Campos y cuerdas

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`Carácter:` Optativa, 2º.

Parte de cuerdas

`(http://teorica.fis.ucm.es/ft7/strings.html)`

Este curso proporciona un **introducción** a las cuerdas y D-branas clásicas y a la cuantización de cuerdas en espacio-tiempo de Minkowski.

Programa

1. **Classical string.** Nambu-Goto's and Polyakov's actions. Symmetries: reparametrization invariance and Weyl invariance. Field equations and boundary conditions, distinction between open and closed strings. Virasoro constraints. Mode expansions for the string coordinates. Mode expansions for the energy-momentum tensor and Virasoro generators. Gauge $h_{ab} = \mathrm{diag}(-1,+1)$ and residual gauge symmetry.
2. **Classical string in a general background** $(G_{\mu\nu}, H_{\mu\nu\lambda}, \Phi)$**.** Polyakov's action. Field equations and boundary conditions. Example: *pp*-waves. Definition of D-branes.
3. **Quantization of the string in Minkowski flat spacetime.** Introduction to different quantization methods (gauge-fixing quantization, old-covariant quantization, BRS quantization).
   - **3.1.** *Light-cone quantization*. Light-cone gauge condition. Action, Lagrangian and Hamiltonian. Physical degrees of freedom and solution to the Virasoro constraints. Quantization: symplectic form and commutations relations. Lorentz invariance and $D = 26$. Spectrum: tachyon and $D = 26$.
   - **3.2.** *Old covariant quantization*. Quantization: symplectic form and commutations relations. Conditions for physical states in terms of Virasoro operators. Virasoro algebra and its anomaly.
4. **Quantization of the superstring in Minkowski's background.** World-sheet supersymmetry and Majorana fermions. Equations of motion. Boundary conditions: Ramond and Neveu-Schwarz sectors. Mode expansions. Quantization and $D = 10$.
5. **Introduction to Wess-Zumino-Witten models.**

Bibliografía

Todos los temas cubiertos en este curso y muchos más se encuentran ampliamente tratados en:

- M. B. Green, J, H. Schwarz, E Witten, "Superstring theory", vols. 1 & 2, Cambridge University Press (Cambridge 1987).
- J. Polchinski, "String theory", vols. 1 & 2, Cambridge University Press (Cambridge 2000).