

MGMT 3331

Business Analytics:

Note: There is no Pass/Fail option for this class

Fall 2018

Data Management and Descriptive Analysis

Instructor: Prof. Elliot Bendoly, PhD

Class: Class: TT 12:45-2:05

Room: Schoenbaum 219

Email: bendoly.2@osu.edu

Office Hours: I'm highly available by email to answer questions, though I'm often traveling around campus.

I don't want to miss you! ; I also want to make sure I'm not meeting with another student when you come by, so...

... **PLEASE email me whenever you want** and we can quickly set up a time to meet (I might just have a simple answer for you I can share via that email). I strongly encourage face-to-face meetings on topics that you feel need more attention.

REQUIRED: You must either have access to a PC, or a Mac running Parallels / Boot camp

(Parallels: <http://www.parallels.com/products/desktop/>) (Bootcamp: <https://www.apple.com/support/bootcamp/getstarted/>)

Course Overview

In most settings individual decisions are not made in isolation. Multiple decisions must be made simultaneously and involve judgments that involve limitations, are interdependent or prone to considerable uncertainty with regard to outcomes (often all three). **Question:** In an ever more demanding business climate where critical decisions need to be made within shorter and shorter time windows, how do effective managers get a handle on these complex decision environments, let alone come up with good solutions? **Answer:** They develop or customize analytical tools and frameworks to get the job done.

Increasingly this involves leveraging the capabilities of familiar and accessible technologies. The effectiveness of such leverage critically is dependent on ⁽¹⁾ the ability to translate real-world problems into forms that such technologies can assist with, ⁽²⁾ the ability to portray/visualize these translations in ways that enhance the understanding of the dynamics of these problems, ⁽³⁾ the ability to structure mechanisms that derive suggested solutions to these problems, as well as describe the robustness of these solutions to sources of uncertainty, ⁽⁴⁾ the ability to clearly convey the justification and practicality of final solutions to others. Whereas these skills are often assumed to be distributed among multiple roles in a firm, managers competent in all four are certainly at an advantage in modern firms. The cherry on top of course is ⁽⁵⁾ an ability to develop tools that are not only useful to the developer but also to the developer's co-workers and/or clients.

This course is designed with the goal of equipping students with competencies in each of the above skill sets – the intended product being an individual capable of developing analytically rigorous decision support tools, catered to specific managerial environments, which can be easily handed off for robust application by a range of intended users in those environments.

Required Texts [<https://tinyurl.com/BUSMGT-3331-29958>]

2nd Edition - Excel Basics to Black Belt: An Accelerated Guide to Decision Support Designs

by Elliot Bendoly –2013, Cambridge University Press (ISBN: 978-1107625525)

Note: At least one in-class quiz or activity may require the use of this textbook. Electronic versions, printed-from-electronic version and the 2008 text are NOT interchangeable references (I know as a matter of fact that there are some errors and omissions in the electronic and earlier versions - So please make sure to get the bound version of the **2013 2nd edition**).

Visual Analytics for Management

by Elliot Bendoly, Sacha Clarke –2017, Routledge / Taylor & Francis (ISBN: 978-1138190726)

Associated Forums

All students are also expected to join the **"Excel Blackbelts" group on LinkedIn** (see "Participation")

Grading (see associated due dates at end of syllabus)

Graded deliverables	% of Total	Type
In-class Quizzes	20%	N ↑
Homework Assignments	20%	N ↑
Course Project items	40%	C 🧑‍🤝🧑
In-class Participation	20%	O 🗣️

LEGEND

Graded Deliverable Types:

- Independent Work** [N ↑]: Strictly non-collaborative, original individual work. Discussions with instructor only. NO USE of GroupMe, LinkedIn and other forums.
- Collaboration-Required** [C 🧑‍🤝🧑]: An explicit expectation for collaboration among students either in-class or outside (e.g. in group projects).
- Optional-Collaboration** [O 🗣️]: Original individual work/submissions; Students are permitted, but not required, to discuss among themselves.

Course Technology

Examples of decision support system development and use will focus on the **Microsoft Excel** environment. This design is based on at least four motivating forces: 1) Unlike other possible platforms Excel has become a commodity among business firms and students are more likely to find it available for use in the workplace than any other foundation for DSS development, 2) Excel has a number of simple yet effective built-in functions (eg. Solver, interactive graphics, macros, pivot tables, etc.) which make its use as a flexible and robust platform for DSS development extremely straightforward, 3) The extensive capability for integration built in across Microsoft products provide the potential for wide-spread ubiquitous Excel based decision structures in the workplace (ie. it can be catered to assist co-workers who use packages like Word or PowerPoint regularly but don't know the first thing about Excel), and 4) Most critically, as a de facto standard, other application environments have been designed to integrate specifically with Excel to extend its features (Microsoft BI tools, Palisade's suite, user-developed add-ins, etc.)

RiskOptimizer. Purchase of the 2nd Edition text book grants access to a one-year license to Palisade's Decision Tools Suite. When you get the text, check out the download: <http://www.palisade.com/bookdownloads/bendoly/>

MS Power BI Desktop: As an alternative interface for power BI tool access and mobile visualization sharing, students are recommended to seek out this tool. Currently it is available for free through the Microsoft support site: <https://powerbi.microsoft.com/en-us/desktop/>

Video Capture tools: Although not expressly 'integrated' with Excel, video captures of Excel-based tool-use can be absolutely critical in emphasizing the value and usability of the tool. As part of their project deliverables, students will need to make use of some form of screen/video capturing technology (See Group Projects). Some available packages for free download include: WeVideo (my current favorite since no install is needed): <https://www.wevideo.com/> . Other packages are available from Techsmith: <http://www.techsmith.com/products.html> . Further, at OSU you should have access to related software through the Digital Union (as well access to people to show you how to use it). There are five locations on campus. The information can be found at <https://odee.osu.edu/digital-union>. MediaSite software may also help: <https://resourcecenter.odee.osu.edu/mediasite> . Whatever you use, shoot for screen resolution.

Details of Course Grading

Homework [N ↑]

There will be up to 3 homework assignments (due by 5pm on the due date via email [< 2 MB please, you'll never need more]; 5% penalties are automatically incurred for submissions missing that deadline + 3% additional penalties per hour late). So please manage your time, and start these as soon as they are distributed. These assignments will come in multiple parts and cover several days' worth of material. Although I am comfortable with peer-to-peer discussion of the questions, **students should NOT share advice on approaches to solution**. I expect final work to be independent. I don't want to see work that looks suspiciously like someone else's, and I certainly don't want to see work simply copied from one student and dressed-up differently in another student's submission; such submissions will be deemed violations of the **Honor Code**.

On occasion, when I feel students have had sufficient in-class time to complete work, I will request submissions (e.g. via e-mail) of work developed in class [such requests will be made very infrequently but will not be announced prior to the in-class work period]. This can help ensure checks on the originality of work and serious participation during these in-class periods.

Aside from this, my office hours are designed to provide opportunities for students to ask for guidance on these HWs. Please don't come in with "I have no idea" – Instead approach me with some suggestions of your own for tackling the problem with specifics on where you are stuck. We'll both spend our time better this way. I am always more than happy to help students willing to demonstrate individual effort. *See last page of syllabus for due dates*

Quizzes [N ↑]

We will have 3-4 semester quizzes (on the order of 20 minutes each). These quizzes will serve as a check to student preparation for class and absorption of prior material (i.e. having done readings, followed along on in-class examples, etc.). I will always provide study tips in advance of these quizzes to help students focus their time in preparation. Quiz dates are found on the course schedule attached. All students must take all quizzes. Make-ups are granted only in rare occasions, with rationale filed and supported by the program office.

Group Projects [C 🧑🏫]

Each student will be required to contribute to one group project spanning the duration of the semester. **In contrast to homeworks and quizzes, students are expected to collaborate**; ideally groups of **4-5** students per group project.

These group projects can either focus on providing guidance in terms of (**Route-1**) specific solutions (eg. as possible through optimization, simulation, etc.) or (**Route-2**) enhanced data navigation and visualization (eg. as possible through sophisticated use of dynamic tables, heuristics, graphics, live feeds, etc.). Students will also have the choice of focusing on the development of either (**Format-A**) a traditional workbook-based dashboard (w/ embedded tables and graphs), or (**Format-B**) a workbook-independent Excel add-in (see *Expectations on User Interface Development* for examples of each). Group projects that are able to professionally display a combination of these features may of course be the most impressive, but at the same time will likely require more effort (and room for greater error). Ultimately “planned scope” by itself can’t/shouldn’t be automatically equated with, or lead to an expectation of a “higher score”.

Regardless of focus, all groups must demonstrate the role of ‘variability’ in their support system. For projects with a focus on **Route-1**, this might mean incorporating variance/uncertainty in either an optimization search mechanism, a post-analysis robustness comparison or in terms of general descriptive both with numbers and graphics. The latter could also be used in projects focusing on **Route-2**, as can a demonstration of robust fool-proofing against tool misuse, and built-in customizability of data depicted and graphics displayed.

Project grades are broken into four key deliverables:

(a) Project Outline, (b) Working Application, (c) In-class Presentation, (d) YouTube Videos

Project Outlines

Decisions on the specific format of the project (workbook or add-in) won’t likely be possible until students gain sufficient exposure to course material. However, I want groups to think about the general theme of their projects early on. To motivate that, all groups will first develop a project outline. To get groups started, it will be useful for students to select a specific management problem “class” for study (eg. human resource management, facility location/supply network modification, order/customer scheduling, strategic/tactical opportunity/threat identification, performance and performance-trajectory monitoring etc. – whatever students find appealing). In selecting a project, I encourage students to leverage work experiences and/or club experience, where available. I also encourage students to build on Fisher course work and other class projects they have been involved with.

For that “class” of problems, your group will be expected to provide a document with the following elements:

- 1) OVERVIEW: Briefly describe your intended tool (a few sentences), including your intended focus on either Route-1 or -2, and intended Format-A or -B. Make sure to pinpoint what you see as the primary difficulty(ies) associated with developing decisions for this ‘class’ of problem, and hence the value of the proposed tool.
- 2) INTENDED USE: Provide a “story” of how you envision your tool being used (paragraph).
- 3) KEY FACTORS & DEPENDENCIES: Provide a conceptual sketch of the various relationships assumed between the intended key outputs of your tool, and the factors that might be subject to change by users (or solution search engines).
- 4) LIMITATIONS: Provide some thoughts on what limitations exist with regards to the extent to which these factors can be reasonably modified by users (or as part of searches).

To further demonstrate your group’s understanding of the issues you’ll be facing in development, provide at least one of the following items:

- 5a) DRAFT OF ANALYTICS: A concrete ‘model’ for optimizing some key decision, or summarizing data, in their context (outlining any applicable mathematical notation is strongly encouraged here).
- 5b) DRAFT OF VISUALIZATION: A concrete outline for how you intend to better organize/visualize data/results (a computer-drawn sketch of a draft interface is encouraged here).

The outline should be no more than 6 pages single-spaced in length (no less than 2 pages), not counting any data or diagram appendices deemed relevant. It should include a tentative TITLE for their proposed application (3 words max). The format of the outline should be 5 sections outlined descriptions of each of the elements (1-6) listed above.

See last page of syllabus for due dates

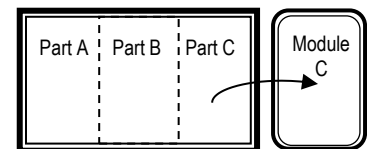
PROJECT CONCEPTS that are OFF LIMITS *** (i.e. DON'T do these):

- 1) Projects that involve any of the following genres: Fantasy league management, College search.
- 2) The development of one-shot consulting solutions – These are intended to be ‘repeated use’ tools, not one-point-in-time solutions to an existing problem. Make sure your design is for multiple practical use.
- 3) The development of nothing more than a forecast – Forecasts can help form the basis of decision support but I do not want forecasting to be the main part of the deliverable (take a forecasting class).

Working Applications

The primary project deliverable (the decision support tool submitted via email (IF < 5 MB, otherwise Google Drive) - *please make sure it runs as expected off of another computer!*) will be due near the end of the semester (*See last page of syllabus for due date*). The evaluation criteria listed on the next page should be taken into consideration when designing and developing your tool. In terms of general content and functionality, the tools must make use of at least two data manipulations (eg. heuristic, optimization, simulation, query, data cleaning, drill down, etc.). Data used in analysis should be appropriate to the context – some significant portion must have been acquired either through available archives/databases, on-line sources, surveys or real-time observations of activities conducted by the group. The tool should also demonstrate a robustness to use such that variants of the problem dealt with could also be specified by other users for subsequent comparative analysis. Outputs (eg. descriptive summaries, notable constraints to decision making and prescriptions for policy) should be clearly depicted – implied is the leveraging of visualization technique covered in the course.

In the design of your interface, please consider how future versions of your tool might appear if developed for mobile technology. Consider clear functional divisions in your tool that might allow a modular design on a smaller screen.



With your submission, please also feel free to include soft-copies of any additional documentation you feel would be helpful in clarifying your application’s use. The quantity and form of such paper-work is all up to your own discretion. If you don’t feel any documentation is needed aside from what is embedded in your system, i.e. that your tool is sufficiently straightforward for a user new to it, that’s great – ultimately it’s your call.

In-Class Presentation

Teams will present their applications **in-class during one of the two last weeks of the course**. Once feedback on project outlines have been returned to students, I’ll post a sign-up so that teams can specify their preferred final presentation dates. Slides are not a requirement, since the audience will prefer to see the tool in use. Since these presentations will involve both a brief justification of the work and a fairly comprehensive demonstration of functionality (15minutes), as well as a Q&A period to follow (5-8 minutes), we will limit the number of presentations per each class session to. So plan ahead for preferred presentation dates. **Dress is business casual.**

Video Walkthroughs and Pitches

Teams will also be expected to create 2 YouTube videos. The 1st will be a **walk-through** of their tool. This should predominantly be a screen capture presentation of how their application is intended to be used (between 4 and 8 minutes in length). These should not replicate your entire presentation; they are designed to only showcase the application, not describe the context for which it was designed, and not describe limitations/future prospects). The 2nd video should be an **elevator pitch** for the application (20-40 seconds). It should quickly introduce the application, state its purpose and functionality, and end with “For more information see [your Application Title] on Excel-Blackbelts.com”.

(See Course Technology regarding some viable screen/video capture options)

Such software allows for continuous screen capture capabilities with voice-over recording, as well as editing to create video files that can be posted to YouTube for my viewing (if you wish to share with others, that’s your option). These videos serve several purposes: 1) Creating them gives you practice for your in-class presentations; 2) They serve as back-up presentations to me (and others perhaps) in case of technical difficulties during your “live” presentations; 3) They can be used as a virtual component of your personal vitas.

YouTube links should be e-mailed to me. *See last page of syllabus for due date*

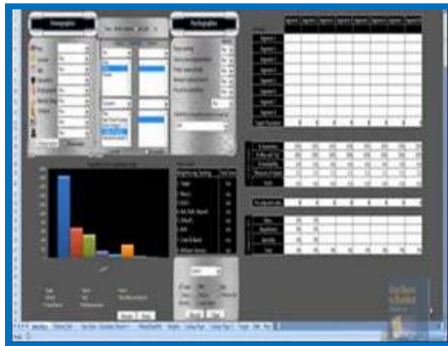
Expectations on interface development:

Although the aesthetics of the interface are not a direct concern of mine, the interface should be user-friendly and to that extent will require some conscious effort on the part of the group to ensure that controls and results are easy to locate and view in a logical and easily interpretable manner. On the following pages are some screen shots of past projects that were able to provide both the level of rigor in back-end data-management, calculations and automation while still providing what would be expected of a professional front-end interface.

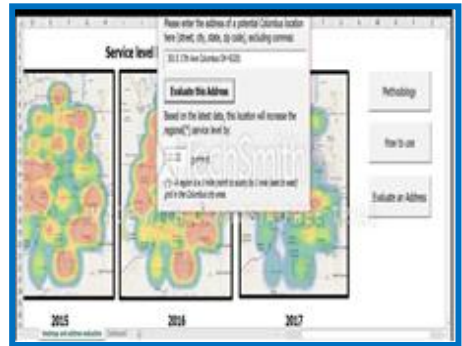
Route-1 Examples: Workbook-based Applications (others at <http://experimental-instruments.com/Gallery.htm>)



[DHL Recruitment Marketing \(walkthrough\)](#)



[Channel Management Support \(walkthrough\)](#)



[Service Location Analyst \(walkthrough\)](#)



[Production Planning Support \(pitch\)](#)

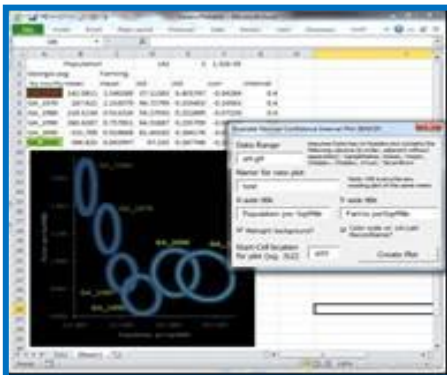


[Facility Location Support \(walkthrough\)](#)

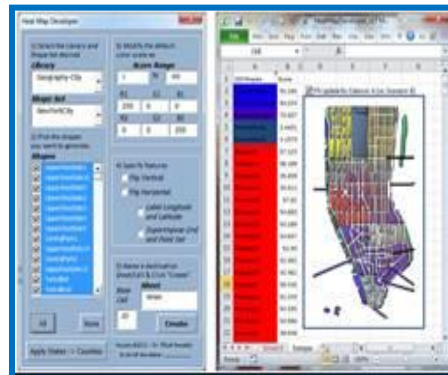


[Physician Patient Support \(walkthrough\)](#)

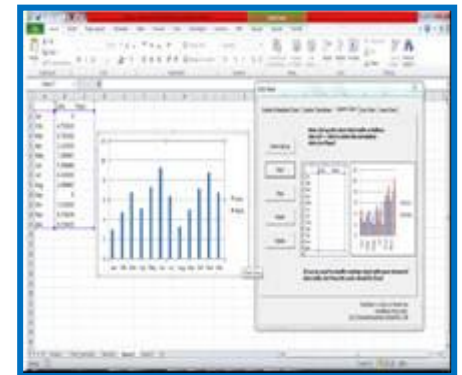
Route-2 Examples: Workbook-independent Add-ins (others at <https://sites.google.com/site/exceladdinsdirectory/home/main-directory>)



[BiNCIP: Bivariate Normal Confidence Interval Plotter](#)



[Heatmap Developer Add-in](#)



[ClickPlot Add-in](#)

Participation [O

The course is designed to incorporate significant portions of in-class lab-time during which students will be able to work on examples and later on their own projects. While *attendance* in class is *voluntary*, participation in lab exercises is *expected* (a unique issue to lab courses). Furthermore there are benefits to what I refer to as "positive" versus "negative" participation even during non-lab discussions/lectures. Positive participation involves consistently providing insightful contributions to classroom discussion, enthusiasm in class learning activities and a willingness to take responsibility and add-value to student-group projects. This is assessed at the end of the semester based on my classroom observations as well as peer (e.g. project group member and audience) evaluations. Highly positive participation can push students above the boundary of two grades. Similarly, negative participation can have the opposite effect.

This year I also will be requiring all students to join in the "Excel Blackbelts" group on LinkedIn.
<https://www.linkedin.com/groups?home=&gid=3124035>

This is a 28,000+ member discussion forum and job board. A good place to network, get off-topic questions answered, and voice specific questions on your projects (questions about homework problems should NOT be posted – *such posts will be viewed as a breach of the ethics contract*).

Negative participation involves things like talking about non-class issues during class discussion, doing homework in class, not participating in activities, not contributing to group project work, consistently arriving late or leaving early (without informing me ahead of time), etc. Consistent negative participation (again measured by my own observations and reports of your peers) can bring a student's grade down.

To that end, all students are required to sign the class's Ethics Contract (provided by email or online conference) and submit a signed copy to me within the first week of class (preferably the first day). Without a signed contract I will not be able to assign any points to assignments (i.e. scores on quizzes and homeworks will be "0"). Signing of the ethics contract is also part of the total participation grade in this course. Students are also encouraged to read over the COAM (Committee on Academic Misconduct) for guidelines established by OSU. A copy is included within this syllabus.

Q: Why is this so important?

A: This is not a class of "1" - What you do effects the learning environment of those around you. I want to give everyone the best opportunity to take lessons away from the time they spend in class, and anything that detracts from those opportunities needs to be discouraged. Having said that, again, you will not be penalized for not attending class. If you feel that on certain days you have other priorities or will have a hard time avoiding negative participation of some kind... just don't come in (That's ok). But if you do come to class, come prepared to listen and work.

*A final note on in-class demos with Excel: In class I'll often ask students to open up files I've made available (either on-line access from the Cambridge site or the course conference). **BEFORE opening a new file, unless instructed otherwise, PLEASE close down the Excel application first (if already open)**. The entire application, not just a given workbook. In class we will alternate between different Excel settings, some of which will not work well with certain examples. Closing down Excel prior to opening new examples will help avoid functionality errors.*

A quick note on the development environment:

The fact that "Excel" is used as the primary platform for development in this course is nothing more than a matter of convenience, on a number of levels: ⁽¹⁾ Most students have Excel freely available to them, ⁽²⁾ Most corporations have Excel available to their workers and already have a legacy of use, ⁽³⁾ Excel is much more and user-friendly and versatile an environment for managerial support system development than a host of other object-oriented development environments.

DISCLAIMERS:

- 1) If you already have extensive Excel or VB development experience, this class might not be right for you. I'll be spending a bit of time ramping people up to a skill base at which development can take place. Please consult with me personally if you feel you have considerable experience and are unsure whether to participate in the elective.
- 2) If you are not willing to dive a little into computer programming (which we'll do only very lightly with Macros at the very end of the semester), this course might not be for you. I want to emphasize that NO past programming experience is expected, and that those students who have learned the few key tricks we'll cover in class on Macros have truly appreciated the power these have given them. Please consult with me personally if you feel uncomfortable with the idea of learning a little about these very powerful tactics.

COAM (Committee on Academic Misconduct) Guidelines

1. **ACKNOWLEDGE THE SOURCES THAT YOU USE WHEN COMPLETING ASSIGNMENTS:** If you use another person's thoughts, ideas, or words in your work, you must acknowledge this fact. This applies regardless of whose thoughts, ideas, or words you use as well as the source of the information. If you do not acknowledge the work of others, you are implying that another person's work is your own, and such actions constitute plagiarism. Plagiarism is the theft of another's intellectual property, and plagiarism is a serious form of academic misconduct. If you are ever in doubt about whether or not you should acknowledge a source, err on the side of caution and acknowledge it.
2. **AVOID SUSPICIOUS BEHAVIOR:** Do not put yourself in a position where an instructor might suspect that you are cheating or that you have cheated. Even if you have not cheated, the mere suspicion of dishonesty might undermine an instructor's confidence in your work. Avoiding some of the most common types of suspicious behavior is simple. Before an examination, check your surroundings carefully and make sure that all of your notes are put away and your books are closed. An errant page of notes on the floor or an open book could be construed as a "cheat sheet." Keep your eyes on your own work. Unconscious habits, such as looking around the room aimlessly or talking with a classmate, could be misinterpreted as cheating.
3. **DO NOT FABRICATE INFORMATION:** Never make up data, literature citations, experimental results, or any other type of information that is used in an academic or scholarly assignment – **Amendment:** *UNLESS USED STRICTLY TO ILLUSTRATE THE FUNCTIONALITY OF A TOOL, IN LIEU OF PROPRIETARY DATA OR IN ITS RESTRICTED USE.*
4. **DO NOT FALSIFY ANY TYPE OF RECORD:** Do not alter, misuse, produce, or reproduce any University form or document or other type of form or document. Do not sign another person's name to any form or record (University or otherwise), and do not sign your name to any form or record that contains inaccurate or fraudulent information. Once an assignment has been graded and returned to you, do not alter it and ask that it be graded again. Many instructors routinely photocopy assignments and/or tests before returning them to students, thus making it easy to identify an altered document.
5. **DO NOT GIVE IN TO PEER PRESSURE:** Friends can be a tremendous help to one another when studying for exams or completing course assignments. However, don't let your friendships with others jeopardize your college career. Before lending or giving any type of information to a friend or acquaintance, consider carefully what you are lending (giving), what your friend might do with it, and what the consequences might be if your friend misuses it. Even something seemingly innocent, such as giving a friend an old term paper or last year's homework assignments, could result in an allegation of academic misconduct if the friend copies your work and turns it in as his/her own.
6. **DO NOT SUBMIT THE SAME WORK FOR CREDIT IN TWO COURSES:** Instructors do not give grades in a course, rather students earn their grades. Thus, instructors expect that students will earn their grades by completing all course requirements (assignments) while they are actually enrolled in the course. If a student uses his/her work from one course to satisfy the requirements of a different course, that student is not only violating the spirit of the assignment, but he/she is also putting other students in the course at a disadvantage. Even though it might be your own work, you are not permitted to turn in the same work to meet the requirements of more than one course. You should note that this applies even if you have to take the same course twice, and you are given the same or similar assignments the second time you take the course; all assignments for the second taking of the course must be started from scratch.
7. **DO YOUR OWN WORK:** When you turn in an assignment with only your name on it, then the work on that assignment should be yours and yours alone. This means that you should not copy any work done by or work together with another student (or other person). For some assignments, you might be expected to "work in groups" for part of the assignment and then turn in some type of independent report. In such cases, make sure that you know and understand where authorized collaboration (working in a group) ends and collusion (working together in an unauthorized manner) begins.
8. **MANAGE YOUR TIME:** Do not put off your assignments until the last minute. If you do, you might put yourself in a position where your only options are to turn in an incomplete (or no) assignment or to cheat. Should you find yourself in this situation and turn in an incomplete (or no) assignment, you might get a failing grade (or even a zero) on the assignment. However, if you cheat, the consequences could be much worse, such as a disciplinary record, failure of the course, and/or dismissal from the University.
9. **PROTECT YOUR WORK AND THE WORK OF OTHERS:** The assignments that you complete as a student are your "intellectual property," and you should protect your intellectual property just as you would any of your other property. Never give another student access to your intellectual property unless you are certain why the student wants it and what he/she will do with it. Similarly, you should protect the work of other students by reporting any suspicious conduct to the course instructor.
10. **READ THE COURSE SYLLABUS AND ASK QUESTIONS:** Many instructors prepare and distribute (or make available on a web site) a course syllabus. Read the course syllabus for every course you take! Students often do not realize that different courses have different requirements and/or guidelines, and that what is permissible in one course might not be permissible in another. "I didn't read the course syllabus" is never an excuse for academic misconduct. If after reading the course syllabus you have questions about what is or is not permissible, ask questions!

Class Schedule

Week	Date	Topics	Readings (BB=Blackbelt text; VA: Visual Analytics)	Deliverables	Type*
1 - Foundations for Decision Support Simple Patterns and Visualizations	Aug 21st (Tues)	The benefits of DSS; Current student domain knowledge/interests; Overview of course	Preread: Chapter 1,2&Supplement (BB); Chapters 1-3 (VA)		
2 - Overview of Graphical Options Reference, Logic and Getting Data	Aug 23rd (Thur) Aug 28th (Tues) Aug 30th (Thur)	Data Recognition and organization basics Trait and relational graphs - Basics and exotics Creation, interpretation, integration of logic structures	Chapter 4 (BB)		
3 - Acquiring and Rationalizing Data	Sep 4th (Tues) Sep 6th (Thur)	Data linkage and acquisition Data compression, simple inference and caveats	Chapter 3 (BB)	Quiz #1 (start of class, Tues, Sep 4th)	N ↑
4 - Analytics of Optimization in DSS	Sep 11th (Tues) Sep 13th (Thur)	Model construction and basis of math-programming Sensitivity and robustness of optimal prescriptions	Chapter 6 (BB)	HW1 (due Mon, 5pm Sep 10th)	N ↑
5 - Complex-Dynamic Optimization	Sep 18th (Tues) Sep 20th (Thur)	Dealing with non-linearities & multiple objectives Frameworks, analysis and interpretation	Chapter 7 & Supplement (BB)		
6 - Simulation Analysis & Control	Sep 25th (Tues) Sep 27th (Thur)	Assessing the riskiness of our decisions Decision/performance tests; Tabular tool integration	Chp 8 & Supp. (BB), begin Chapter 9 (BB)	Quiz #2 (start of class, Thur, Sep 27th)	N ↑
7 - Simulation Optimization	Oct 2nd (Tues) Oct 4th (Thur)	Use of control forms in managing simulations Joint use of simulation tactics & optimization	Chapter 9 (BB) continued	HW2 (due Mon, 5pm Oct 1st)	N ↑
Oct 9th (Tues) - 7-Week Semester Exams - No Classes					
Oct 11th (Thurs) - Fall Break - No Classes					
8 - Intro to Programming Syntax	Oct 16th (Tues) Oct 18th (Thur)	"Surgery" and bottom-up coding; Basic syntax Designs with conditional action and Loops	Begin Chapter 11 (BB) (Chapter 12(BB) as ref)	Outlines (due 11pm Wed, Oct 17th)	C #th
9 - Advanced Use of Automated DS	Oct 23rd (Tues) Oct 25th (Thur)	Creating User-defined functions and Add-ins Error handling, non-standard objects and controls	Chapter 11 (BB) cont. Chapter 13(BB)	Quiz #3 (start of class, Tues, Oct 23rd)	N ↑
10 - Leveraging User-Friendly Design	Oct 30th (Tues) Nov 1st (Thur)	User front-end interfacing and protection Finishing touches on UI packaging	Chapter 13 (BB) cont.	Quiz #4 (start of class, Tues, Oct 30th)	N ↑
11 - Critiques and Considerations	Nov 6th (Tues) Nov 8th (Thur)	Tools for financial simulation, optimization and support Customer service/consulting sim., optim. and support	Chp 8&10 (VA) (Past Projects in Deck)	HW3 (due Wed, 5pm Nov 7th)	N ↑
12 - Lab Intensives (mid-design)	Nov 13th (Tues) Nov 15th (Thur)	Project Labs and Advisory - I Project Labs and Advisory - II			
13 - Lab Intensives (design wraps)	Nov 20th (Tues)	Project Labs and Advisory - III			
Nov 22nd (Thur) - Thanksgiving Break - No Classes					
14 - Final Presentations	Nov 27th (Tue) Nov 29th (Thur)	Presentations Presentations	Final Projects Submitted (by 11pm Fri, Nov 30th)	Final Videos Submitted (Links due via email 11pm Sun Dec 2nd)	C #th
15 - Final Presentations	Dec 4th (Tues)	Presentations			
*Graded Deliverable Types:					
<p>N ↑ Independent Work: Strictly non-collaborative, original individual work. Discussions with instructor only.</p> <p>O Optional-Collaboration: Original individual work/submissions; Students are permitted to discuss among themselves</p> <p>C #th Collaboration-Required: An explicit expectation for collaboration among students</p>					

(only for in-class participation activities -->)