Introduction to PPC: Provisional 2008-9 Syllabus

- Fermions and Bosons, characterized by "charges"
- Interactions viewed as exchange of mediating particle. Strength (coupling constants) and range (mass of mediating particle)
- Concept of reaction cross-section, luminosity
- Energy, momentum, invariant mass $(E^2=p^2+m^2)$
- Concept of running coupling constants (idea of unification)
- Symmetries and conservation laws, types and examples
- Electroweak unification and the Higgs: concept of effective mass and phase transition
- Some current research topics: vacuum energy, GUTs
- Expansion of the Universe: Doppler effect, Hubble's law and Friedmann equation
- Matter and Radiation
- Some solutions to Friedmann equation, concept of critical density and role of curvature
- Cosmic Microwave Background: Observed properties and implications. Concept of Decoupling. Evidence for Hot Big Bang Theory.
- Nucleosynthesis: Observations and implications. Evidence for Hot Big Bang theory
- Inhomogeneities in the CMB, Acceleration of the Expansion?
- Observable contents of the Universe: the Dark Matter problem
- Dark Matter candidates

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