Dark Matter

There is a theory which states that if ever anyone discovers exactly what the Universe is for and why it is here, it will instantly disappear and be replaced by something even more bizarre and inexplicable. There is another theory which states that this has already happened.
Douglas Adams

Date and Time: April 7–11, 2014, 9:30 – 12:30
Location: INF 226, K2/3
Lecturer: Joachim Kopp (jkopp@mpi-hd.mpg.de)
Website: http://www.mpi-hd.mpg.de/phenocond/graddays2014.html

Topics

1. Basics of cosmology
2. Evidence for dark matter
3. Dark matter freeze-out in the early Universe
4. Dark matter–nucleus scattering and direct dark matter searches
5. Dark matter production at colliders
6. Dark matter annihilation and indirect dark matter searches
7. *Optional*: Axions
8. *Optional*: Sterile neutrinos as dark matter candidates
9. *Optional*: Asymmetric dark matter models

Prerequisites

1. Relativistic quantum mechanics
2. Basic knowledge in quantum field theory and particle physics (scattering theory, cross sections, Feynman diagrams, Lagrangians, basic concepts of the Standard Model)
3. Helpful, but not necessary: general relativity

Literature

1. E. Kolb, M. Turner, *The Early Universe*
   Westview Press, 1994, ISBN 0-201-62674-8
2. M. Peskin, D. Schroeder, *An Introduction to Quantum Field Theory*
   Westview Press, 1995, ISBN 0-201-50397-2
3. R. Wald, *General relativity*
   The University of Chicago Press, 1984, ISBN-0-226-87033-2
4. T. Schwetz, *ISAPP 2011 Lectures on Dark Matter Phenomenology*
   http://www.mpi-hd.mpg.de/ISAPP2011/pages/lectures/Schwetz.pdf
5. G. Bertone, D. Hooper, J. Silk, *Particle Dark Matter: Evidence, Candidates and Constraints*
   Phys. Rept. 405 (2005) 279390, http://arxiv.org/abs/hep-ph/0404175
6. G. Jungman, M. Kamionkowski, K. Griest, *Supersymmetric Dark Matter*
   Phys. Rept. 267 (1996) 195373, http://dx.doi.org/10.1016/0370-1573(95)00058-5