



Course Syllabus

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- Texts** Selected Chapters of *Spreadsheet Modeling and Decision Analysis* (4th ed.),
by C. T. Ragsdale (South-Western, 2003)
Managing Business Process Flows (1st ed.), by R. Anupindi *et al.* (Prentice Hall, 1999)
The Goal (2nd rev. ed.) by E. Goldratt (North River Press, 1992)
Course Binder

Course Description: The focus of this course will be on managing *processes*: actions which convert inputs into outputs. Virtually any business function can be thought of as a network of processes, from manufacturing a car, to developing a consulting proposal for a potential client, to analyzing merger opportunities. There are three main themes for this course: the role of operations within the firm, process analysis and management, and process improvement. Two quantitative modelling tools — constrained optimization and simulation — will also be covered in some depth.

The first theme of this course examines the spectrum of different types of processes, ranging from unique projects (like issuing an IPO) to high-capacity continuous flow items (like sugar or petroleum distillation). The appropriate process depends on the volume and variety of the products being manufactured, as well as on the operational strategy of the firm. A firm that competes on the basis of product innovation and responsiveness will require very different production and distribution systems than another firm that competes as a low-cost producer.

The second theme of the course focuses on process analysis and management. Very generally, the performance of a process can be summarized by three measures: the *flow rate* of products through the process, the amount of *inventory* within the process, and the *flow time* which products spend within the process. The relationships among these three measures are captured through the elegant equation known as “Little’s Law.”

One extension of process analysis examines the presence of variability (in demand, supply, quality, and/or capacity), which can make it difficult to determine the capabilities of a process in terms of capacity and responsiveness. Both queueing theory and simulation models will be particularly helpful for understanding and characterizing these process capabilities under uncertainty.

A second extension of process analysis focuses on networks of processes and the interactions therein. The just-in-time philosophy seeks to smooth the flow of products through an internal network, while the topic of supply chain management examines flows through an external distribution network.

The third and final theme in this course examines process improvement, analyzing variation within a process and discussing the currently popular “6 σ ” programs. Additionally, the operational consequences of the dramatic improvement in information flow (both in terms of speed and volume) resulting from the wide-spread diffusion of the Internet will be discussed throughout the course.

Two quantitative tools will also be introduced. Constrained optimization models, especially linear programs, are helpful in developing intuition about managing with finite resources. Monte Carlo simulation models are useful when the complexity and “messiness” of real world problems preclude an analytic solution.

This course is directed towards a general manager, and will tend to emphasize general service applications over manufacturing examples whenever practical. But having said that, it is sometimes easiest to visualize the important course concepts by considering physical systems rather than (for example) financial or information flows. Additionally, the operational consequences of the dramatic improvement in information flow (both in terms of speed and volume) resulting from the wide-spread diffusion of the Internet will be discussed throughout the course.

This course will often reflect the “adult learning model” which states that adults retain 10% of what they read and 20% of what they hear, but 70% of what they say and 90% of what they do. Students will be involved with the course on a day-to-day basis, including three team projects and extensive class discussions.

Computer Use: Microsoft’s Excel 2003 (2002 or 2000 are also fine) will be used extensively throughout the course, both in class and for the team projects in linear programming and simulation. You should have a solid knowledge of its use, including absolute *vs.* relative addresses (*e.g.*, \$A\$1 *vs.* A1), the different types of graphs, basic formatting, and common Excel functions. (The handout “Useful Excel Functions,” under the Supplemental Readings tab of your binder, reviews these common functions, as well as the to-be-introduced `If` and `SumProduct` functions.) If you are uncomfortable with your Excel background, I would recommend that you consult any of the hundreds of Excel guides on the market. Probably a smaller one (*e.g.*, *Excel 2003 for Dummies*) would be more than sufficient.

Please bring your laptops to class on January 24 and February 7, when we’ll practice formulating and analyzing optimization and simulation models, respectively. In the past I have found that students learn new software much better when they can follow the class development along on their own laptops. You will also need your laptops for the required individual formulation session at the end of those days, and may want them at the review sessions on model formulation those evenings.

We will use two add-in extensions to Excel: The first is Solver, which is distributed as part of the Microsoft Excel CD, but is not typically installed. Please read the article “Installing Solver as Part of Microsoft Excel” for tips on installing Solver prior to January 24, when we’ll use it in class. The second is the popular commercial add-in @Risk for simulation. A CD containing @Risk is distributed with the course binder. Please install @Risk on your laptop prior to February 7.

Many Excel spreadsheets are available on our course CD; others will be posted on the NCCE 508 home page, which is located within the Johnson School intranet:

<http://intranet.johnson.cornell.edu/>.

Computer Tutorials: Two computer tutorials (`RentADent.exe` and `Harriet.exe`) are available on the course CD. These are Camtasia presentations designed to introduce you to the Solver and @Risk add-ins, respectively. (They are homemade, so please overlook their rough edges.) The third (`risk45tutorial.html`) is an optional, professional, introduction to @Risk written by its developer, Palisade Corporation. Under the default installation, its location is `C:\DTools\Risk45\Tutorial\`.

Course Handouts: Most handouts will be distributed in the course binder on the first day of class. Additional class handouts will be available from the instructor, and (if possible) from the course web site.

Grading: Course grades will be based on the following criteria:

Team Projects	“Palisades Gas and Electric Company”	15%
	“Calambra Olive Oil (A)”	20%
Team Participation	Reassignment of 25% of team grade	—
Experiential Activities	“The Solodrex Investment Bank”	2%
	“You Can’t Take It With You”	2%
	Supply Chain Exercise	2%
Class Participation		9%
In-Class Quiz	<i>The Goal</i>	10%
Final Exam	Open book, open notes, closed computer	40%

Incompletes will be given only in accordance to Cornell University policy.

Blind and Visually-Impaired Grading: Both the quiz on *The Goal* and the final examination will be graded blindly, using removable cover pages for your name. Both team projects will be graded on a “visually-impaired” basis. For each project, your team should identify itself by its group number (1 – 12); do not include your individual names anywhere.

Late Assignments: Because the solutions to the assignments are discussed in class, I will not be able to accept assignments after the start of class. If you have a scheduling conflict, please feel free to turn the assignment in early, or e-mail it to me as an attachment.

Regrades: Every effort will be made to accurately grade the assignments. If you ever feel that your performance on an assignment has been *consistently* underestimated, please resubmit your work along with a written statement explaining why you feel that your grade should be adjusted. In order to prevent “cherry-picking,” I will regrade your entire assignment. If you’re satisfied with your grade, but just want to discuss the solution in more detail, feel free to talk with me in person.

Honor Code: Although I trust this won’t be an issue, it’s worth spelling out my expectations explicitly. The two team projects should reflect the analysis of only those individuals on that team, and not anyone else. The quiz and the final exam should of course reflect only individual work; no help is to be given or received on them.

Team Projects: The two team projects (“Palisades Gas and Electric Company,” worth 15%, and “Calambra Olive Oil (A),” worth 20%) are due at the beginning of class on Saturday morning. For each, turn in one 3½” diskette containing at least one Excel (.xls) file. Label the diskette with your team number (1 – 12), but do not include your individual names anywhere. Please recognize that everyone is jointly responsible for all of the material in the team projects; in addition to classroom discussion, supplemental questions on these projects may well appear on the final exam.

Team Participation: Because the team projects comprise over a third of the total grade, peer review will be used to reassign 25% of the total team project grade among the members of each team. You will be asked to evaluate the *other* members of your team as to the extent of their contribution, beyond what you did yourself. (These peer evaluations will be combined through a constrained optimization problem, which avoids the bias in a straightforward weighted average.) Essentially, if you do your share of the team projects, then your team total will not change; if you do nothing, it will drop by 25%; and if you do twice your share, it will increase by 25%.

Experiential Activities: For several important components of the course, the learning comes from the process of experiencing the activity. There is no deliverable, and no easy way to make up the missed experience. These activities include an experiential simulation of supply chain management, and the two hands-on individual application cases for optimization and simulation. Attendance in good spirits at each activity is worth a very small (2%) fraction of the course grade.

Individual Application Cases: These two short individual assignments, “The Solodrex Investment Bank” and “You Can’t Take It With You,” located with the Deliverables, are designed to reinforce your individual modeling skills in optimization and simulation, immediately after coverage in class. In contrast to the other assignments, you may provide and receive unlimited help from anything or anyone. The only restriction is that you must personally build and solve the model; *e.g.*, you cannot use anyone else’s spreadsheet, and you cannot let anyone else take over your keyboard or mouse. Depending on your familiarity with Excel, each assignment should take less than 15-20 minutes of analysis, once you know what you’re doing. If you want to get a head start on these assignments, the first few questions can be done prior to class.

Self-Assessment Quizzes: Periodically throughout the course we will pause for 5-15 minutes for you to work through an old exam question on the quantitative topic being covered. The purpose is to give you — and me — an opportunity to see how well you’ve learned the topic. They are not handed in for a grade.

Discussion Cases: I will use short introductory cases regularly throughout the course to provide a richer context for discussing the various concepts covered. I think you will find it much easier to follow the lectures and to participate in class discussions if you familiarize yourself with the case and address (or at least spend time thinking about) the distributed discussion questions ahead of time. No write-up is due to be handed in for these cases, although follow-up questions may appear on the final exam.

Supplemental Readings: There are two types of supplemental readings which augment the two textbooks. The first type presents new concepts and information, and is important for your understanding of the course material. These readings are identified in black text on the *Course Schedule*, and are prefaced by a ‘●’ in the *Supplemental Readings Table of Contents*. The second type illustrates the application of course concepts in business today, and helps provide a broader business context for these concepts. These readings are identified in green text on the *Course Schedule*, and are prefaced by a ‘○’ in the *Supplemental Readings Table of Contents*.

The Goal Quiz: We will have a very short qualitative in-class quiz on *The Goal* (worth 10% of your course grade) on Saturday, January 24. Although the quiz will be open book and open notes, you will not have enough time to extensively search through the book during the course of the exam. Your best preparation for the exam is to read the book carefully, and maybe go as far as to jot down the page numbers of some key passages.

Class Participation: General informed participation in class discussions is essential in making this course successful. To encourage this, 9% of the course grade will be based on contributions (as opposed to attendance or displayed knowledge; good questions count too). *The entire 9% range will be used, which effectively increases the importance of participation in determining your final grade.* Everyone starts the quarter with 2%, which is where shy or absent folks will end up. (In very rare cases, which you shouldn’t worry about, it’s possible to wind up below 2%.) Obviously, preparing the material ahead of time will help ensure that your comments are productive. In evaluating your class participation, I will be asking myself the question “How much better off is the class because you are here?”

Final Exam: The final exam will be open-book/open-notes, and will consist of short essay questions and quantitative problems. The exams are designed so that students with a good grasp of the course materials will be able to finish within the time limit of 1½ hours. You should bring a calculator, but not a computer, to the exam. Unless you explicitly hear otherwise from me, you should consider all course material (including the team projects, discussion cases, and supplemental readings) to be “fair game” for the exam.

Course Feedback: If you have any comments or feedback about the course, please feel free to come see me at any time. This is especially true about aspects of the course which I can change “on the fly” this Spring.

WebEx OnStage: We will use this Internet-based remote communication software package for questions and informal review sessions between class weekends.