

Lehrform (*teaching format*) / **SWS** (*hours per week*): 4K

Kreditpunkte (*credit points*): 6

Turnus (*frequency*): usually, each winter term

Inhaltliche Voraussetzungen (*content-related prior knowledge/skills*): basic knowledge in algorithm theory

Sprache (*language*): English

Lehrende (*teaching staff*): AG Kombinatorische Optimierung und Logistik (Prof. Dr. Nicole Megow)

Studiengang (<i>degree program</i>)	Module	Semester
Informatik (Master)	IMAT, IMA-SQ, IMA-AI	ab 1.Sem.
(Techno)Mathematik (Master)	WP, Vertiefung Algebra/Numerik	
Informatik (Bachelor)	(nur <i>Freie Wahl</i>)	

Lernergebnisse / Learning Outcome:

- to know, distinguish and be able to describe different models for uncertainty in the input data
- to know different types of performance measures
- be able to formulate problems under uncertainty and classify them
- to know and apply general techniques for designing online algorithms
- be able to analyze the performance of algorithms and establish mathematical bounds

Inhalte / Contents:

The course introduces the most common models for modeling uncertainty in the input data for optimization problems and shows how to design and analyze efficient algorithms in these models. The course covers a selection of the following topics. Recent developments in the literature may be included.

- online optimization: ski rental, list accessing, caching
- potential function method
- randomization in online optimization, Yao's principle
- online scheduling
- online routing, dial-a-ride problems
- online optimization with predictions, learning-augmented algorithms
- bulk-robust optimization: shortest paths, matchings
- cost-robust problems
- random-order model, secretary problem
- two-stage stochastic optimization

Hinweise (*remarks*): The table lists only the primary / most specific modules to which this course is assigned.