

Gauge theory and moduli spaces: an introduction

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Program:

- Basics in gauge theory: bundles, connection and curvature.
- Anti-self-duality equations and instantons.
- Moment maps and symplectic reduction.
- Hyper-Kähler geometry and reduction.
- The ADHM equations.
- The moduli space of instantons and Donaldson's theorems.
- The moduli space of Higgs bundles.
- Non-abelian Hodge correspondence.
- Hitchin integrable system.

Recommended bibliography:

- Geometry of Yang-Mills Fields, M. Atiyah, Accademia Nazionale Dei Lincei Scuola Normale Superiore (1979).
- Construction of instantons, M. Atiyah, V. Drinfeld, N. Hitchin, Y. Manin, Phys. Lett. 65A (1978).
- Instantons and Four-Manifolds, D. Freed, K. Uhlenbeck, Springer-Verlag (1984).
- Integrable systems: Twistors, loop groups, and Riemann surfaces, N. Hitchin, G. Segal, R. Ward, Vol. 4. OUP Oxford (2013).
- Stable bundles and integrable systems, N. Hitchin, Duke Math Journal, 54(1):91-114 (1987).
- The self-duality equations on a Riemann surface, N. Hitchin, Proc. London Math. Soc, 55(3):59-126 (1987).
- An Introduction to Gauge Theory and its Applications, M. Jardim, Publicações Matemáticas, 25 CBM (2017)
- The geometry of four-manifolds, S. Donaldson, P. Kronheimer, OUP Oxford (1990).
- Differential Geometry of Complex Vector Bundles, S. Kobayashi, Princeton University Press (1987).
- Topology, Geometry and Gauge Fields: Interactions, G. Naber, Springer-Verlag.