OSCM 230 Management Science

1. General Information

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| **Instructor:** | Professor Jake Feldman |
|  | Knight Hall 414 |
|  | Email: jbfeldman@wustl.edu |
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| **Instructor Office Hours:**  **Administrative Assistant:** | 2:00-3:00pm, Mondays and Wednesdays, or by appointment  Breena Smith, Knight Hall 455 |
| **Meeting Time/ Location:** | Tuesdays and Thursdays  Classroom: SH 103  Section 3: 10:00-11:30AM  Section 4: 1:00-2:30PM  Section 5: 2:30-4:00PM |
| **Teaching Assistants:** | Isabella Neuberg isabellaneuberg@wustl.edu  Adrian Lee adrianlee@wustl.edu  Casey Wagenaar caseywagenaar@wustl.edu  Kevin Pung kpung@wustl.edu |

#### Course Description & Objectives

Many managerial decisions, regardless of their functional orientation, are increasingly based on analysis using quantitative models from the discipline of management science. Management science tools, techniques and concepts (e.g., data, models, and software programs) have dramatically changed the way businesses operate in manufacturing, services, marketing, finance, and other areas.

The primary goal of the course is to help students become effective problem solvers, smart consumers of data, and finally intelligent business decision makers in various management situations. The course utilizes structured problem solving approaches heavily relying on data for defining the problem, uncovering useful relationships between critical variables and outcomes, defining measures for evaluating alternatives, modeling underlying conceptual relationships and constraining resources, and proposing via rigorous search process of exploration and exploitation “best fitting and robust” solutions for the given environment and its underlying uncertainties. Applications of those analytic tools will be illustrated using examples from various business functional areas: finance, marketing, operations, economics and strategy, etc.

The course introduces to students following quantitative modeling approaches:

1. *Optimization tools*: Structure the problem, evaluate and uncover solutions in a variety of business decision-making situations: resource/budget allocation, portfolio management, dynamic decision making, etc.
2. *Decision analysis*: Assess value of options and value of information in the presence of uncertainties.
3. *Simulation*: Allocate resources, evaluate policy/strategy under uncertainties
4. *Data-driven decision making*: Integrate data management and analysis in each of the above three modeling approaches

The implementation of quantitative analysis tools has been facilitated considerably by the development of spreadsheet-based software packages; we will make liberal use of Excel and its optimization and data analysis add-ins.

1. **Course Material**

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| Textbook (optional): | B. Render, R.M. Stair Jr., and N. Balakrishnan, “Managerial Decision Modeling with Spreadsheets,” 2nd edition, Prentice Hall. |
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| Course Notes: | Course notes will be distributed in class. The notes will also be available to you through BLACKBOARD |
| References: | * Two copies of the textbook are on reserve in the business school library * For those looking for a more complete reference, I suggest:   + Excel 2013 Bible, by John Walkenbach, ISBN-13: 978-1118490365;   + Excel 2013 Data Analysis and Business Modeling, by Wayne L. Winston, ISBN-13: 978-0735669130. |
| ForClass | We will be using an on-line polling software platform called ForClass. The tool allows you to provide answers to key questions electronically using iPads/smartphone or laptops/desktops, allows the instructors to collect your answer to facilitate more effective class discussions, and enables you as a student to learn from your peers. |

#### Course Requirements & Grading

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| Mid-term exam | 28% |
| Final exam | 40% |
| Quizzes | 20% |
| In-class case studies (graded on effort) | 12% |

##### Exams (Mid-term 28%, Final 40%) 68%

The best preparation for the exams will be a review of the homework assignments, course notes, quizzes, and cases. A sample midterm and final exam will be distributed. Both exams will be closed book with the exception of one 8.5″×11″ piece of paper with writing on both sides.

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|  | Date | Time | Location |
| Midterm Exam | October 13 | Regular class time | SH 113 |
| Final Exam | December 15 | 3:30-5:30pm | SH 103, SH 106 |

##### Quizzes 18%

Quizzes are intended to test your knowledge of the required material. Each quiz will consist of a single problem based on homework and/or lecture material. Quizzes will be administered during class sessions, and will take 10-15 minutes of class time. **No make-up quizzes will be administered!** If you know in advance that you will be unable to attend class for some reason, please send me an email message ahead of time.

In-class case study preparation 12%

In-class cases require detailed readings and will often require analysis of relevant data to support your conclusions. For each case, I will give you two or three warm-up questions to help you prepare for the classroom discussions. Most case preps require the use of Excel spreadsheet. **Please submit your answers/analysis and spreadsheet online via Blackboard.** Bring a copy of your answers to the warm-up questions to the case-discussion sessions (**🖉** in Course Schedule) for class discussion. Late turning-ins will not be accepted. **The case preparation should be your individual work.**

###### Re-grade policy

If you have questions regarding the grading of quizzes, exams, or case studies, **re-grade requests can be submitted only within a week (7 days) of having been handed back.** A re-grade request consists of the originals and a statement of your questions. **You can submit the re-grade requests to me in class or contact the TA directly. Both the instructor and the TAs reserve the right of re-grade up and down.**

**Homework**

Provide opportunities to practice the skills of modeling and analysis introduced in the course. The homework emphasizes quantitative aspects of the course material and provides feedback on how well you have mastered the analytic techniques. The only way to learn Management Science is to work problems, and so the homework exercises are substantial. **Homework will NOT be collected.**

Both the textbook homework problems and solutions are available on BLACKBOARD.

1. **ACADEMIC INTEGRITY**

The Olin Business School is a community of individuals with diverse backgrounds and interests who share certain fundamental goals. Primary among these goals is the creation and maintenance of an atmosphere conducive to learning and personal growth for everyone in the community. Becoming a member of the Olin community is a privilege that brings certain responsibilities and expectations. The success of Olin in attaining its goals and in maintaining its reputation of academic excellence depends on the willingness of its members, both collectively and individually, to meet their responsibilities. All individuals associated with Olin should conduct themselves with the utmost integrity in all aspects of their life, both on and off campus.

Below, I discuss three aspects of academic integrity. First, I present my commitment to matters of integrity. Second, I provide an overview of Olin’s Code of Conduct as it relates to Academic matters, and third, I discuss matters of Olin’s conduct of Conduct as it relate to *Professional behavior*.

**My commitment to Integrity as the instructor of this course**

The purpose of Olin’s Code of Conduct is to clarify expectations about academic and Professional behavior. The Code is meant to encourage and clarify appropriate academic, classroom, interpersonal, and extra-curricular etiquette that is expected of each individual by their peers, the faculty and the institution. It is also intended to help describe the overall environment of excellence and professionalism that members of the Olin community seek to establish and to continually enhance. It is the responsibility of each member of the Olin community to uphold the spirit, as well as the principles, of the Code.

As an instructor, I will consistently and fully support Olin’s Academic Code of Conduct and Olin’s Code of Professional Conduct. I take the matters of academic integrity and professional conduct seriously and expect that you do, too. I encourage you to ask if you have any questions about academic integrity in this course.

Please refer to the publication ***Integrity Matters: Olin Business School Code of Conduct***for specific responsibilities, guidelines and procedures regarding academic integrity. You may also consult with MBA Program Dean Joe Fox or BSBA Program Dean Jeff Cannon if you have questions or concerns.

**Olin’s Code of Conduct as it Relates to Academic Matters**

**The following is a summary of the Code as it applies to Academic matters:**

**Student Academic Violations.** *It is dishonest and a violation of student academic integrity if you:*

1. **Plagiarize** – You commit plagiarism by taking someone else’s ideas, words or other types of product and presenting them as your own. You can avoid plagiarism by using proper methods of documentation and acknowledgement.
2. **Cheat on an examination** – You must not receive or provide any unauthorized assistance on an examination. During an examination you may use only material authorized by the faculty.
3. **Copy or collaborate on assignments without permission** – It is dishonest to collaborate with others when completing graded assignments or tests, performing laboratory experiments, writing and/or documenting computer programs, writing papers or reports and completing problem sets (unless expressly discussed in class).

If you have any questions regarding the definition of allowable behavior, it is your responsibility to ask for clarification prior to engaging in the collaboration.

1. **Fabricate or falsify data or records** – It is dishonest to fabricate or falsify data in laboratory experiments, research papers, reports or other circumstances; fabricate source material in a bibliography or “works cited” list; or provide false information on a resume or other document in connection with academic efforts. It is also dishonest to take data developed by someone else and present them as your own.
2. **Engage in other forms of deceit or dishonesty that violate the spirit of the Code**

For details, please refer to ***Integrity Matters: Olin Business School Code of Conduct***

**Olin’s Code of Conduct as it Relates to Professional Behavior**

**Expectations – Professional Standards of Conduct**

Olin students are expected to conduct themselves at all times in a professional manner. Professional behavior includes, but is not limited to, the following:

**In the classroom**

* **Attendance**: Students are expected to attend each class session. Students who must miss a session for any reason should make every effort to notify the instructor prior to the class meeting. Students should never register for courses scheduled in conflict with one another.
* **Punctuality**:Students are expected to arrive and be seated prior to the start of each class session. They should display their name cards in all classes at all times.
* **Behavior:** Classroom interaction will be conducted in a spirited manner but always while displaying professional courtesy and personal respect.
* **Preparation:** Students are expected to complete the readings, case preparations and other assignments prior to each class session and be prepared to actively participate in class discussion.
* **Distractions**:
  + *Exiting and Entering:* Students are expected to remain in the classroom for the duration of the class session unless an urgent need arises or prior arrangements have been made with the professor.
  + *Laptop, PDA, and Other Electronic Device Usage:* Students are expected to not use laptops, PDAs, and other electronic devices in classrooms unless with the instructor’s consent and for activities directly related to the class session. Accessing email or the Internet during class is not permitted as they can be distracting for peers and faculty.
  + *Cellular Phone and Pager Usage:* Students are expected to keep their mobile phones and pagers turned off or have them set on silent/vibrate during class. Answering phones or pagers while class is in session is not permitted.
  + *Other distractions:* Those identified by individual instructors, such as eating in the classroom.

For details, please refer to ***Integrity Matters: Olin Business School Code of Conduct***

**POLICY ON MISSING CLASSES AND EXAMS FOR INTERVIEWS**

We strongly advise that students schedule job and internship interviews around their class times and exam schedules. Employers understand that academics are your top priority. For off-campus interviews at the employer’s site, most will accommodate a student who needs to schedule an interview around a class or exam. For on-campus interviews, you should sign up quickly- as soon as possible- since these timeslots are fixed and are available on a first-come first-served basis only. In the event that an interview conflicts with a scheduled class, you must notify the professor in advance; the sooner you do that you demonstrate professional courtesy and a sense of commitment to the professor. How the professor treats the absence is at the professor’s discretion in accordance with the course syllabus or other means of communication. An interview conflict is not a valid reason for missing an exam. If you experience or anticipate problems, you should seek advice from Weston Career Center advisors.

**DISABILITIES**

Reasonable accommodations will be made for students with verifiable disabilities. Students who qualify for accommodations must register through Washington University’s Center for Advanced Learning Disability Resources (DR) in Cornerstone. Their staff members will assist me in arranging appropriate accommodations.

1. **Tentative Course Schedule[[1]](#footnote-1)**

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| Module 1: Linear Optimization | | |
| 1. MON., SEPT. 7 | Topics  Read  HW #1[[2]](#footnote-2) | Introduction to Linear Programming  Simple examples  Chapter 2.4-2.6, 2.9  Chapter 3.1-3.3, 3.5, 3.7 |
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| 1. WED., SEPT. 9 | Topics  Read  HW #2 | Simplex (Algorithm for solving LPs)  Chapter 3.4, 3.6, 3.8 |
| 1. MON., SEPT. 14 | Topics  Read  HW #3  **Quiz #1** | LP Formulations: Shortest path, max flow, matching Chapter 5.1-5.3, 5.6  **Optimization Formulation** |
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| Module 2: Trade-off Analysis | | |
| 1. WED., SEPT. 16   🖉 | Topics  Read | Airline revenue management, Sensitivity Analysis for LP  Chapter 4 |
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| 1. MON., SEPT. 21   🖉 | Topics  **Turn in** | Sensitivity Analysis  “Parket Sisters” (BLACKBOARD)  **Case study preparation #3** |
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| 1. WED., SEPT. 23 | Topics  Read | Combining everything: Ad Optimization Case  Ad Optimization Case |
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| **Module 4: General Optimization** | | |
| 1. MON., SEPT. 28 | Topics  Read HW #4 **Quiz #2** | Solution challenges, algorithms to smooth problems  Chapter 6.6  **Sensitivity Analysis** |
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| 1. WED., SEPT. 30 | Topics  **Turn-in** | Applications of general optimization  **Case study preparation #4** |
| 🖉 |
| 1. MON., OCT. 5 | Topics HW #5 **Quiz #3** | Data-driven optimization  **General Optimization** |
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|  | \*\*\*\*\*Bring a laptop to class\*\*\*\*\* | |
| 1. WED., OCT. 7 | **Midterm Review** | |
|  | Read | “It’s the Process Not the Product” (BLACKBOARD)  “Just Modeling Through: A Rough Guide to Modeling” (BLACKBOARD) |
| 1. MON., OCT. 12 | **Midterm Exam** | |
| **Module 4: General Optimization (cont.)** | | |
| 1. WED.,OCT. 14 | Topics  Read | Non-smooth problems  Binary decisions  Chapter 6.1-6.4 |
| 1. MON., OCT. 19   🖉 | Topics  Read  HW #6  **Turn in** | Non-smooth problems  Logical constraints  **“**Scheduling Employees in Quebec’s Liquor Stores with Integer Programming”(Blackboard)  **“**Early Integer Programming.” (BLACKBOARD)  **Case study preparation #5** |
| **Module 5: Decision Making under uncertainty – Decision Tree** | | |
| 1. WED., OCT. 21 | Topics  Read  HW #7  **Quiz #4** | Structure of the Decision Problems  Decision Making without Probabilities  Decision Making with Probabilities  Chapter 8.1-8.5  “Making Better Decisions Faster” (BLACKBOARD)  **Nonsmooth Optimization** |
| 1. MON., OCT. 26     🖉 | Topics  Read **Turn in** | Decision Tree  Value of Information  Chapter 8.6-8.10  “More March Madness.” (BLACKBOARD)  **Case study preparation #6** |
| 1. WED., OCT. 28 | Topics HW #8 | Data-driven decision analysis |
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|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| MON., NOV. 2 | **No Class** |  |
| WED., NOV. 4 | **No Class** |  |
| 1. MON., NOV. 9 | Topics  HW#9  **Quiz #5** | Value of options  Utility Functions  **Decision Analysis** |
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| **Module 6: Decision Making under uncertainty – Simulation** | | |
| 1. WED., NOV. 11 | Topics Read | Random Number Generation  Review of Probabilistic and Statistical Concepts  Chapter 10.1-10.4  Appendix A “Liquidity Risk Management” (BLACKBOARD) |
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|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| 1. MON., NOV. 16 | Topics  Read  HW #10 | Simulation Applications  Simulation-based optimization  Chapter 10.7-10.10 |
|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| 1. WED., NOV. 18     🖉 | Topics  Read  HW #11  **Turn in** | Process Simulation  Performance Estimation  “Tour Bus Production Process” (BLACKBOARD)  "A Better Way to Size up Your Nest Egg" (BLACKBOARD)  **Case study preparation #7** |
|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| 1. MON., NOV. 23 | Topics  HW #12  **Turn in**  **Quiz #6** | Simulation Applications  **Case study preparation #8 (Selected Homework Problems)**  **Simulation** |
| 🖉 |
|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| WED. NOV. 25 | **Thanksgiving Break, No Class.** | |
| 1. MON., NOV. 30 | Topics | Data-driven simulation  Simulation Applications |
|  | **\*\*\*\*\*Bring a laptop to class\*\*\*\*\*** | |
| **26.** WED., DEC. 2 | **Course Summary** | |
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1. **Homework Sets, In-class Case Study Preparation, and Quizzes**

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| **Due**  **Date** | **Homework Set**  (Will not be collected)  Answers are available on BLACKBOARD | | **In-class Case Study Preparation**  (case and preparation question are available on **Blackboard**, submit answers online via **Blackboard** before class starts) | **Quiz**  (in class) |
| **8/26** |  |  | **Case study preparation #1 (Handout/Blackboard)** |  |
| **9/7** | Hw #1 | Linear Optimization Formulation  Chapter 2: 40, 41, 43,44  Chapter 3: 35 + one problem on BLACKBOARD |  |  |
| **9/9** | Hw #2 | Linear Optimization Formulation  Chapter 3: 2, 5, 6, 18, 29, 34, 42, 45\*, 20\*,21\*,38\* |  |  |
| **9/14** | Hw #3 | Linear Optimization Formulation  Five problems on BLACKBOARD |  | **Quiz #1** |
| **9/16** |  |  | **Case study preparation #2** |  |
| **9/21** |  |  | **Case study preparation #3** |  |
| **9/28** | Hw #4 | Sensitivity Analysis  Chapter 4: 8, 15, 16, 18, 19, 21, 22, 24 |  | **Quiz #2** |
| **9/30** |  |  | **Case study preparation #4** |  |
| **10/5** | Hw #5 | General Optimization – Smooth Problems  Chapter 6: 38, 40  + Threeextra problems on BLACKBOARD |  | **Quiz #3** |
| **10/12** |  | **Midterm Exam** | |  |
| **10/19** | Hw #6 | General Optimization – Non-smooth Problems  Chapter 6: 18, 19, 22, 25, 17\*, 21\*  + Four extra problems on BLACKBOARD | **Case study preparation #5** |  |
| **10/21** | HW #7 | General Optimization – Non-smooth Problems Three problems on BLACKBOARD |  | **Quiz #4** |
| **10/26** |  |  | **Case study preparation #6** |  |
| **10/28** | Hw #8 | Decision Analysis  Chapter 8: 28, 40, 46 |  |  |
| **11/9** | Hw #9 | Decision Analysis  Chapter 8: 44, 45 |  | **Quiz #5** |
| **11/16** | Hw #10 | Simulation  Chapter 10: 17 |  |  |
| **11/18** | Hw #11 | Simulation  Chapter 10: 30, 31\* | **Case study preparation #7** |  |
| **11/23** | Hw #12 | Simulation  Chapter 10: 34, 39, 33\* | **Case study preparation #8** | **Quiz #6** |
| **12/15** |  | **Final Exam** | |  |
| \* Problems are more challenging problems, and are optional. | | | | |

1. I reserve the right to make minor changes and updates throughout the semester. [↑](#footnote-ref-1)
2. Homework is due before class, but will not be collected. [↑](#footnote-ref-2)