Module MA-INF 1301	**Algorithmic Game Theory and the Internet**		
Workload 270 h	**Credit points** 9 CP	**Duration** 1 semester	**Frequency** every 2 years
Module coordinator	Prof. Dr. Marek Karpinski		
Lecturer(s)	Prof. Dr. Marek Karpinski, Prof. Dr. Norbert Blum		
Classification	**Programme** M. Sc. Computer Science	**Mode** Optional	**Semester** 2. or 3.
Technical skills	The goal is to provide basic techniques and methods related to the Game Theory for analyzing modern Internet-based communication networks and for designing algorithms for the underlying problems of transmission control, resource allocation, mechanism design, market equilibria, combinatorial auctions, and the network cost allocation		
Soft skills	Presentation of solutions and methods, critical discussion of applied methods and techniques		
Contents	The most defining characteristic of the Internet is that it was not designed by a single central entity, but emerged from the complex interactions of many individual entities or economic agents, such as network operators, service providers, designers, users, etc. We aim at providing basic framework and basic techniques for analyzing and designing algorithms for the following Internet-related problems and contexts: game theoretic problems connected to the Internet and other decentralized networks, resource allocation, mechanism design, Nash and market equilibria, network economics, combinatorial auctions, cost allocations and network design. We will address new broadly applicable and unifying techniques that have emerged recently in the above areas and discuss new fundamental paradigms in design of the relevant algorithms.		
Prerequisites	**Recommended:** Introductory knowledge of foundations of algorithms and complexity theory is essential.		
Format	**Teaching format** / **Group size** / **h/week** / **Workload[h]** / **CP** Lecture: 60 / 4 / 60 T / 105 S / 5.5 Exercises: 30 / 2 / 30 T / 75 S / 3.5 T = face-to-face teaching; S = independent study		
Exam achievements	Written exam (graded)		
Study achievements	Successful exercise participation (not graded)		
Forms of media			
Literature	• D. P. Bertsekas, A. Nedic, A. E. Ozdaglar: Convex Analysis and Optimization, Athena, 2003 • M. Karpinski, W. Rytter: Fast Parallel Algorithms for Graph Matching Problems, Oxford Univ. Press, 1998 • D. M. Kreps: A Course in Microeconomic Theory, Princeton Univ. Press, 1990 • N. Nisan, T. Roughgarden, E. Tardos, V.V. Vazirani (ed.): Algorithmic Game Theory, Cambridge Univ. Press, 2007 • M. J. Osborne, A. Rubinstein: A Course in Game Theory, MIT Press, 2001		