|  |
| --- |
| Code of course: **BMI-LOTD17-208E.03** |
| Title of course: **Epistemology of the Principle of Relativity** |
| Leader: **László E. Szabó** |
| **General aim of the course and the contents:**  The course is a case study on one of the most fundamental and influential principles of modern physics, the Principle of Relativity. After a short review on the history of the principle, from the famous passage in Galileo's *Dialogue* through Einstein's 1905 paper to the contemporary texts, we will consider a typical textbook formulation of the principle: “The laws of physics have the same form in all inertial frames of reference.” The core part of the lecture course will be a word-by-word analysis of this single sentence. It will be seen that the actual statement is not at all simple and obvious. We will encounter several difficulties to be resolved, and our final analysis will conclude that some of the problems remain unanswered, and the universal validity of the principle, at least in a few peculiar situations, is questionable. Finally, we will deal with the general epistemological status of the Relativity Principle and its friends (like the Cosmological Principle). It will be seen that there is a tension between these principles and the operational foundations of physical concepts. In fact, it will be argued, there is no objective knowledge of the world without the perspectival elements of our experiences.  **Grading criteria, specific requirements:**  Oral exam from the material of the lectures. Video records and the slides of the lectures will be available.  **Suggested readings:**   * H. Reichenbach: *The Theory of Relativity and A Priori* *Knowledge*, University of California Press, Berkeley and Los Angeles, 1965. * L. E. Szabó: On the meaning of Lorentz covariance, *Foundations of Physics Letters* 17 (2004) pp. 479 - 496 [preprint: [PDF](http://phil.elte.hu/leszabo/Preprints/covariance_preprint.pdf)] * H. Reichenbach: *The philosophy of space and time*, Dover Publications, New York, 1958. * M. Friedman: *Foundations of Space-Time Theories -- Relativistic Physics and Philosophy of Science*, Princeton University Press, Princeton, 1983. * J. S. Bell: How to teach special relativity, in *Speakable and unspeakable in quantum mechanics*, Cambridge University Press, 1987. * A. Einstein, [Relativity: The Special and General Theory](https://www.ibiblio.org/ebooks/Einstein/Einstein_Relativity.pdf) * L. E. Szabó: Lorentzian theories vs. Einsteinian special relativity -- a logico-empiricist reconstruction, in A. Maté, M. Rédei and F. Stadler (eds.), *Vienna Circle and Hungary -- Veröffentlichungen des Instituts Wiener Kreis*,  Springer 2011. [[PDF](http://phil.elte.hu/leszabo/Preprints/leszabo-lorein-preprint.pdf)] * L. E. Szabó: Does special relativity theory tell us anything new about space and time? [[PDF](http://philosophy.elte.hu/leszabo/Preprints/lesz_does_d.pdf)] (Prolog) * M. Gömöri and L.E. Szabó: Formal statement of the special principle of relativity (2015),*Synthese*, 192 (2015), pp. 2053–2076,  DOI: 10.1007/s11229-013-0374-1 * Earman, J. (2004): Laws, Symmetry, and Symmetry Breaking: Invariance, Conservation Principles, and Objectivity, *Philosophy of Science* 71, 1227. * Norton, J. D. (2013): Special Theory of Relativity: The Principles, http://www.pitt.edu/~jdnorton/teaching/HPS\_0410/chapters/Special\_relativity\_principles |