

Module Description

IN2211: Auction theory and market design

TUM Department of Informatics

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| Module level: Master | Language: English | Module duration: one semester | Occurrence: winter semester |
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| Credits*: 5 | Total number of hours: 90 | Self-study hours: 60 | Contact hours: 30 |
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* The number of credits can vary depending on the corresponding SPO version. The valid number is always indicated on the Transcript of Records or the Performance Record.

Description of achievement and assessment methods:

The examination takes the form of a written 75 minutes test, in which students solve problems to prove they are able to use, analyze and assess the game theoretical models of auctions. The additional answering of theory questions ensures participants understand the fundamental challenges of combinatorial auctions. Moreover, the correct responses require independent defense of the choice of auction format based on desired properties of the market allocation such as efficiency or revenue maximization for example. All problems and questions demand the students to phrase their individual responses.

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| Exam type: written | Exam duration (min.): 75 | Possibility of re-taking: In the next semester: No At the end of the semester: Yes | Homework: No |
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| Lecture: No | Conversation: No | Written paper: No |
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(Recommended) requirements:

IN0022 Informations Systems II, operations research/linear programming

Contents:

Basic game theoretical concepts (dominant strategies, Nash equilibrium under complete and incomplete information), Mechanism Design Theory, basics of auction theory (sealed bid and open auction formats, Revenue Equivalence, Optimal Auctions), Combinatorial Auctions, Assignment Markets, challenges of combinatorial auction design (iterative combinatorial auctions and combinatorial clock auctions), applications of combinatorial auctions (spectrum and procurement auctions), approximation mechanisms, Matching Markets

Study goals:

After successful completion of the module students understand the economic properties of various auction formats. They know different game theoretical approaches to model the strategic interactions between the auctioneer and bidders. Furthermore, they understand the fundamental strategical challenges of various auction mechanisms and computational questions related to the determination of allocations and payments. Moreover, they can independently defend the choice of auction format based on desired properties of the market allocation such as efficiency or revenue maximization for example.

Teaching and learning methods:

The module consists of a lecture and a content-aligned tutorial. The lecturer presents the content of the module, parts of the corresponding literature and application examples for various auctions interactively. Students are accustomed

with different auction formats and their modeling, and learn to differentiate their applications. In the tutorial participants solve exercises in single person and team work, and evaluate the respective game- and auction theoretical models. Thus, students learn particularly to assess the basic challenges of combinatorial auction design and to constructively criticize their own work.

Media formats:

Script, exercise sheets, PowerPoint, PC and E-Learning platform

Literature:

Y. Shoham and K. Leyton-Brown: Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations. Chapters 3, 5, 6, 10, 11, 12. For class 2 and 3.: N. Nisan, T. Roughgarden, E. Tardos and V. Vazirani (editors): Algorithmic Game Theory. Chapters 9 and 11 by Nisan. For class 2, 4 and 6: V. Krishna: Auction Theory. Chapters 16 and 17 on multi-object auctions.

Responsible for the module:

Bichler, Martin; Prof. Dr.: martin.bichler@mytum.de

Courses (Type, SH) Lecturer:

0000000780 Exercises for auction theory and market design (IN2211) (2SWS P, WS 2016/17) [BF]
Bichler M, Merting S, Waldherr S

240942031 Auction Theory and Market Design (IN2211) (2SWS L, WS 2016/17) [BF]
Bichler M, Merting S, Waldherr S

For further information about this module and its allocation to the curriculum see:
<https://campus.tum.de/tumonline/wbModHb.wbShowMHBReadOnly?pKnotenNr=487476>

Generated on: 18.07.2017 10:55