COMPOSITION

*See Assignment Rubrics on Canvas for Details*

<table>
<thead>
<tr>
<th>Major Coursework Components</th>
<th>Component Proportion</th>
<th>Coursework Sub-component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Grade Elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Professionalism</td>
<td>25%</td>
<td>Includes attendance, on-time arrival, in-class participation, on-time assignments, etc.</td>
</tr>
<tr>
<td>2 Daily Reading Quizzes</td>
<td>25%</td>
<td>Quizzes</td>
</tr>
</tbody>
</table>

| Team Grade Elements         |                      |                          |
| 3 Case Studies              | 25%                  | Homework Files 15%       |
| 4 Final Exam/Presentation   | 25%                  | Presentations 10%        |
|                            |                      | Excel File 10%           |
|                            |                      | Presentation 15%         |
## Grading Scale:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>%</th>
<th>Points Toward GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>≥ 97%</td>
<td>4.0</td>
</tr>
<tr>
<td>A</td>
<td>&gt; 93% - 97%</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>&gt; 90% - 93%</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>&gt; 87% - 90%</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>&gt; 83% - 87%</td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td>&gt; 80% - 83%</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>&gt; 77% - 80%</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>&gt; 73% - 77%</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td>&gt; 70% - 73%</td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>&gt; 67% - 70%</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td>&gt; 65% - 67%</td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 65%</td>
<td>0.0</td>
</tr>
</tbody>
</table>

## Coursework Components Descriptions

**Individual grade elements:**

1. **Professionalism**
   Professionalism is based on the standard expected in the workforce. Classroom attendance, on-time arrival, full attention on classroom proceedings, in-class verbal participation, assignments submitted on time.

   In addition, English (exclusively) is heavily encouraged when in the classroom and when with your team. English is the language of business, and it is the only language all of your classmates and teammates understand.

   During team and group presentations, **no electronic devices are allowed**. You are encouraged to take paper-based notes for discussing after your classmates complete their presentation.

2. **Quizzes**
   There will be a short quiz on each assigned reading. **All quizzes are to be completed individually with no assistance from online resources, searches, texting, etc.** The quizzes will be a mix of paper-based and online via Canvas. Quizzes are closed note, closed book.

   During Week 8, you will submit a one-page outline of the major topics from Mike Walsh’s book, “The Algorithmic Leader” in place of a weekly quiz.

3. **Homework (Case Studies)**
   Homework will be completed in **teams of 2-3** and submitted via Canvas prior to due date stated in Canvas for the assignment. Teams will be identified on Canvas. The first Case Study is a completion grade; it will not be presented during class.

   The remaining case studies will be presented during class by randomly choosing 2-3 teams to present. All teams will complete assigned Case Studies and be prepared to present their Case Study results each week.
Each team is allowed one “pass”. I recommend saving this for a week when one of your members is unexpectedly absent (you must be present to present). Please sit with your teammate for in-class work. If your teammate is absent, you may be paired with another team for in-class work.

4. Final Exam
The final project begins as a “take-home” final in groups of 3-4. It will be a comprehensive project as an analysis consulting company with three required deliverables: the Excel file(s), an “executive summary” which presents your findings for the decision maker (DM) and your visual presentation (uploaded in PDF format).

For the final, you should make use of ASP and other tools from the course to enable your group to answer questions regarding your data in real-time during the final presentation. You and your group will present your analysis during the scheduled final exam period.

GRADING POLICIES

1. Late Work
In order to receive full credit, assignments must be submitted to Canvas before the due date stated in Canvas.

- Instructor-granted extensions (with no penalty) can be considered in exceptional situations. To be granted an exception, students must notify the professor before the due date and demonstrate a truly exceptional the situation. The instructor reserves the right to grant or refuse, based on circumstances.
- Without a granted extension, the student/team will receive on letter grade (10%) deduction per day.
- If you notify the instructor prior to missing class, you will be allowed to take the daily quiz online. It must be submitted by the end of the day after our normal class meeting to be considered on-time.

2. Attendance
Attendance and on-time arrival in each and every class are expected. Attendance will be taken. Instructor-granted excused absences can be considered (e.g. for business travel, health issue), but request of such must be communicated before the class meeting. More than two excused absences will reduce the Professionalism score by one letter grade (10%). A single unexcused absence will reduce the Professionalism score by one letter grade (10%). Tardiness will also reduce the Professionalism score.

3. Extra Credit
Opportunities for extra credit will be offered to all students equally. The first is to read “The Goal” and complete the extra credit quiz via Canvas by Week 12. The second is to read Chapter 12 and complete the extra credit quiz via Canvas by the end of the term. Additional opportunities may be added throughout the term.

4. Regrading Policies
Students may challenge a grade and ask for a regrade at any time, if he/she believes the grade is not fair.

5. Missed Exam / Presentation / Quizzes
Request for reschedule of a missed exam or quiz must be received before the scheduled exam or quiz, and is reserved for truly exceptional situations. The instructor reserves the right to grant or refuse, based upon circumstances. A missed unexcused quiz or exam receives a 0. An excused missed exam that is not rescheduled and taken within a reasonable amount of time receives a 0.

6. How to Succeed in this Course

- Read assigned readings before class
- Stay off electronics during classmate presentations
- Participate in discussions
- Use the English Writing Center for major assignments
- Turn in assignments before they are due and in correct file formats
- Review assignment grading rubrics prior to submission
- Review Canvas comments on graded assignments

ADDITIONAL POLICIES

Use of Laptop Computers and Electronic Devices in the Classroom

A laptop capable of accessing Canvas for quizzes and Excel 2016 is required during class. Additionally, laptop & tablet computers, smart phones and other electronic devices can be helpful in taking notes, providing tools for course exercises and referencing course related materials. However, they can also be distracting when used for non-course related activities such as emailing & texting, posting on social media, reading news sites, shopping online, or looking at YouTube videos. Some students have even been observed working on class assignments for the same or other courses. As common sense suggests, and a March 2013 study by Faria Sana, Tina Weston and Nicholas J. Cepeda confirmed, students who are multitasking during class have less understanding and recall of what’s being discussed. The study also found that “participants who were in direct view of a multitasking peer scored lower on a test compared with those who were not.” *

Phones are not allowed to be used during quizzes, other students’ presentations, or in a manner distracting to the instructor or other students.

The instructor will upload PowerPoint lecture slides before each class, and each student may follow along with them on his/her laptop. Students should please refrain from using his/her laptop for any other distracting purpose. Any digressions will be reflected in the Professionalism score.

* Reference the Wall Street Journal article: I’m Banning Laptops from My Classroom, July 10, 2016 by Stuart Green
* Reference the WashU Teaching Center Article https://teachingcenter.wustl.edu/resources/course-design/developing-course-policies-on-laptops-mobile-devices/

Privacy and Security

Recording of class sessions either audio or video is prohibited without permission from the instructor and the other class members.
Language Sensitivity
When in the classroom, all students should speak English at all times. While meeting with classmates on a classroom project, speak a language that every student present (in your group) understands, without exception. Any digressions will be reflected in the Professionalism score.

Collaboration:
Collaboration on team efforts is critical – in academia and in business. But it is not always appropriate. With the exception of your team projects and unless expressly noted, all assignments are to be completed on your own. You are encouraged to discuss ideas and techniques broadly with other class members, but all written or presentation work, whether in preliminary or final form, is to be generated by you working alone. If in doubt - ask.

SEVER/UNIVERSITY POLICIES

Ethics of Academic Integrity (SEAS)
All students in the School of Engineering & Applied Science are expected to conform to high standards of conduct. This statement on student academic integrity is intended to provide guidelines on academic behaviors which are not acceptable.

Engineering courses typically have many problem sets assigned as homework. You are not allowed to collaborate when solving homework problems, performing lab experiments, writing or documenting computer programs, or writing reports unless the instructor specifically states otherwise. For this course you are to work with your assigned groups, not accessing any answers for the specific case studies from other groups, other students, or internet resources.

It is dishonest and a violation of academic integrity if:

1. You turn in work which is represented as yours when in fact you have significant outside help. When you turn in work with your name on it, you are in effect stating that the work is yours, and only yours.
2. You use the results of another person’s work (exam, homework, computer code, lab report) and represent it as your own, regardless of the circumstances. This includes using sources of homework or quiz solutions.
3. You request special consideration from an instructor when the request is based upon false information or deception.
4. You submit the same academic work to two or more courses without the permission of each of the course instructors. This includes submitting the same work if the same course is retaken.
5. You willfully damage the efforts of other students.
6. You use prepared materials in writing an in-class exam except as approved by the instructor.

7. You write on or make erasures on any test material or class assignment being submitted for re-grading.

8. You collaborate with other students planning or engaged in any form of academic dishonesty.

9. You turn in work, which is represented as a cooperative effort, when in fact you did not contribute your fair share of the effort.

10. You do not use proper methods of documentation. For example, you should enclose borrowed information in quotation marks; acknowledge material that you have abstracted, paraphrased or summarized; cite the source of such material by listing the author, title of work, publication, and page reference.

WASHINGTON UNIVERSITY IN ST. LOUIS SUPPLEMENTAL RESOURCES

1. **Disability Resources**: If you have a disability that requires an accommodation, please speak with instructor and consult the Disability Resource Center at Cornerstone (cornerstone.wustl.edu). Cornerstone staff will determine appropriate accommodations and will work with your instructor to make sure these are available to you.

2. **English writing support**: For additional help on your writing, consult the expert staff of The Writing Center (writingcenter.wustl.edu) in Olin Library (first floor). It can be enormously helpful to ask someone outside a course to read your essays and to provide feedback on strength of argument, clarity, organization, etc.

   The Engineering Communication Center (http://engineering.wustl.edu/current-students/student-services/Pages/default.aspx) offers students in the School of Engineering and Applied Sciences help with oral presentations, writing assignments, and other communications projects, as well as job-search documents such as resumes and cover letters.

3. **English competence**: Students are encouraged to check their grammar and spelling before submitting their written works. Although, students are free to choose whatever tools best fit their need, some of the common tools for grammar, spelling, and citing references can be found in the list below.
   
4. **Bias reporting:** The University has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of bias, prejudice or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. See: [brss.wustl.edu](http://brss.wustl.edu)

5. **Mental health service:** Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. See: [shs.wustl.edu/MentalHealth](http://shs.wustl.edu/MentalHealth)

6. **Sexual Harassment:** Sexual harassment is a form of discrimination that violates university policy and will not be tolerated. It is also illegal under state and federal law. Title IX of the Education Amendments of 1972 prohibits discrimination based on sex (including sexual harassment and sexual violence) in the university's educational programs and activities. Title IX also prohibits retaliation for asserting claims of sex discrimination. The university has designated the Title IX Coordinator identified below to coordinate its compliance with and response to inquiries concerning Title IX.

For more information or to report a violation under the Policy on Discrimination and Harassment, please contact:

**Discrimination and Harassment Response Coordinators**
- Apryle Cotton, Asst. Vice Chancellor for Human Resources
  - Section 504 Coordinator
  - Phone: 314-362-6774
  - Email: apryle.cotton@wustl.edu
- Leanne Stewart, Employee Relations Manager
  - Phone: 314-362-8278
  - Email: leannerstewart@wustl.edu

**Title IX Coordinator**
- Jessica Kennedy, Director of Title IX Office
  - Title IX Coordinator
  - Phone: 314-935-3118
  - Email: jwkennedy@wustl.edu

You may also submit inquiries or a complaint regarding civil rights to the United States Department of Education's Office of Civil Rights at 400 Maryland Avenue, SW, Washington, DC 20202-1100 or by visiting the [U.S. Department of Education website](http://www.ed.gov) or calling 800-421-3481.
## TENTATIVE COURSE SCHEDULE

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<thead>
<tr>
<th>Thursday 1800-2100</th>
<th>Week</th>
<th>Reading Due</th>
<th>HW Due</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 Aug</td>
<td>1</td>
<td>Syllabus</td>
<td></td>
<td>Syllabus Review and Introductions</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Decision Analysis and Optimization Examples</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intro to Modeling and Decision Analysis</td>
</tr>
<tr>
<td>5 Sep</td>
<td>2</td>
<td>Chap 1, Chap 2</td>
<td></td>
<td>Scientific Management Primer</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intro to Optimization and Linear Programming</td>
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<tr>
<td>12 Sep</td>
<td>3</td>
<td>Chap 3, Article #1</td>
<td>Case Study</td>
<td>Modeling and Solving LP Problems in a Spreadsheet</td>
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<tr>
<td>19 Sep</td>
<td>4</td>
<td>Chap 4</td>
<td>Case Study</td>
<td>Sensitivity Analysis and the Simplex Method</td>
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<tr>
<td>26 Sep</td>
<td>5</td>
<td>Chap 5</td>
<td>Case Study</td>
<td>Network Modeling</td>
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<tr>
<td>3 Oct</td>
<td>6</td>
<td>Chap 6</td>
<td>Case Study</td>
<td>Integer Linear Programming</td>
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<tr>
<td><strong>10 Oct</strong></td>
<td>7</td>
<td></td>
<td></td>
<td><strong>Fall Break - no class all week</strong></td>
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<tr>
<td>17 Oct</td>
<td>8</td>
<td>“The Algorithmic Leader” Chap 5 &amp; 6 review</td>
<td>Case Study</td>
<td>Review and Special Topics</td>
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<tr>
<td>24 Oct</td>
<td>9</td>
<td>Chap 7, Articles #2 &amp; 3</td>
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<td>Goal Programming &amp; Multi Objective Optimization</td>
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<td>In-class assignment</td>
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<td>31 Oct</td>
<td>10</td>
<td>Chap 9</td>
<td>Case Study</td>
<td>Regression Analysis</td>
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<td>7 Nov</td>
<td>11</td>
<td>Chap 10</td>
<td>Case Study</td>
<td>Data Mining</td>
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<tr>
<td>14 Nov</td>
<td>12</td>
<td>“The Goal” Chap 7,9,10 Review</td>
<td>Case Study</td>
<td>Review and Theory of Constraints</td>
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<td>21 Nov</td>
<td>13</td>
<td>Chap 11</td>
<td>Case Study</td>
<td>Time Series Forecasting</td>
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<td>28 Nov</td>
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<td>Chap 13</td>
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<td>Decision Analysis Panel and Best Practices</td>
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<td>Queuing Theory</td>
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<td>5 Dec</td>
<td>15</td>
<td>Chap 14 Articles #4,5,6</td>
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<td>Decision Analysis in Industry</td>
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<td>9-11 Dec: Reading Days</td>
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<td>12 Dec</td>
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<td><strong>Final Excel and Ex. Sum. Files Due by 11:59 PM 8 Dec</strong></td>
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