Discipline: Operations Research / Operations Management

1. Language

English or German depending on the preferences of the participants. Course materials are provided in English.

2. Title

Advanced Topics in Mathematical Programming

3. Lecturer

Prof. Dr. Malte Fliedner (Universität Hamburg)

https://www.bwl.uni-hamburg.de/om/team/malte-fliedner.html

malte.fliedner@uni-hamburg.de

4. Date and Location

4.10.2019 - 08.10.2021, digitally via Zoom

5. Course Description

5.1 Abstract and Learning Objectives

The course is aimed at doctoral students in the field of business administration or related subjects which seek to deepen their understanding of mathematical programming methods in modeling and optimization. Successful participants will be able to:

- analyze structural elements of common optimization models for problems in research and business practice
- understand important theoretical aspects that drive successful implementations for complex optimization problems
- employ advanced mathematical programming techniques to strengthen model formulations and improve solution performance
- develop mathematical decomposition approaches to tackle large-scale optimization problems

5.2 Content

The course covers a broad range of advanced topics in mathematical programming ranging from different approaches in devising and strengthening optimization models and identifying problem structures that can be exploited via relaxation, aggregation and decomposition methods. Further, the use of exact and heuristic solution techniques in standard solvers and tailored solution algorithms is

discussed. The course will make use of several exercises and case studies to equip participants with relevant knowledge that they can immediately apply in their own research.

5.3 Schedule (including start and end time)

The course is scheduled from Monday to Friday 9:00 to 16:00. With theoretical sessions in the morning and applied tutorials in the afternoon. Afterwards participants can further use their time to work on the exercises and assignments.

5.4 Course format

The course comprises classical lectures to convey the fundamental theory and interactive tutorials where participants apply the theoretical knowledge to example problems from the literature and business practice. An active participation in the class discussions is expected.

6. Preparation and Literature

6.1 Prerequisites

Participants should be familiar with the basics of mathematical modeling and optimization, including linear and mixed integer programming, duality theory and standard solution algorithms.

6.2 Essential Reading Material

H.P. Williamson (2013), Model Building in Mathematical Programming, 5th edition, Wiley, 2013.

F.S. Hillier and G.J. Liebermann (2015), Introduction to Operations Research, 10th edition, McGraw-Hill, 2015

L.S. Lasdon (2002), Optimization Theory for Large Systems, Dover Publication, 2002.

6.3 Additional Reading Material

Participants will receive additional reading material as part of the course.

6.4 To prepare

While the core fundamentals are briefly revisited in the course, participants will profit from brushing up the basics by consulting the essential reading material. Participants are further expected to have a basic familiarity with GAMS and will profit from doing the online tutorial (https://www.gams.com/latest/docs/UG_TutorialQuickstart.html). The GAMS software should be downloaded before the start of the course (https://www.gams.com/download/).

7. Administration

7.1 Max. number of participants

The course is limited to 20 participants.

7.2 Assignments

Course participants will have to complete exercises and assignments as part of guided tutorials and on their own in order to apply the techniques studied in the course.

7.3 Exam

Participants will be graded on the basis of their successful completion of course assignments.

7.4 Credits

The course is eligible for 6 ECTS as described below

8. Working Hours

Working Hours	**Stunden**
Course preparations	50 h
Active participation in class	40 h
Exercises and assignments	90 h
SUMME	**180 h**
ECTS: 6	