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| Code of course: BMA-LOTD-615, BMI-LOTD-615E, BMA-FILD-392 |
| Title of course: **Quantum contextuality** |
| Title of course (in Hungarian): **Kvantumkontextualitás** |
| Lecturer: **Gábor Hofer-Szabó** |
| **General aim of the course**:During the course, we will analyze the concept of contextuality in quantum theory and will overview the main no-go results in quantum theory. Although the course is self-contained; it presupposes some basic knowledge of mathematics (not of quantum theory!) and requires substantial work during the semester.**Content of the course:**1. The formalism of quantum theory
2. What is quantum probability?
3. The von Neumann and the Jauch-Piron theorem
4. The EPR argument
5. Kochen-Specker arguments
6. Pitowky's formalism
7. Ψ-ontic and Ψ-epistemic ontological models
8. What is contextuality?
9. The PBR theorem
10. Contextuality and locality
11. What is a local physical theory?
12. Bell's inequalities
13. The GHZ theorem

**Grading criteria, specific requirements:**(1) Active participation in the course, 2) short weekly assignments, 3) oral exam.**Suggested reading:** M. Dickson: "Non-relativistic Quantum Mechanics," in J. Butterfield and J. Earman (eds.): *Philosophy of Physics*,  Elsevier, 2007.  R. I. G. Hughes: *The Structure and Interpretation of Quantum Mechanics*, Cambridge: Harward University Press, 1989. J. M. Jauch: *Foundations of Quantum Mechanics*, Massachussetts: Addison-Wesley Publishing Company, 1968.  T. Maudlin: *Philosophy of Physics: Quantum theory,* Princeton University Press, 2019. de Muynck, W. M., *Foundations of Quantum Physics, an Empiricist Approach,* Kluwer, 2002. M. Readhead: *Incompleteness, Nonlocality, and Realism*, Oxford: Clarendon Press, 1987. L. Ruetsche: *Interpreting Quantum Theories*, Oxford: Clarendon Press, 2011. |