Teaching plan:

Operations Research
(Quantitative methods in Management)
1. Description of the course

- Name of the course: Operations Research (Quantitative methods in Management)
- Academic year: 2016-2017
- Quarter: first
- Degrees: IBE, ADE, ECO
- Course code: 21959 (ADE/ECO) i 21219 (IBE).
- ECTS: 5
- Student hours dedication: 125 hours
- Teaching language: English
- Professor: Daniel Serra

<table>
<thead>
<tr>
<th>Professor</th>
<th>Seminars</th>
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<tbody>
<tr>
<td>Helena Ramalhinho</td>
<td>Weeks 1-4</td>
</tr>
<tr>
<td>Daniel Serra</td>
<td>Weeks 5-10</td>
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</table>
| Manel Guerris       | Weeks 5-10| 101  
|                     |          | 102  

helena.ramalhinho@upf.edu
daniel.serra@upf.edu

Office hours:
Helena Ramalhinho: Monday 11:00-12:00 or by appointment
Daniel Serra: Thursday-Friday 16:00-17:00

All classes will take place in computer room 40.145
2. Course presentation

The area of quantitative methods for decision making uses the scientific method as the basis to research and help make decisions on complex problems of the organizations. The purpose of this course is to equip the participants with the relevant tools and techniques for applications in solving managerial problems. The focus of this course will be on applications of quantitative methods in business situations.

The methodology of the course is based on what is known as Operations Research, a science that offer to the decision maker different quantitative methodologies in order to make decisions. The objective of the course is to learn the fundamental concepts, the quantitative models, up to date solution techniques in problem solving and complex decision-making. During the course we will see how to apply these techniques in different areas of an organization, such as marketing, production and operations, logistics, finance, etc. Emphasis will be made on practical and real world applications. Excel spreadsheet together with the module "Solver" will be intensively used.

3. Competences to be achieved

The objective of the course is to provide the fundamental concepts, quantitative models, solution methods and up to date techniques in decision making.

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<th>General competences</th>
<th>Specific competences</th>
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<td><strong>Instrumentals</strong></td>
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<td>• Organization and planning capacities.</td>
<td>• Recognize the relevance of quantitative methods in decision making within management organizations.</td>
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<td>• Knowledge of software.</td>
<td>• To be able to know when these tools can be used, and in which environments, and when not to use them.</td>
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<td>• Problem solving.</td>
<td>• To learn how to apply these tools and methodologies of quantitative methods in managerial problems.</td>
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<td>• Information search and processing</td>
<td>• To be able to use information system technologies and optimization software as a support for complex decision making situations.</td>
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<td><strong>Interpersonals</strong></td>
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<td>• Oral communication in public.</td>
<td>• To develop the understanding of the results obtained and how to implement them in “real world” situations.</td>
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<td>• Team work.</td>
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<td>• capacity to write technical reports.</td>
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<td><strong>Systematics</strong></td>
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<td>• Critical reasoning skills in both reading and writing communication.</td>
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<td>• Good analysis of qualitative and quantitative information.</td>
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<td>• Adaptation yo new situations and environments.</td>
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4. Course program

1. Introduction to modelling and decision making

2. Linear Programming:
   2.1. Structure of the problem.
   2.2. Mathematical conditions.
   2.3. Objectives and constraints.
   2.4. Examples of formulations: human resources problems, capacity problems, production and logistics problems.

3. Solution methods in LP
   3.1. Graphical method
   3.2. The simplex algorithm
   3.3. Solver and other software.
   3.4. Heuristic methods

4. Integer programming
   4.1. Problem formulation.
   4.2. The branch and bound procedure.
   4.3. The Transportation and Assignment problems.
   4.4. AMPL Software
   4.5. Metaheuristics Methods
   4.6. Applications: Clique Problems, The Vehicle Routing Problem, Scheduling Problems

5. Multiobjective programming
   5.1. Objective space.
   5.2. Efficiency in solutions
   5.3. The weighting method and constraint methods. Case studies.
   5.4. Goal programming.

6. Network Models
   6.1. Network notation
   6.2. Minimum spanning tree
   6.3. Maximal flow
   6.4. Shortest Path
   6.5. Location problems

7. Project Management
   7.1. Critical Path Model
   7.2. PERT
   7.3. PERT/CMP
   7.4. Probabilistic PERT
   7.5. Case study

8. Decision modelling
   8.1. Decision under uncertainty
   8.2. Decision under risk
5. Evaluation

• Final exam: 60% of the grade. You need to obtain in this exam at least a 4 out of 10 to pass the course.
• Continuous evaluation: 40% of the grade:
  o 30% homeworks and case studies
  o 10% participation in class (seminars are compulsory)

6. Bibliography

Basic textbook:

Additional references

Other references

Quantitative Analysis For Management
Charles P. Bonini , Warren Hausman , Harold Bierman
McGraw-Hill/Irwin; 9 edition (January 1, 1997)

Mik Wisniewski
Prentice Hall; 4 edition (February 27, 2006)

Quantitative Business Modeling
Jack R. Meredith , Scott M. Shafer , Efraim Turban
South-Western College Pub; 1 edition (October 8, 2001)

An Introduction to Management Science: A Quantitative. Approach to Decision Making
David R. Anderson , Dennis J. Sweeney , Thomas A. Williams , R. Kipp Martin
South-Western College Pub; 12 edition (April 19, 2007)

Spreadsheet Modeling and Decision Analysis
Cliff Ragsdale
South-Western College Pub; 5 edition (May 3, 2006)

Quantitative Techniques
T Lucey
Int. Cengage Business Press; 6 edition (September 12, 2002)
7. Methodology

The teaching activities during the course will be as follows:

- 20 sessions of 1:30 hours each. Check Schedule of classes in the intranet of the course.
- 2 seminar groups, with six sessions of 1:30h each, where case studies will be discussed, together with problem solving. Students will have to individually hand out the homework at the beginning of the class using the intranet of the course. Check Schedule of seminars in the intranet of the course.

Attention: Homework and case studies have to be presented by ALL students at most before the first session of the seminars, without exceptions.

Course Material, homeworks and case studies will be posted in the intranet of the course.

8. Schedule

See course intranet on “campus global”

About the instructor

Daniel Serra graduated in 1984 in Economics from the Autonomous University of Barcelona, and obtained a master in systems analysis and his PhD in the Whiting School of Engineering at Johns Hopkins University in 1989. He is actually professor of management in the department of Economics and business at the Universitat Pompeu Fabra (UPF). His fields of specialization are logistics and quantitative methods in management. He has more than 30 publications in international journals, such as European Journal of O.R., Computers and O.R., Journal of the Operational Research Society, Network and Spatial Economics, Journal of Regional Science, Geographical Analysis, Papers in Regional Science, among others. He belongs to the editorial board.
of Geographical Analysis, International Journal of Regional Science, Supply Chain Practice, and International Journal of Operations Research and Information Systems. He has worked in consulting for several firms and institutions in the implementation of quantitative models for decision-making. He has been vicerector of the UPF from 2001 to 2013. Actually, he is the Dean of the UPF Barcelona School of Management.

Personal webpage: http://www.danielserra.es

Helena Ramalhinho Lourenço is a Full Professor at the Economics and Business Department at the University Pompeu Fabra, Barcelona, Spain. She has a B.A. and Master degree in Statistics and Operations Research from the University of Lisbon, Portugal, and a Ph.D. in Operations Research from Cornell University, New York, USA. She has been involved in different research projects and consulting for firms in the area of Operations Research and Logistics. Helena has published several articles in prestigious international scientific journals and has presented her work at international congresses and conferences. Helena teaches at various undergraduate, master’s and PhD’s programs. She is currently the director of the Business Analytics Research Group and a researcher at the Center for Operational Research at the University of Lisbon. Her research interests include Operations Research, Scheduling, Combinatorial Optimization, Metaheuristics, Iterated Local Search, Heuristic Search Optimization, Vehicle Routing, Job-Shop Scheduling, Supply Chain Management, Logistics, Production and Operations Management.

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