Fall 2019 - Operations Management

OPMG-UB 9001

Monday 10:30 - 13:15

Florence Campus, TBA

Class Description:
Prerequisites: STAT-UB 103 Statistics for Business Control and Regression/Forecasting Analysis (or BOTH STAT-UB 1 and STAT-UB 3) OR equivalent.

This course will introduce students to a range of models, methods, tools, all dealing with operations management. This is a quantitative course, with strong attention paid on the capability of understanding and correctly using analytical and mathematical tools.

Instructor Details:
Name: Fabio Schoen
NYUGlobal Home Email Address: fs56@nyu.edu
Office Hours: every Monday 9.30 – 10:30 and, during the week, by appointment through skype or other web service
Villa Ulivi Office Location: TBA
Villa Ulivi Phone Number: +39 055 5007 300

Desired Outcomes:
On completion of this course, students should:
• Have improved their mastery of the role of operations management in modern organizations;
• Have performed quantitative treatment of the theories
• Have made relevant connections between theory and real world examples, through references to media material, readings or case studies
• Have made a simplified, but direct on-field application of operations management to a real case chosen by themselves
• Find an increased interest to go deeper in understanding how the use of quantitative tools and analytics
can improve the quality of managerial decisions

Assessment Components

• Class attendance and participation 5%
• Homework Assignments 20%
• Midterm open book 30%
• Mini Group Project 15%
• Final open book 30%

Failure to submit or fulfill any required course component results in failure of the class.

Assessment Expectations:

• **Grade A**: The student makes excellent use of empirical and theoretical material and offers structured arguments in his/her work. The student writes comprehensive essays/exam questions and his/her work shows strong evidence of critical thought and extensive reading.

• **Grade B**: The candidate shows a good understanding of the problem and has demonstrated the ability to formulate and execute a coherent research strategy.

• **Grade C**: The work is acceptable and shows a basic grasp of the research problem. However, the work fails to organize findings coherently and is in need of improvement.

• **Grade D**: The work passes because some relevant points are made. However, there may be a problem of poor definition, lack of critical awareness, poor research.

• **Grade F**: The work shows that the research problem is not understood; there is little or no critical awareness and the research is clearly negligible.

• *Please note, Stern Business courses will adhere to the Stern Grading Guidelines*

Grading Guidelines

**Required Grading Language for Core Courses**
At NYU Stern, we strive to create courses that challenge students intellectually and that meet the Stern standards of academic excellence. To ensure fairness and clarity of grading, the Stern faculty have adopted a grading guideline for core courses with enrollments of more than 25 students in which approximately 35% of students will receive an "A" or "A-" grade. In core classes of less than 25 students, the instructor is at liberty to give whatever grades they think the students deserve, while maintaining rigorous academic standards.

Grading Policy:
Please refer to Assessment Expectations and the policy on late submission of work.
**Academic Accommodations:**
Academic accommodations are available for students with documented disabilities. Please contact the Moses Center for Students with Disabilities at 212-998-4980 or see the Moses Center for further information.

Students with disabilities who believe that they may need accommodations in a class are encouraged to contact the Moses Center for Students with Disabilities at (212) 998-4980 as soon as possible to better ensure that such accommodations are implemented in a timely fashion. For more information, see Study Away and Disability.

**Attendance Policy:**
Study abroad at Global Academic Centers is an academically intensive and immersive experience, in which students from a wide range of backgrounds exchange ideas in discussion-based seminars. Learning in such an environment depends on the active participation of all students. And since classes typically meet once or twice a week, even a single absence can cause a student to miss a significant portion of a course. To ensure the integrity of this academic experience, class attendance at the centers is mandatory, and unexcused absences will be penalized with a two percent deduction from the student’s final course grade. Students are responsible for making up any work missed due to absence. Repeated absences in a course may result in failure.

For courses that meet once a week, one unexcused absence will be penalized by a two percent deduction from the student’s final course grade. For courses that meet two or more times a week, the same penalty will apply to the number of class times over a single week.

**Excused Absences:**
In case of absence, regardless of the reason, the student is responsible for completing missed assignments, getting notes and making up missed work in a timely manner based upon a schedule that is mutually agreed upon between the faculty member and the student. The only excused absences are those approved by the Office of Academic Support; they are as follows:

- **Absence Due to Illness**
  - If you are sick, please see a doctor. Contact the Office of Student Life for assistance.
  - For absences that last for two or more consecutive days, a doctor’s certificate, "certificato medico” is required. The doctor will indicate in writing the number of days of bed rest required. Please note these certificates can only be obtained on the day you see the doctor and cannot be written for you afterwards.
  - Absences can ONLY be excused if they are reported WITHIN 48 HRS of your return to class via the online NYU Florence Absence Form
  - OAS will not accept a student email or telephone call regarding an absence due to illness
  - OAS will only notify faculty of absences REPORTED on the ABSENCE FORM
  - The Office of Student Life, when assisting you in cases of severe or extended illness, will coordinate with the Office of Academic Support to properly record your absences

- **Due to Religious Observance**
  - Students observing a religious holiday during regularly scheduled class time are entitled to miss class without any penalty to their grade. This is for the holiday only and does not include the days of travel that may come before and/or after the holiday
  - Information regarding absences due to religious observance must be provided at least SEVEN DAYS PRIOR to the date(s) in question using the online NYU Florence Absence Form
  - Please note that no excused absences for reasons other than illness can be applied retroactively.
Due to a class conflict with a program sponsored lecture, event, or activity

- All students are entitled to miss one class period without any penalty to their grade in order to attend a lecture, event or activity that is sponsored by La Pietra Dialogues, Acton Miscellany or the Graduate Lecture series.
- Information regarding absences due to a class conflict must be provided at least SEVEN DAYS PRIOR to the date(s) in question using the online NYU Florence Absence Form.
- Please note that no excused absences for reasons other than illness can be applied retroactively.

Students with questions or needing clarification about this policy are instructed to contact a member of the Office of Academic Support located in Villa Ulivi or to email florence.academicsupport@nyu.edu

Late Submission of Work

- All course work must be submitted on time, in class on the date specified on the syllabus.
- To request an extension on a deadline for an assignment, students must speak to the professor one week prior to the due date.
- To receive an incomplete for a course at the end of the semester, two weeks before final exams, both the student and the faculty member must meet with the Assistant Director of Academic Affairs to review the request and if granted, they must both sign an Incomplete Contract detailing the terms for completing missing coursework.

Plagiarism Policy

PLAGIARISM WILL NOT BE TOLERATED IN ANY FORM:
The presentation of another person's words, ideas, judgment, images or data as though they were your own, whether intentionally or unintentionally, constitutes an act of plagiarism.

In the event of suspected or confirmed cases of plagiarism, the faculty member will consult first with the Assistant Director for Academic Affairs as definitions and procedures vary from school to school. Please consult the "Academic Guidelines for Success" distributed on your USB key at Check-in and on the NYU Florence Global Wiki.

For a detailed description of some possible forms of plagiarism and cheating please consult the Community Compact that you signed at Orientation, a copy of which is on the above mentioned Wiki and USB key.

Writing Center:
The Writing Center, located in Aula Belvedere in Villa Ulivi, offers you feedback on any type of writing, at any stage in planning or drafting. Sign up for a consultation at the Writing Center's website and submit your working draft or ideas a day in advance to NYU Florence Writing Center. Drop in for a consultation M-Th, but remember that appointments are given priority. Be assured that very rough drafts are welcome. Please note that we do not correct or “fix” your writing; instead we prompt you to think and work. Our aim is to create stronger writers in the long term, not necessarily perfect papers in the short term.

Required Text(s):


The corresponding e-book version is also perfectly feasible.

\textit{Please notice: we will use slightly less than 50\% of the textbook.}

Copies of each textbook are available for consultation and short term loans in the \textit{Villa Ulivi Library}. Extra copies of some textbooks are also available for semester long loans. For more information on Books and Course Materials go \textit{here}.

\textbf{Supplemental Texts(s):}


\textbf{Internet Research Guidelines:}
The careful use of internet resources is encouraged and a list of recommended websites will be given. Failure to cite internet and other non-traditional media sources in your written work constitutes plagiarism.

\textbf{Additional Required Equipment:}
A simple numerical calculator (square roots, exponential) might be useful, although not required, during midterm and final exams

\textbf{Class Assignments and Topics:}

\textit{Session 1 - Mon Sep 2\textsuperscript{nd}}

\textbf{Introduction:} Operations as a competitive weapon; operations strategy and decision making; the lecture will cover basic facts and definitions. Then we will present some basic analytical tools for decision making and decision trees. Selected problems will be solved in class.


\textit{Session 2 - Mon Sep 9\textsuperscript{th}}

\textbf{Linear Programming (LP)}

Linear Optimization (LP) is the basis of a large number of fundamental quantitative tools; this is the reason why we present it very early, at the beginning of this course; be prepared to answer simple question on formulating and solving linear programming problems. We will go into more detail on LP in class and show how to solve more significant problems using a spreadsheet.

Part of the lecture will be based on using a spreadsheet to solve optimal decision problems. If you like, take your own laptop in class, provided it is equipped with a spreadsheet (Excel, Gnumeric, OpenOffice)

Prereading: Supplement D, pages 445-461 (429-441 \textit{in 11\textsuperscript{th}}, 607-624 \textit{in the tenth edition})

\textit{Assignment 1: decision making must be returned today}
Session 3- Mon Sep 16th  
Project management (deterministic).

Class discussion: how to prepare a network diagram of a simple project, how to find start and finish times, how to crash a project network. Students are encouraged to think about the possibility of using Linear Programming for Project Management.

Prereading: Chapter 7, pages 267-290 (257-278 in 11th, 69-84 in the tenth edition)

Assignment 2: Linear Programming must be returned by today

Session 4- Mon Sep 23rd  
Forecasting

Class discussion: regression, moving averages, exponential smoothing, trends and seasonal patterns.

Prereading: Chapter 8, pages 307-328 (295-320 in 11th, 483-507 in 10th)

Assignment 3: Project management must be returned by today

Session 5- Mon Sep 30th  
Inventory Management (Part 1: deterministic systems)

Class discussion will require an understanding of the basic EOQ and POQ formulae and of the concepts of reorder point and optimal lot size. Exercises will be based on problems at the end of the chapters (only those related to deterministic systems)

Prereading: Chapter 9, pages 351-367; Supplement C pages 395-397 (337-352 and 379-384 in 11th, pages 327-341 and 365-370 in 10th)

Assignment 4: Forecasting must be returned today

Session 6- Mon Oct 7th  
Inventory Management (part 2: stochastic systems)

We will expand the material of the previous lecture to include uncertainty (in demand, lead times, ...). Class discussion will be based on the effect of uncertainty in inventory and lot size decisions. We will introduce and analyze the newsvendor model.

Prereading: Chapter 9, pages 367-377 and Supplement C pages 400-403 (352-362 and 384-387 in 11th, 341-349 and 370-372 in 10th)

Assignment 5: Inventory (deterministic) must be returned today

Session 7- Mon Oct 14th  
Waiting line models

Class discussion on the main characteristics of queueing models and their analysis. Exercises at the end of the chapter. Notice: this part will not be required for the midterm, just for the final exam.

Prereading: Supplement B, pages 185-196 (179-193 in the 11th, 245-260 in the 10th)

Assignment 6: Inventory (stochastic) must be returned today
Session 8 - Mon Oct 21\textsuperscript{th}.

Midterm exam, open book.

The exam will cover the quantitative tools learned up to the two lectures on Inventory Management, included. Typical problems to be solved will be (NB: this list is not exhaustive!) drawing and analyzing a decision tree, drawing a project network and finding the critical path, choosing and using a forecast model, choosing an optimal decision for a specific inventory problem.

Session 9 - Mon Nov 4\textsuperscript{th}.

Quality Management and Statistical Process Control.

Students should become capable of understanding statistical quality concepts and capable of choosing, constructing and interpreting a suitable control chart.

Prereading: Chapter 3, pages 121-142 (115-140 on the 11\textsuperscript{th}, 177-202 on the 10\textsuperscript{th})

Assignment 7: Waiting Line models must be returned today

Session 10 - Mon Nov 11\textsuperscript{th}.

Operations Planning and Scheduling.

Basic concepts in Operations will be reviewed: staffing, scheduling, resources, costs. Exercises at the end of the chapter.

Prereading: Chapter 10, pages 409-430 (393-402 on the 11\textsuperscript{th}, 527-548 on the 10\textsuperscript{th})

Assignment 8: Statistical Quality Control must be returned today

Session 11 - Mon Nov 18\textsuperscript{th}.

Simulation.

How to build and understand micro-simulation models. Some simulation examples will be developed in class using a spreadsheet and applied to non deterministic versions of models analyzed during the course (e.g., simulation of a non deterministic project management case).

Prereading: this material is no more in the current edition of the textbook: relevant material to be read before class will be posted on NYU Classes

Assignment 9: Operations planning and scheduling must be returned today

Session 12 - Mon Nov 25\textsuperscript{th}.

Supply chain management.

Some of the main concepts in supply chains will be presented and discussed. Most of the lecture will be devoted to an on-line management simulation game to be played in class with your own laptop. Be sure to arrive exactly on time and with a laptop with Internet connection. Discussion on the outcome of this game will follow.
**Prereading:** Chapter 12, pages 521-539 (only a quick overview) (379-396 on the 11th, 381-395 on the 10th)

**Assignment 10:** Simulation must be returned today

**Session 13 - Mon Dec 2nd**

**Project reports**

During this lecture, each group will give a presentation of the mini project results. Every member in the group should take active part in this presentation. Five minutes of discussion will be allocated after each presentation - students are required to interact with the presenting group asking questions and commenting.

*Facultative Assignment 11 (Personnel shift planning) should be returned today - if returned, feedback will be provided*

**Session 14 - Mon Dec 9th**

**Final Exam, open book**

The exam will cover the quantitative tools learned in the second part of the course and will contain only sporadic references to subjects covered during the first half. Typical problems to be solved will be (NB: this list is not exhaustive!) choosing the correct queueing model to analyze a specific situation and using the appropriate formulae, drawing a control chart, showing how to perform a numerical simulation of a simple management situation, planning personnel shifts.

**Session 15 – TBA (almost surely: Nov 18th, 17:30-19:30)**

We are planning a site visit to KKT / Verizon Connect (Florence, via Paisiello 16/20), a tech company born from a startup which is now an important research center for Data Science within Verizon. The visit will allow students to meet an advanced research team active in ICT, logistics, data science, machine learning.

**Classroom Etiquette**

- Eating is not permitted in the classrooms. Bottled water is permitted.
- Cell phones should be turned off during class time.
- The use of personal laptops and other electronic handheld devices are prohibited in the classroom unless otherwise specified by the professor.
- We recycle! So keep it green! Please dispose of trash in the clearly marked recycle bins located throughout the on campus buildings.

**Required Co-curricular Activities**

A field trip to Verizon Connect (Florence) is planned and will be officially announced as soon as approved.

**Suggested Co-curricular Activities**
Suggested optional co-curricular activities will be announced in class and/or via email by the professor throughout the semester.

Final Notes

Assignments: there will be a total of 10 written assignments consisting in exercises to be solved individually and posted to me through the NYU Classes system as PDF files (you can use the email-scan facilities at villa La Pietra to transform even a hand written doc into pdf or a low-resolution scan from your smartphone). Please, avoid any other format (jpg, docx, ...). Failure to satisfy this requirement will influence the class participation score. There are many free on line tools to convert to a small pdf any document.

Assignments will be posted after each lecture and they will be due before the beginning of the following lecture, unless otherwise specified on the syllabus or in class (and confirmed on NYU Classes).

Important notice: following a successful experiment started in Fall 2018, self assessment for the 10 Assignments will be required: after the closing date I will post a solution for each assignment and a (non exhaustive) list of possible common errors together with an associated penalty. Each student will be requested to check her/his assignment against the proposed solution and post, via NYU Classes, a self assessment containing a list of errors and a proposed evaluation. Failure to submit a self-assessment or failure to recognize important errors or omissions will negatively impact on the evaluation.

Some details on the Mini-project

There will be a group mini-project to be performed by groups of 3 or 4 students; I will choose and communicate via NYU classes each group’s composition -- I will try to form groups with students with different backgrounds. Projects will be proposed by each group not later than the seventh (Mon Oct 15th) class meeting. Projects reports should be completed not later than Thu Nov 28th and sent to me through NYU classes (as pdf files). Projects will be discussed in class on Mon Dec 2.

Each group should prepare a report, typically between 6 and 8 A4 pages describing the case.

A quantitative analysis is most welcome. A report might be just qualitative, but it should use as much as possible some of the concepts learned during the course and contain suggestions for tool adoption oriented towards increase quality and competitiveness. If possible, use of some quantitative tools will be extremely welcome and groups should try their best in order to obtain at least some data useful to experiment with the methods presented in the course. A critical appraisal of the advantages obtainable from these tools will be appreciated.

In accordance with each group, we might be planning different possibilities for the mini-project (e.g., a lab project developed on an optimization model based on realistic data).

A rubric stating expectations regarding the project and the presentation will be posted during the semester.

A sample of past projects:
- Analyzing safety stock levels for bus passes
- Queueing at H&M store, Florence
- Operations Management at Villa Ulivi Cafe
- Prediction of ice cream selling at La Carraia
- Waiting line analysis at Esselunga department store
- Staffing and promotion planning at the Space Electronic discoteque
- Inventory decision for the balsamic vinaigrette sauce at Osteria il Gatto e la Volpe
- Scheduling student participation to the “Okkupazione” event at NYU Florence
• Improving queue management at Firenze Santa Maria Novella railway station
• An analysis of GROM, top quality Italian ice cream
• The "Oil Shoppe" - analysis of a small sandwich-maker in Florence
• An analysis of queues and ticket validation on the 25 bus to NYU Florence campus
• Supply chain analysis of UniCOOP Firenze supermarkets
• An analysis of olive picking at NYU Florence
• Queueing analysis at the Uffizi gallery

Important dates

Mon Sep 2: first class meeting
Mon Oct 14: deadline for Project proposal by each group
Thu Nov 28: deadline for project reports (post a pdf file through NYU classes)
Mon Dec 2: project exposition by each team
Mon Oct. 21: Midterm exam, open book
Mon Dec. 9: Final exam, open book.

Your Instructor
Fabio Schoen. Full professor of Operations Research at the University of Florence, School of Engineering, where he teaches "Fundamentals of Operations Research", "Optimization Methods", "Models and methods for Organization and Management". His research activity deals with optimization, in particular large scale non convex, and its applications to various fields ranging from health care, scheduling, logistics, forecasting, machine learning, data mining, analytics. A few years ago he founded a startup, KKT srl, devoted to Vehicle Routing, which was acquired in 2014 by Fleetmatics, a worldwide leader in fleet intelligence which has been acquired in August 2016 by Verizon, and now is part of Verizon Connect. In 2017 he founded a new startup, Intuendi, focused on forecasting and inventory management.
He is the Director of the PhD program in Information engineering at the University of Florence.
He is the delegate for the Industry 4.0 programme at the Department of Information Sciences.
He is Associate Editor of the scientific journals: Computational Optimization and Applications, Journal of Global Optimization, Operations Research Letters, Optimization Methods and Software.