

STARTED: Vector bundles. Bundles, generally.

TODAY, FEB 24. Generalized Hopf $S^{2n+1} \rightarrow CP^n$. Tautological line bundle. Its powers. Going back and forth between complex line bundles and circle bundles.

CP^n as a Kahler manifold. Its symplectic form as the curvature of the tautological line bundle.

CP^n as sitting inside $u(n)$. (Co)-adjoint orbits, generally. A bit of Lie groups: $SO(3), SU(2), O(n), Sp(n), U(n)$.

Mechanics on manifolds, and reduction. Symplectic geometry, generally. Local models. The cotangent bundle. Poisson geometry.

LANGUAGE: Functorial linear algebra constructions applied to vector bundles. The general tensor calculus. Splitting of $T^*M \otimes T^*M$ into ‘2-forms’ and ‘metrics’. Poisson tensors.

WED FEB 26. Mechanics on manifolds, Symplectic geometry ct’d. Focus on the Rigid body, ct’d

MON. Mar 2. ... Killing form. The two exponentials being equal.

WED Mar 4. More Lie groups. $SO(3), SU(2), O(n), Sp(n), U(n)$. Framings. Coframings. Structure constants. Parallelizable manifolds.

Frobenius, again. Application to sub-algebras and subgroups.

HOPED TO DO, in last few weeks (likely is WISHFUL THINKING.)

Vector bundles continued. Basic K theory. Statement of Poincare-Hopf. Topology around bundles. Pull-back bundles. Homotopy theory of vector bundles.

Control theory. The falling cat.

HODGE THEORY.

Moser’s method

Chow-Rashevskii = Anti-Frobenius, and its dual.

DONE: *HW 2 Due*. k-forms. Exterior differential calculus. Basic operations d, \wedge, i_v or L_v, F^* .

DONE: Integrating k-forms. Focus on 2-forms. Statement of Stokes’ theorem.

DONE: Cartan’s magic formula. Other identities in the exterior differential calculus.

DONE: *Discussion of Midterm Metrics*. Examples from surface theory. Structure equations for Riemannian surfaces: getting the Gauss curvature.

DONE. *Midterm Due*. . Lie derivative, generally. Cartan’s magic formula.

DONE: deRham theorem.

DONE: Applications of deRham theorem. Ingredients of cohomology.