## OPERATIONS MANAGEMENT
Langone MBA PROGRAM, Spring 2017, Section 31
PROFESSOR PRAVEEN NAYYAR

See syllabus for important details.

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| 5       | 3/9/17         | QUIZ I  
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| 6       | 3/23/17        | CASE: Cincinnati Children's Hospital Medical Center.  
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| 7       | 3/30/17        | Optimal Resources Management  
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| 8       | 4/6/17         | CASE: L.L Bean, Inc.: Item Forecasting and Inventory Management (Inventory)  
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| 9       | 4/13/17        | Quiz II  
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| 10      | 4/20/17        | CASE: L.L. Bean, Inc.: Item Forecasting and Inventory Management (Forecasting)  
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| 11      | 4/27/17        | Global Supply Chain Management and Linear Programming  
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| 12      | 5/4/17         | FINAL EXAMINATION | | |

See syllabus for important details.
For this Operations Management course, it is **essential** to have a good understanding of mathematics (arithmetic, geometry and algebra) from high school and college-level algebra and knowledge of basic statistics. In particular, you should be able to:

1. Conduct arithmetic operations and numerical analyses (including interpolation and graph theory), geometric constructions, measurements and analyses, and multivariate algebraic formulations and solutions to problems (including subscripted variables and non-linear relationships).
2. Compute descriptive statistics such as mean, mode, median and variance of a given empirical distribution.
3. Create a frequency distribution from given data.
4. Use probability theory in simple situations such as coin tosses and assessing likelihood of events given an empirical distribution, a normal distribution, or a Poisson or exponential distribution.
5. Use a normal distribution table.
6. Conduct a regression analysis to fit a line to empirical data.
7. Understand and use basic first differential calculus.
8. Construct and analyze spreadsheets of data including using Excel’s built-in data analysis tools.

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**PLEASE SEE NOTE ON NEXT PAGE.**
PLEASE NOTE
This is a relatively demanding course with extensive reading and analytical assignments. The best way to get the most out of this course is to be prepared for each session and to start preparing early. Allocate 2 hours preparation time for each hour of class time. A 3-hour class requires 6 hours of preparation time.

How to Succeed?

1. Carefully, without distractions, read the assigned chapter(s) in the text. Record (write, type) your notes on the chapter.
2. Attempt the assigned discussion questions (DQ) and objective questions (OQ).
3. Carefully, without distractions, read the assigned case(s). Record (write, type) your notes.
4. Analyze the case(s). Refer to the syllabus for guidance. Use “Analyzing Business Cases.” Apply the course materials discussed and contained in the text.
5. Refer to and use any templates provided.
6. Record (write, type) your case analyses.
7. Discuss the text, the case(s) and your analyses with your classmates.
8. Contribute in class.
9. Listen attentively in class (without distractions).
10. Take copious notes in class.
11. Re-read the text and re-analyze the cases after each class.
12. Re-work Quizzes.
COURSE MATERIALS

1. Text


Do not use ANY OTHER edition or the international edition.

2. Cases

You must purchase the assigned cases from Harvard Business School Publishing following the link below.

i. New Balance Athletic Shoe, Inc.
ii. Kristen’s Cookie Company (A)
iii. National Cranberry Cooperative
iv. National Cranberry Cooperative Spreadsheet Supplement
v. Cincinnati Children’s Hospital Medical Center
vi. Delamere Vineyard
vii. L. L. Bean, Inc.: Item Forecasting and Inventory Management
viii. Pioneer Hi-Bred International, Inc.

Course link: Operations Spring 2017 Cases
http://cb.hbsp.harvard.edu/cbmp/access/58318275

You need to register on the site to create a user name if you do not already have one.

1. Visit hbsp.harvard.edu and log in
2. Click My Courses. Click the course name: Operations Spring 2017 Cases

COURSE DETAILS
Professor: Praveen Nayyar
Course Name: Operations Spring 2017 Cases
Course Number: COR1-GB.2314
Course Start Date: January 10, 2017
Course End Date: July 9, 2017
Reference Code: 58318275

For technical assistance, please contact the Harvard Business Publishing Tech Help line at (800) 810-8858 (outside the U.S. and Canada, call 617-783-7700); or email techhelp@hbsp.harvard.edu. Their business hours are 8am-8pm ET, Monday-Thursday, and 8am-7pm ET on Friday.
IMPORTANT REMINDERS

Code of Conduct
Please review Stern’s Code of Conduct:
https://nyustern.campusgroups.com/ose/code-of-conduct/
http://www.stern.nyu.edu/sites/default/files/assets/documents/con_039512.pdf

Academic Accommodation
If you have a qualified disability and will require academic accommodation during this course, please contact the Moses Center for Students with Disabilities (CSD, 212 998-4980) and provide me with a letter from them verifying your registration and outlining the accommodations they recommend. If you will need to take an exam at the CSD, you must submit a completed Exam Accommodations Form to them at least one week prior to the scheduled exam time to be guaranteed accommodation.

Default Policies for Stern Courses
Please review the Default Policies for Stern Courses:
http://www.stern.nyu.edu/portal-partners/academic-affairs-advising/policies-procedures/default-policies-stern-courses

Laptops
Please note that laptops may be used in class to take notes or to refer to your notes and electronic documents for this course. Laptop use must not distract you or others.
THE BASICS

1. This is a course about EXECUTION. It is about getting the right things done correctly. It is about delivering what customers will pay for.
2. This is an introductory course. It covers a wide variety in medium depth.
3. This is not a lecture course. If you learn passively from Powerpoint slides, this course is not for you. This course requires active learning.
4. Analytical rigor will be emphasized and there will be many detailed calculations.
5. You will need to prepare extensively for each session and come to every class.
6. Points earned for each segment of the course will be summed to obtain a total score for the course. Students will be rank-ordered based on their total score to determine their course grade in conformity with the Stern Core Courses Grade Distribution guidelines. Course grades will be determined as follows:
   - Homework (4 submissions) 30%
   - Class Contributions 10%
   - Quizzes (2) 30%
   - Final Examination 30%

Homework
4 homework assignments are due as detailed in the syllabus below.

Class Contributions
Effective class contribution involves activities that:
1. Lead to a productive start to the discussion.
2. Affect the discussion positively by introducing or using concepts and frameworks.
3. Include carefully considered quantitative or qualitative analyses based on data.
4. Challenge what appears to be "accepted wisdom."
5. **Do not repeat** what has already been said.

- You may be asked to start or manage the discussion or answer a specific question during the class in any session.
- If you are not fully prepared, let me know before class.
- Attend all classes, even if you are not adequately prepared.
- Inform me if you will be unable to attend class.
- **Absence from classes will adversely affect your course grade.**

Quizzes and Final Examination
- Two quizzes will be held during scheduled classes.
- The final examination will be held in the last scheduled session of the course.
- **There will be no make-up quizzes or exams offered. Please manage your calendars accordingly.**
Note on Grading

- Managerial problems seldom have unique solutions. But, some solutions are better than others. Accuracy and precision, when possible, will be rewarded.
- I will look for compelling logic and reasoning in the analysis, application of course concepts, tools and analytic techniques, practicality of recommended actions, "value added" of exhibits or analyses, and clear and concise writing.
- Since "cut and dried" solutions are not always possible, the grading process will be, in part, subjective but equitable.
- Any questions about your points or grades earned must be submitted in writing within 5 business days after you receive them.

Etc.

- Discussion Questions (DQ) and Objective Questions (OQ) to help you prepare as well as assess your preparation are posted on NYU Classes under Syllabus.
- Materials to prepare for each session, if needed, will be posted on NYU Classes under Lessons.
CLASS SCHEDULE

Session #  Topics and Assignments

**Session 1  Mission, Objectives, Strategy and Operations**

**Read:**
1. This syllabus (yes, all of it, please).
2. Text Chapters 1 & 2.
3. Analyzing Business Cases. (See NYU Classes (NYUC))
4. Terms Used in Operations Management. (NYUC)

**Prepare:** **New Balance Athletic Shoe, Inc.**
1. Evaluate New Balance’s current operations strategy in the context of its mission, objectives and business strategy.
2. Assume that the total USA market for athletic footwear was 400 million pairs in 2005. Estimate New Balance’s cost to manufacture 25% in the USA. Is it worth it?
3. What should New Balance do, if anything, in response to the Adidas-Reebok combination?
4. Evaluate the NB2E initiative.

**Session 2  Operations Design and Analysis**

**Read:**
Text Chapters 7 & 11.

**Prepare:** **Kristen’s Cookie Company (A)**
Answer the questions at the end of the case. Draw a process-flow diagram, identify bottlenecks, and compute process throughput time, process cycle time, and process capacity per 4-hour day. Assume all orders are for 1-dozen cookies. Use the format below for each task in the process flow diagram. Indicate units of measure. See Terms Used in Operations Management. (Cycle Time = Throughput Time / # of Resources. Capacity = 1/Cycle Time.)

<table>
<thead>
<tr>
<th>Task</th>
<th>Throughput Time</th>
<th>Cycle Time</th>
<th># of Resources</th>
<th>Capacity</th>
</tr>
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**Session 3  Introduction to Queuing and Simulation**

**Homework #1 DUE at start of class.**

**Read:**
Text Chapters 9 & 10.
Session 4  Operations Design and Analysis

Prepare: National Cranberry Cooperative
1. Draw a process flow diagram for the process fruit operation of RP #1.
2. Identify any bottlenecks in the process.
3. What are the average arrival rates and processing rates per hour for wet and dry berries. Consider total, peak, non-peak and maximum days. What are the expected arrival rates next year?
4. Should NCC have bought the fifth dumper? Justify your answer by a queuing analysis (See Chapter 10) of the dumpers only. (Assume single phase. Ignore the rest of the process.)
5. NCC is considering selling two dumpers to create more space for trucks waiting to unload. In addition, NCC is considering reserving one dumper for trucks bringing dry berries and the two remaining dumpers for trucks bringing wet berries. Evaluate these alternatives.
6. Identify the problems at NCC. How severe are these problems?
7. Develop and evaluate alternative solutions to the problems. Conduct detailed numerical analyses of the build-up of inventory to gain insights. To start, examine a day when 18,879 barrels arrive, of which 70% are wet. First, assume that trucks arrive evenly spaced for 11 hours (with no lunch break) and processing starts at 7:00 am.
8. Second, using simulation, repeat the analysis using the actual arrival schedule given in the case (available on NYUC) for a sample day. Break-up the day into 1-hour increments. Assume that:
   - 80% of the arrivals are wet berries (Ignore actual wet/dry mix.)
   - 10,000 barrels or more are received for 25 days in an year
   - 25 workers work overtime when needed to process berries.

Some templates are available on NYUC to help you analyze the case.
The National Cranberry Cooperative Spreadsheet Supplement contains some of the data tables from the case.

Session 5  Quiz I
Delivering High Quality

Homework #2 DUE at start of class.

Quiz 1: Please bring a calculator. The quiz is expected to include all the material covered until now in this course.

Read: Text Chapter 12.
Session 6 Quality

Read:  Text Chapter 13 (to page 330).
Prepare:  Cincinnati Children’s Hospital Medical Center
1. Compare and contrast a goods-producing operation with a service-producing operation.
2. How might any differences between goods- and service-producing operations impact CCHMC’s approach to delivering high quality?
3. Evaluate CCHMC’s policy on transparency.
4. Consider Exhibit 4, Figure D. What should they address first?
5. What would you recommend going forward?

Prepare:  Delamere Vineyard
1. What are Delamere’s strengths and weaknesses? What does it deliver to customers that other vineyards do not? What does it take to be outstanding in the wine business?
2. What uncertainties does Richardson face?
3. What does quality mean in winemaking?
4. What principles and concepts should one apply to improving quality in a production system such as winemaking?
5. What should Richardson do? Should he pursue any of the quality improvement ideas he is considering?

Session 7 Optimal Resources Management
Introduction to Supply Chains and Inventory

Homework #3 DUE at start of class.

Read:  Text Chapters 16 & 20.
Gather:  Data on the amount, composition and value of inventory and the annual costs of managing and holding inventory in your current or previous firm or organization, or any other organization. Be prepared to present the data.

Session 8 Supply Chains and Inventory

Prepare:  L. L. Bean, Inc.: Item Forecasting and Inventory Management.
1. The Excel file BeanItemData.xls on NYUC contains demand and forecast data for 84 items. Assume that L. L. Bean will use these data to plan their next season. Consider an item that retails for $45 and costs L. L. Bean $25. Its liquidation price is estimated to be $15. The sales forecast for this item is 12,000 units. What quantity should L. L. Bean order of this item? Use the method described in the case. This is a single-period inventory model discussed on page 519 of the text.
2. How significant (quantitatively) of a problem is the mismatch between supply and demand for L. L. Bean? (Hint: It is not obvious.)
3. How does L. L. Bean use past demand data and a specific item forecast to decide how many units of that item to stock? Is this the best they can do?
4. What item costs and revenues are relevant to the decision of how many units of that item to stock? What inventory management method does L. L. Bean use?
5. How can inventory management be improved at L. L. Bean, Inc.?

Prepare: The Nut Case. (NYUC)
As David Nutt, prepare for your meeting with Peter on the weekend. Which ordering policy should David adopt? (See template on NYUC.)

Session 9 Quiz II
Introduction to Forecasting

Homework #4 DUE at start of class.

Quiz II: Please bring a calculator. The quiz is expected to include all the material covered until now in this course.

Read: Text Chapter 18. Focus on understanding the broad principles of each method rather than the detailed mechanics of each computation. Under what conditions is each method appropriate to use?

Session 10 Forecasting
Introduction to Linear Programming

Read: Appendix A for Introduction to Linear Programming.
Bring: Your laptop with your answers to the questions below.
Required: Data Analysis Add-in available for Excel. Look under Data tab.
Prepare: L. L. Bean, Inc.: Item Forecasting and Inventory Management.
1. Some items in L. L. Bean’s catalog are considered “staples.” Staples are carried every year and include items such as doormats, tote bags, gloves, hats and basic jackets. Some analysts believe that forecasting demand for such items requires different methods than the item forecasting methods described in the case.
   ◊ What factors would you consider in selecting forecasting methods for such staple items?
   ◊ Which forecasting method(s) discussed in Chapter 18 would you recommend to L. L. Bean for such staple items?
   ◊ Use the method(s) you recommend and the historical data for the years 1988 to 1991 (NOTE: DO NOT USE THE 1992 DATA) for one type of doormats in the Excel file BeanDoormats Data and
Template.xls on NYUC to forecast monthly demand for this item for 1992 (January to December).

Also compute forecast errors for the first five months of 1992 for the method(s) you recommend. (See template on NYUC.)

**NOTES**

a. The following methods can be easily implemented in Excel: simple average, 3-month moving average, simple exponential smoothing, and linear regression.

b. **Some of the notation differs** between the Book, Excel and the Templates for the smoothing constants used in forecasting.
   - The **Book** uses Alpha and Delta and it does not use a smoothing constant for Seasonality.
   - The **Templates** refer to Alpha, Beta and Gamma respectively.
   - Keep these differences in mind as you analyze L. L. Bean, Inc.

2. How can forecasting be improved at L. L. Bean, Inc.?

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**Session 11 Global Supply Chain Management and Linear Programming**

**Read:** Text Chapter 14.

**Read:** Text Appendix A. Pay particular attention to the formulation of linear programming problems on pages 694, 700, and 705. And, pay particular attention to Excel Solver setups.

**Bring:** Your laptop with your answers to the questions below.

**Required:** **Solver Add-in available for Excel. (Check under Data tab in Excel.)**

**Prepare:** Pioneer Hi-Bred International

1. Why was John Smith so apprehensive about the 1998 production plan? How would uncertainty of forecast demand and production yield affect the supply management decisions at Pioneer?

2. What should John Smith do about the 33% safety stock? What would be the impact on the 1998 plan if the safety stock inventory was reduced to 20%? How would changing production yields affect the safety stock decision?

3. What should John Smith do about Northern Hemisphere production and off-season production?

4. What should John Smith do about overseas production issues?

5. How would the LP model help John Smith make such decisions as the overproduction rate and overseas production?

6. What are the advantages and disadvantages (limitations) of the LP model in the current case?

7. Page 7 of the case describes Johnson’s efforts at formulating and solving a simplified LP model for Pioneer Hi-Bred. Formulate such a simplified LP model for Pioneer Hi-Bred to determine how much of each product should be grown in each area, processed in each plant,
transported to each market and sold in each market to meet demand. How many decision variables did you get? How many constraints?

8. The simplified LP model for Pioneer Hi-Bred that Johnson (and you) formulated above is too large for Excel to handle. Therefore, please use the instructions and data available on NYUC to formulate a greatly reduced model and to solve it using Excel Solver.

9. How sensitive is the optimal solution to changes in the cost coefficients and the RHS limits of the constraints in the LP model?

10. How can the LP model be improved?

Some templates are available on NYUC to help you formulate, setup in Excel and solve the reduced problem.

Please setup and solve the problem by yourself. Do not simply use the templates.

| Session 12 | Final Examination |

**NOTE:** Please bring a calculator. The Final Examination is expected to include all the material covered in this course.