Quantitative Methods

Code: MK5KVANA04MX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Graph theory, using graphs; The basic tasks of linear programming, applications; Queue models and inventory models, Basics of probability calculus (probability space, conditional probability, independence of events, random variables, distributions sights, the law of large numbers); Sampling methods, descriptive statistics; Estimates (the estimated properties, point estimates, interval estimates); Non-parametric tests (fit testing, homogeneity, independence test); Parametric tests (Tests for the expected value and the standard deviation); Correlation and regression analysis; Time series analysis; Statistics in quality management (Statistical Process Control, Six Sigma); Simulation, Monte Carlo methods; Decision theory, decision model, decision matrix, decision-making process; Goodness and reliability of business processes

Literature:

Compulsory:

- Rice, J. A. (2007): Mathematical statistics and Data Analysis. Belmont. Thomson's.
- Wolfram, S. (2003): The mathematica book. Champaing. Wolfram Media.

Recommended:

- STATISTICS Methods and Applications:
- http://www.statsoft.com/textbook
- Murphy, P.: Introduction to Quantitative Methods:
- http://www.ucd.ie/statdept/classpages/introductiontoquantitativemet.htm
- Investopedia (www.investopedia.com) CFA Level 1 - Chapter 2: Quantitative Methods:
- http://www.investopedia.com/study-guide/cfa-exam/level-1/quantitative-methods/
- Cornuejols, G. - Trick, M.: Quantitative Methods for the Management Sciences (Course Notes)
- http://mat.gsia.cmu.edu/classes/QUANT/

Schedule

1st week Registration week	
2nd week: **Lecture:** Types of optimization problems: unconstrained and constrained optimization. **Practice:** Problems related to optimization.	**3rd week:** **Lecture:** Methods of optimization: derivative-based optimization. **Practice:** Problems related to derivative-based optimization.
4th week: **Lecture:** Derivative-free optimization I (genetic algorithms, neural networks). **Practice:** Problems related to derivative-free optimization.	**5th week:** **Lecture:** Derivative-free optimization II (decision trees, clustering). Network optimization. **Practice:** Problems related to derivative-free optimization.
6th week:	**7th week:**

Lecture: Survey of probability calculus (probability space, random variables, probability distributions, limit theorems)	**Lecture:** Basics of statistics: point estimation, interval estimation, hypothesis testing
Practice: Problems related to probability calculus.	**Practice:** Hypothesis testing.

8th week: 1st drawing week

9th week:	**10th week:**
Lecture: Normality test, one- and two-factor ANOVA	**Lecture:** Basics of decision theory – decision model, decision matrix, decision-making process.
Practice: ANOVA	**Practice:** Process simulation
11th week:	**12th week:**
Lecture: Monte Carlo methods	**Lecture:** Basics of game theory
Practice: Process simulation.	**Practice:** Problems related to game theory.
13th week:	**14th week:**
Lecture: Time series characteristics. Time series regression.	**Lecture:** ARIMA models, Markov chains.
Practice: Problems related to time series.	**Practice:** Problems related to Markov chains.

15th week: 2nd drawing week

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test on the 8th week and the end-term test on the 15th week. Students must sit for the tests.

B, for a grade:

The grade is based on the average grade of the two tests.

The minimum requirement of the mid-term and the end-term test is 60% separately. The grade for each test is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 60, the student once can take a retake test of the whole semester material.