Game Theory Exam Topics, Autumn 2019

1. Combinatorial games, Chomp, strategy-stealing, k-nim, Sprague–Grundy function, sums of games, Hackenbush, Hex (Ferguson Part I, Sections 1–4; Karlin–Peres Chapter 1).
2. Maker-Breaker games, Erdős-Selfridge theorem, Hex (Karlin-Peres 1.2.1-1.2.2, `https://en.wikipedia.org/wiki/Maker-Breaker_game`)
3. Hackenbush (Ferguson Part I, Section 6)
4. Strategic games, domination, pure Nash equilibrium, repeated Prisoners Dilemma (Ferguson Part III Section 2; Karlin–Peres Chapter 4 and Section 6.4; Pritchard lectures 1–3)
5. Mixed Nash equilibrium, iterated elimination. Proof of the Nash theorem using Brouwer's fixed point theorem (Karlin–Peres Chapter 5, Pritchard lecture 4)
6. Maxmin strategies, von Neumann's minimax theorem on two-player 0-sum games, (Ferguson Part III Section 1; Karlin–Peres Chapter 2; Pritchard lecture 5)
7. Correlated equilibrium, evolutionary stability (Karlin–Peres Chapter 7)
8. Vickrey auction, Top trading cycles algorithm (Karlin–Peres Sections 10.4, 14.2, bdulkadiroğlu–Sönmez Section 3.1.1)
9. Stable matchings, many-to-one matchings (Karlin–Peres Chapter 10; Abdulkadiroğlu–Sönmez Section 2)
10. Cooperative games, core, Shapley value. Examples: matching game, spanning tree game (Ferguson Part IV, Sections 1–2)

List of online resources referred above:

- Thomas S. Ferguson, *Game Theory*, `http://www.math.ucla.edu/~tom/Game_Theory/Contents.html`
- A.N. Karlin, Yuval Peres, *Game Theory, Alive*, `https://homes.cs.washington.edu/~karlin/GameTheoryBook.pdf`
- David Pritchard, *Game Theory and Algorithms*, `http://ints.io/daveagp/gta/`
- Atila Abdulkadiroğlu, Tayfun Sönmez, *Matching Markets: Theory and Practice*, `https://www2.bc.edu/tayfun-sonmez/WorldCongressSurvey-June22-2011.pdf`

Note that these resources discuss several topics that we did not cover. You only have to learn the theorems that were mentioned in the lectures.