

Program of the Block Course

Combinatorial Optimization at Work

Lectures	Prof. Dr. Martin Grötschel (MG), (groetschel@zib.de), www.zib.de/groetschel
Exercises	Dr. Thorsten Koch (TK), (koch@zib.de), www.zib.de/koch
Date	October, 4-15, 2005, 9:00-17:00 h (no lectures on Sunday, October 9)
Place	Zuse Institute Berlin (ZIB), Takustr. 7, 14195 Berlin, lecture hall 2005
Language	English

The course focused on the utilization of combinatorial optimization in practice. The program was a daily alternating combination of lectures, mathematical modelling exercises, problem solving, computer work with software that was specially made available for the course, etc. Approximately twenty real applications were taught. Every new case study started with an oral presentation of the real problem and its mathematical modelling, then the theory behind was explained. Finally the development of the solution algorithms was described and the successes of the problem solution in practice were demonstrated.

Prof. Dr. Robert Bixby (BB), Rice University, Houston and ILOG, Paris gave three guest lectures on October 7 and 8, one on wafer fabrication, beef cutting, and concrete delivery and two on the state of the art in LP and MIP software and problem solving.

Eran Davidson (ED), President & CEO of HassoPlattnerVentures (<http://www.hp-ventures.com/>), Potsdam spoke on entrepreneurship in the evening of October 12. HassoPlattnerVentures is an "incubator" and is now searching for "young top persons with the best ideas from the sciences who have a great entrepreneurial spirit and ideas for IT products and services providing particular user benefits - to target global markets".

Some lectures were given or supported by ZIB members who have pertinent experience with the problems presented. The guest speakers included Tobias Achterberg (TA), Andreas Bley (AB), Ralf Borndörfer (RB), Hans-Florian Geerdtes (HG), Marc Pfetsch (MP), Thomas Schlechte (TS).

On October 5, 2005, 50 participants of the course visited Volkswagen in Wolfsburg.

Tuesday, Oct. 4

01M0: 09:00-09:30	MG	Welcome and Introduction
01M1: 09:30-10:30	MG	Linear and Integer Programming: an Introduction
01M2: 11:00-12:30	MG	Basics of Polyhedral Theory
01A1: 13:30-15:00	TK	Using ZIMPL and LP / IP Solvers
01A2: 15:30-17:00	TK	Exercises

Wednesday, Oct. 5

06:45-19:03		Excursion to Volkswagen, Wolfsburg Visit of "VW Konzernlogistik" and more
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For those who stayed in Berlin:

00M1: 09:00-10:30	TA	Chip Verification 1
00M2: 11:00-12:30	TA	Chip Verification 2
00A1: 13:30-15:00	MP	Introduction to PORTA and Polymake & Exercises
00A2: 15:30-17:00	MP	Exercises

Thursday, Oct. 6

02M1: 09:00-10:30	MG	The Travelling Salesman Problem and some Applications
02M2: 11:00-12:30	MG	Scheduling Stacker Cranes & Some Aspects of Logistics
02A1: 13:30-15:00	MG	Sequencing Welding Robots
02A2: 15:30-17:00	TK	Exercises

Friday, Oct. 7

03M1: 09:00-10:30	MG	Chip Design
03M2: 11:00-12:30	MG	Printed Circuit Board Production: Some Issues
03A1: 13:30-15:00	BB	From Planning to Operations: The Ever-Shrinking Optimization Time Horizon (Beef Cutting, Dispatching of Concrete Trucks, Production-line Scheduling of Wafer Fabs)
03A2: 15:30-17:00	TK	Exercises

Saturday, Oct. 8

04M1: 09:00-10:30	BB	Simplex Algorithms: The Legacy of George Dantzig (Algorithmic framework for the primal and dual, ratio test, degeneracy, pricing, solving large-scale problems)
04M2: 11:00-12:30	BB	MIP: Then and Now
04A1: 13:30-15:00	BB	Exercises
04A2: 15:30-17:00	TK	Exercises

Monday, Oct. 10

05M1: 09:00-10:30	MG	Combinatorial Optimization and Telecommunication
05M2: 11:00-12:30	MG	Telecommunication Network Design
05A1: 13:30-15:00	AB	Internet Routing & Exercises
05A2: 15:30-17:00	TK	Exercises

Tuesday, Oct. 11

06M1: 09:00-10:30	MG	Frequency Assignment for GSM Mobile Phone Systems
06M2: 11:00-12:30	HG	Capacity and Coverage Planning for the UMTS Radio Interface
06A1: 13:30-15:00	TK	Site Selection in UMTS
06A2: 15:30-17:00	TK	Exercises

Wednesday, Oct. 12

07M1: 09:00-10:30	MG	Online Optimization
07M2: 11:00-12:30	MG	Service Vehicle Scheduling ("Yellow Angels" of ADAC)
07A1: 13:30-15:00	TK	Exercises
07A2: 15:30-17:00	TK	Exercises
07A3: 17:00-18:00	ED	Special Lecture, Eran Davidson: Entrepreneurship: From University to Start-up Company

Thursday, Oct. 13

08M1: 09:00-10:30	MG	Combinatorial Optimization and Transportation, Telebus
08M2: 11:00-12:30	RB	Crew Scheduling Problems
08A1: 13:30-15:00	TK	Exercises
08A2: 15:30-17:00	TK	Exercises

Friday, Oct. 14

09M1: 09:00-10:30	RB	Vehicle Scheduling Problems
09M2: 11:00-12:30	RB	Combinatorial Auctions and Rail Track Scheduling
09A1: 13:30-15:00	TS&RB	Combinatorial Auctions & Exercises
09A2: 15:30-17:00	TK	Exercises

Saturday, Oct. 15

10M1: 09:00-10:30	MG&TK	Optimizing Container Terminals
10M2: 11:00-12:30	MG&TK	and Related Topics
10A1: 13:00-15:00	MG	Summary and Final Remarks

This block course is equivalent to a one-semester course with 4 hours of lectures and 2 hours of exercises per week at the Institute of Mathematics at Technische Universität Berlin.

Berlin, October 15, 2005, Prof. Dr. Martin Grötschel