

CLASSICAL MECHANICS FOR MATHEMATICIANS

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FS 2021

PROGRAM

- (1) From Newton's laws to Lagrange's equation.
- (2) Differential forms.
- (3) Hamiltonian systems.
- (4) Symplectic integrators.
- (5) The Noether theorem.
- (6) The Hamilton–Jacobi equation.
- (7) Smooth manifolds.
- (8) Vector fields.
- (9) Vector bundles.
- (10) Differential forms.
- (11) The de Rham cohomology.
- (12) The Cartan calculus.
- (13) Symplectic manifolds.
- (14) Lie groups.
- (15) Momentum maps.
- (16) Symplectic reduction.
- (17) Generating functions.
- (18) Hamilton–Jacobi for constrained systems.

REFERENCES

- [1] A. S. CATTANEO AND N. MOSHAYEDI, *Classical Mechanics*.
- [2] A. S. CATTANEO, *Notes on Manifolds*, <http://user.math.uzh.ch/cattaneo/manifoldsFS15.pdf>
- [3] A. CANNAS DA SILVA, *Lectures on Symplectic Geometry*, Springer 2001.
- [4] A. S. CATTANEO, P. MNEV, K. WERNLI, “Constrained systems, generalized Hamilton–Jacobi actions, and quantization,” arXiv:2012.13270