STERN SCHOOL OF BUSINESS NEW YORK UNIVERSITY

COURSE SYLLABUS OPERATIONS MANAGEMENT DRAFT (Spring 2015 syllabus- dates are subject to change)

Tuesday/Thursday
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HONOR CODE

I expect every student to be familiar with the Stern School of Business Honor Code. Some of the ways in which the code applies to this course are discussed below:

- The honor code stipulates that no student will lie, cheat, copy or otherwise behave in an unfair manner to obtain academic advantage over other students.
- As per the honor code, an individual's name on a report **should be included** only if they have contributed to the analysis. If an individual has not contributed to the analysis in an intellectual manner, it is a violation of the honor code to include his or her name.
- Furthermore, you may not refer to case write-ups from classes offered in earlier semesters.
- The premise of *the honor code* is that ideas should be attributed to their source. Therefore, please acknowledge the main source(s) of data, facts, and ideas (other than from the instructor or textbook) in all your written work and when you make a presentation. If you use material from a source other than the lecturer, the textbooks or the lecture notes, you must attribute the source. For example, say, "I discussed this with the TA." Or "I obtained this from the following website."
- You may discuss the homework with your classmates, TA or me. However, you must do them individually. The discussion is limited to "how to solve" type of questions. The actual solution must be done individually. Do not be worried of getting the answer incorrect in the homework. Most of the points will be given for using the correct approach.

COURSE MATERIALS

Recommended CUSTOM TEXT: COMPETITIVE ADVANTAGE FROM

OPERATIONS, Heizer and Render, 7th Edition, Pearson Custom Publishing.

This customized text was prepared by Pearson Custom Publishing for Stern students. It will be denoted as H&R in the outline. Consecutive page numbers in the top center of the book will used to refer to materials from the book.

CASE and READINGS PACKET electronic access at Bookstore (Required)

THE GOAL: A process of ongoing improvement, Any Edition, New or Used, Eliyahu Goldratt, North River Press Publishing Corporation. (**Required**)

GRADING

Class Participation, Attendance, Quizzes	10%
Examinations (Open book)	60%
Homework	30%

HOMEWORK

You will be assigned homework on a class-to-class basis for each topic. The homework assignments are due on the dates (sessions) where the assignments appear in the syllabus. Only homeworks that are specifically designated as **submit** are to be handed-in <u>at the beginning of class</u>. Please keep a copy of all homework submitted for reference during class. You may be asked to come to the front of the room to explain your work.

Homework will be graded, and will not be accepted late. They must be prepared <u>individually</u> in order to receive credit. Please write clearly or word process your homework.

QUIZZES

A quiz might be given in any class. The quiz will relate to the class material of that day. You are expected to come to class.

HOW TO PREPARE FOR CLASS DISCUSSIONS

Please read the cases carefully. Use the study questions supplied in the syllabus as a guide. Be prepared to be called-upon to present the facts of the case, to come to the board to present charts, or to carryout the analysis indicated by the study questions.

HOW TO PREPARE A CASE REPORT

Case reports should be concise, no more than 2 pages of written material. You may attach charts, diagrams or data to that two-page report. Your report should answer all questions either specified.

Exams

There will be two in-class, open book, open notes exams, and a final exam. Each will be worth 20% of your final grade.

SYLLABUS

OPERATIONS MANAGEMENT

MODULE 1: MANAGING BUSINESS PROCESSES

PART 1: Introduction to Operating Systems: Process Design and Analysis and Aggregate Planning

<u>SESSION 1</u>: INTRODUCTION – OPERATIONS AS A SOURCE OF COMPETITIVE ADVANTAGE

Class Plan:

In this session we discuss the course contents, form groups, and discuss other details. The main themes in this session are: what are business processes, how operations management involves the design, planning, and management of business processes, and how operations is a source of competitive advantage for a firm.

Homework Readings (for next class):

- 1. Begin reading "The Goal" by E.M. Goldratt (Finish by Session 6)
- 2. Read "Terms Used In Operations Management", "Analysis of an Operation", and "Process Flow Analysis." (Posted on Blackboard)
- 3. Read Chapters 1 and 7, "Operations..." and "Process Strategy..."
- 4. Be Prepared to Discuss Tuffy Bike Case (In "Process Flow Analysis" Reading)

SESSION 2: PROCESS ANALYSIS: PROCESS CAPACITY AND PROCESS COST, TIME, VARIETY

Class Plan:

In this and the next session, we learn to analyze a business process in detail. The objectives of the analysis are: identify the process capacity, process cost, and time to serve customers. Additionally, understand how to execute orders, schedule labor, and identify bottlenecks.

Using a simple setting, we pick up useful tools and techniques such as capacity calculations, throughput time calculations, work assignment, and scheduling.

Together, the sessions provide insights into capacity management techniques that are used every day in businesses.

Prepare and Submit For Next Class:

- 1. Read, analyze and be prepared to discuss the Kristen's Cookie Company case utilizing the six key questions at the end as guides.
- 2. Draw and **Submit** two Gantt charts for Kristen's operation, one assuming all orders are for one dozen cookies and the second assuming orders are for two-dozen cookies. All one dozen orders come every 10 minutes and two dozen orders every 20 minutes. Assume Kristen's roommate is helping.
- 3. What are the cycle times, throughput times, and capacities of each operation and the whole production system for each case? Note these on your charts.
- 4. Read Chapter 7: "Capacity..."

SESSION 3: PROCESS ANALYSIS: PROCESS CAPACITY AND PROCESS COST, TIME, VARIETY

Class Plan:

In this session, we discuss the strategy of Kristen's Cookies. We shall observe how various elements of the operations strategy of Kristen's come together to support its business strategy. This will enable us to identify the key factors that determine success and failure from an operations viewpoint. In this session, we will begin to understand how factors such as lot size and product variety affect the capacity of an operation.

In this session we will also discuss process choice. Two of the variables that affect the choice of a process are volume and variety. The choice of process goes beyond determining whether to mass produce or make by hand. It also influences the labor skills, the degree of automation, the controls used, the IT and information systems, etc. We study service operations to see if they have special characteristics that are different from manufacturing operations. For service operations, the key factors are the degree of customization versus the intensity of labor.

Prepare and Submit For Next Class:

Prepare and **Submit** a case report for National Cranberry. The questions will be provided.

SESSION 4: PROCESS DESIGN AND FIRM STRATEGY

Class Plan:

In this session we will strengthen our understanding of process capability by examining production in a continuous flow operation. We will review National Cranberry. We continue the discussion of analyzing business processes and determining process performance such as capacity, throughput, and cycle time. We shall link these ideas back to the book "The Goal."

Homework Readings for Next Class:

- 1. Read for class discussion the Shouldice Hospital and Benihana Cases
- 2. Read Chapter 16: "JIT and Lean ... "

SESSION 5: PROCESS EXCELLENCE – JUST IN TIME MANAGEMENT

Class Plan:

We will discuss Shouldice Hospital and Benihana. We will discuss the design of business processes and determine on what basis we should be making design decisions. We will discuss business strategy and its implications on operations design and process choice.

In addition we will discuss the concept of Just In Time Management as a process design approach to create excellence in operation performance.

Homework Readings for Next Class:

1. Read Forecasting Materials (Supplied)

Related Links:

Dell: <u>http://www.dell.com/</u> **Related Links:** Lean Operations <u>http://www.stern.nyu.edu/om/under_cafo/Seshadri/allrefs.htm - lean_operations</u>

SESSION 6: AGGREGATE PLANNING/FORECASTING

Class Plan:

The question of how much capacity our production processes need and how much we should produce in an uncertain business environment we be examine using aggregate planning and forecasting techniques.

Prepare and Submit For Next Class:

- 1. **Submit** Solutions to Forecasting Problems (Handout)
- 2. Read Chapter and Supplement 6:"Managing Quality" and "Statistical Process Control"

PART 2: Managing for Competitive Advantage: Quality as a Strategic Issue

<u>SESSION 7</u>: QUALITY – ITS DEFINITION AND BASIS FOR COMPETITION

Class Plan:

In this session we introduce quality management concepts. The objectives of the session are to understand what is quality, what are the costs associated with it, and raise questions about managing quality in the age of super-mass production.

Homework Readings For Next Class:

1. Read for Discussion the Hank Kolb Case

Related Links:

SUVs: <u>http://www.fordvehicles.com/suvs/http://www.fordvehicles.com/suvs/</u> Tires: <u>http://www.firestone.com/</u> The Government Regulators: <u>http://www.nhtsa.org/</u> The W. Edwards Deming Institute: <u>http://www.deming.org/</u> The Juran Institute: <u>http://www.juran.com/main.html</u>

SESSION 8: QUALITY ANALYSIS, MEASUREMENT AND IMPROVEMENT, AND STATISTICAL QUALITY CONTROL

Class Plan:

In this session we learn about the two faces of quality. What does a customer want? What can a process deliver? And, how to manage their interaction. We shall discuss useful quality management tools, such as, the fishbone chart, Pareto analysis, and process control charts. We will also learn about six-sigma quality. Specifically:

- 1. What is six sigma quality and how it applies to product and process design?
- 2. What is process capability? How to measure process capability?
- 3. How does six sigma quality relate to the teaching of Deming?
- 4. What is meant by "Quality is free."

In this session we learn about statistical process control. We discuss how statistical process control techniques are used in many different industries

Prepare and Submit For Next Class:

- **1. Submit** SPC Problems (Handout)
- 2 Read Ford-Firestone Case and **Submit** a fishbone diagram showing the probable causes for the tire failure problem (as set out in the case). A fishbone diagram shows probable causes for a problem such as: due to manufacturing, materials, design etc.

SESSION 9: TOTAL QUALITY MANAGEMENT

Class Plan:

In this session we will review the Quality Tools and the SPC techniques covered in the previous classes. We will discuss the business implications of quality problems such as the Ford-Firestone case and others such as Toyota and BP Oil.

Prepare and Submit For Next Class:

1. **Submit** Ritz Carlton Case

Related Links:

Total Quality Mgmt: Lib.upm.edu.my/iistqm.htmlIntegrated Quality Dynamics, Inc: www.iqd.comSix Sigma at GE: http://www.ge.com/sixsigma/Visit the American Quality Control Society's http://www.asq.org/ website

SESSION 10: SERVICE SYSTEM QUALITY/ Exam #1 Review

Class Plan:

We will finish our discussion of Quality Management with a look at how a top hotel/resort chain maintains its position. We will then review all course material covered to date in preparation for the first exam.

SESSION 11: EXAM #1

Homework Readings For Next Class:

1. Read Chapter 12: "Inventory Management"

Part 3: Managing for Competitive Advantage: Inventory Concepts and Models

SESSION 12: INVENTORY / LOGISTICS

Class Plan:

In this and the next four sessions, we discuss inventory management and more broadly *supply chain management*. Material, information and funds flow through *supply chains*. Demand is matched with supply, orders with fulfillment, and products are planned to fill customer needs and to compete against other products in the market. The integrated management of the three flows, material, information, and funds, is called supply chain management. We learn how firms compete using new principles of supply chains. We also learn how inventory, one of the fundamental levers for managing supply chains, can be analyzed and managed.

Prepare and Submit For Next Class:

1. Submit Answers to Inventory Problems (Inventory Handout #1)

SESSION 13: THE ROLE OF INVENTORY - THE TRADITIONAL VIEW FOR MATURE PRODUCTS, INVENTORY MODELS

Class Plan:

In this session we explore the effect of centralization on inventory costs. We see how scale economies can be derived even in very ordinary situations. We then discuss alternate ways of deriving these scale advantages. We will look at the effect of demand variability on inventory decisions.

Prepare and Submit For Next Class:

- 1. Submit Answers to Inventory Problems (Inventory Handout #2)
- 2. Read Chapter and Supplement 11: Supply Chain ... " and "Outsourcing ... "

Related Links:

l2: http://i2.com

SAP: http://www.sap.com/solutions/scm/

KMART files for bankruptcy http://money.cnn.com/2002/01/22/companies/kmart/

SESSION 14: INVENTORY MANAGEMENT – THE SUPPLY CHAIN VIEW – MATCHING DEMAND AND SUPPLY

Class Plan: We will introduce advanced Supply Chain concepts. We learn the key operating principles behind such systems. We also learn about the firms that have adopted such production systems. We will also prepare for The Beer Game!

Reading Homework For Next Class:

1. Beer Game Materials (Handout)

SESSION 15: SUPPLY CHAIN CONCEPTS IN ACTION: THE BEER GAME

PLEASE BE A FEW MINUTES EARLY AND BE READY TO PLAY AT THE VERY START OF CLASS

Related Links:

What is systems dynamics? http://www.albany.edu/cpr/sds/

Homework Reading For Next Class

- 1. Submit BEER GAME Team Results
- 2. Read Chapter D: "Waiting Line Models"

MODULE 2: OPERATIONS ANALYSIS TOOLS

PART 1: Queueing Models

SESSION 16: THE EFFECTS OF UNCERTAINTY - WAITING LINES

Class Plan:

Recall Pete's people (The Goal) who were trying to beat the robot? Demand and supply often do not match. The mismatch creates special problems for managers. To

understand these problems it is important to understand the time-scale at which these uncertainties happen. Very long and gradual changes in demand can be dealt with using techniques for managing seasonal demand. Medium term uncertainties, such as day-to-day fluctuations in demand levels, can be dealt with using staffing solutions and overtime. Demand uncertainties on the *same* time scale as operational variables such as processing time or set-up time need special techniques. These techniques are called waiting line or queuing techniques. We learn a bit about the other two and lot more about the waiting line techniques in this and the next session.

We learn how variability in processing times and arrival patterns create delays. These delays are due to queues. We learn why queues form? How to estimate the queuing delays? How to plan to extra capacity to reduce unwanted delays? And how to reduce uncertainty?

Prepare and Submit For The Next Class:

1. **Submit** Data Display of Arrival and Service Rates (Handout)

SESSION 17: ADVANCED QUEUEING MODELS

Class Plan:

We will examine models of waiting lines. In particular, we discuss whether single lines are better than multiple lines, whether and when specialization using dedicated servers is preferred, as well as, several psychological factors that affect the perception of "waiting" in lines.

Prepare and Submit For The Next Class:

- 1. **Submit** Solutions to Problems (Handout)
- 2. Read and prepare for discussion First City National Bank Case (Handout) The following study questions will help:
 - a) Considering the data supplied for arrival and service times, how would you calculate an average arrival rate and service rate?
 - b) As Mr. Craig, what characteristics of this queuing system would you be most interested in observing?
 - c) What is the best number of tellers to use?

SESSION 18: APPLIED QUEUEING MODELS

Class Plan:

In this class we will see how our understanding of queueing priciples can be applied to provide competitive advantage.

Homework Readings For Next Class:

1. Read Chapter F: "Simulation"

PART 2: SIMULATION AS A PROBLEM SOLVING TOOL FOR OPERATING SYSTEMS

SESSION 19: AN INTRODUCTION TO SIMULATION Class Plan:

We will introduce simulation as a useful tool to study processes. It is widely use in practice to answer different types of questions, such as, what should be the configuration and capacity of facilities, what scheduling rules should be used, how should due-dates be assigned to customer orders, how does yield impact process performance etc. We will cover Monte Carlo Simulation techniques and their application to a variety of operations problems. In this session we shall learn about discrete event simulation.

Prepare and Submit For The Next Class:

- 1. Submit Solutions to Problems (Handout)
- 2. Submit Solution to First City National Simulation (Handout)

Related Links:

A simulator add-in to Excel: Crystal Ball <u>http://www.crystalball.com/</u>

Arena is an industrial strength simulation software. You can read more about it at: <u>http://www.arenasimulation.com/</u>

SESSION 20: SIMULATION APPLICATIONS/Exam #2 Review

Class Plan:

We will complete our discussion of Simulation and review material covered in preparation for Exam #2.

SESSION 21: EXAM #2

Homework Readings For Next Class:

1. Read Chapter B: "Linear Programming"

Part 3: Allocating Resources for Strategic Capacity Planning

<u>SESSION 22</u>: THE BASIC LINEAR PROGRAMMING (LP) PROBLEM SOLUTION TECHNIQUES: GRAPHICAL METHOD AND ENUMERATING THE CORNER POINTS

Prepare and Submit For Next Class:

1. Submit Graphical Solutions to Problem Set (Handout)

Class Plan:

We will learn the use of linear programming for planning and optimizing systems. We shall discuss several applications of LP to Operations Management problems. We learn how to solve LP problems by hand using a graphical technique. We also learn to carry out sensitivity analysis.

Related Links:Linear Programming and other Operations Research Topics <u>http://www.informs.org/Resources</u>

Related Links:

Visit the website of llog and look under OPL Studio. <u>http://www.ilog.com/</u>

Related Links:

Linear Programming and other Operations Research Topics: http://www.informs.org/Resources

Related Links:

Operations Research Society http://www.informs.org/

SESSION 23: LINEAR PROGRAMMING USING EXCEL SOLVER

Class Plan:

In this session we will learn how to solve LP problems using Excel Solver. We will examine the implications of binding and non-binding constraints. We will also review the information provided by Solver sensitivity reports.

Prepare and Submit For Next Class:

1. Submit LP Formulations to Problems (Handout)

SESSION 24: LINEAR PROGRAMMING APPLICATIONS

Class Plan:

In this session three different applications of LP will be reviewed to show how LP can help with a wide variety of business problems.

Prepare and Submit For Next Class:

- 1. **Submit** Solver Solutions to Problems (Handout)
- 2. Read Chapter 3 "Project Management"

PART 4: Time-to-Market & Responsiveness

SESSION 25: TIME BASED COMPETITION

Class Plan:

Competing based on time means being able to execute large projects, on time and within cost. In this session we first discuss the value of time-based competition.

Then, in this and the next session, we learn about network techniques for planning and managing large projects. Successful project management involves planning and managing the time to complete the project, monitoring the use of resources during project execution, and increasing the probability of successful completion. Network planning and control techniques provide the tools necessary for undertaking these tasks.

Prepare and Submit For Next Class:

1. Submit: Solutions to Project Management problems handed out in class.

Related Links:

Not all projects are successful. The links below contain examples of major engineering project failures in the last century.

Denver Airport

http://www.eee.bham.ac.uk/dsvp_gr/roxby/ee4a3/Lecture2/index.htm

http://www.prenhall.com/divisions/bp/app/alter/student/useful/ch13denver.html

Challenger

http://www.tsgc.utexas.edu/archive/general/ethics/shuttle.html http://history.nasa.gov/sts511.html

Other failures

http://www.cds.caltech.edu/conferences/1997/vecs/tutorial/Examples/Cases/failures.htm

SESSION 26: PROJECT MANAGEMENT TECHNIQUES/Course Review

Class Plan:

We will discuss the probabilistic methods for project analysis. We will also touch upon project crashing. We will learn why it is sometimes beneficial to reduce the duration of a project, even though it may increase the cost of the project. We will discuss project crashing techniques that optimally reduce the duration of a project by selectively reducing the duration of only certain activities.

Related Links:

Please visit the website of Primavera <u>http://www.primavera.com/</u> to see examples of the state-of-art network planning tools.

FINAL EXAM