	Morse theory	**Hamiltonian Floer theory**
Space	M closed manifold	$\widetilde{\mathcal{L}_0 M}$ for $M = (M, \omega)$ compact symplectic
Function(al)	$f : M \to \mathbb{R}$	$\mathcal{A}([\gamma, u]) = -\int_{D^2} u^*\omega + \int_0^1 H_t(\gamma(t))$
Critical points	$x \in M$ such that $df(x) = 0$	$\gamma : S^1 \to M$ such that $\dot{\gamma}(t) = X_t^H(\gamma(t))$
Non-degeneracy condition	$\lvert\partial_i \partial_j f(x)\rvert \neq 0$ (i.e. f is Morse)	$\lvert id - d\phi_1^H\rvert \neq 0$ (i.e. H is non-degenerate)
Index	Morse index	Conley–Zehnder index[1]
Auxiliary metric	g a Riemannian metric on M	$\langle -, - \rangle_J := \int_0^1 \omega(-, J-)$ for compatible J, which defines a Riemannian metric on $\widetilde{\mathcal{L}_0 M}$
Negative gradient equation	$\dot{\gamma}(t) + \nabla^g f(\gamma(t)) = 0$	$\overline{\partial}_{H,J}(u) := \partial_s u + J(u)(\partial_t u - X_t^H(u)) = 0$
Transversality condition	(f, g) is Morse–Smale	(H, J) is regular
Compactness	Morse compactness: *a sequence of negative gradient trajectories limits (up to subsequence) to a broken gradient trajectory*	Gromov–Floer compactness: *in the absence of sphere bubbles, a sequence of Floer trajectories limits to a broken Floer trajectory*[2]
Coefficients	$\mathbb{Z}/2$ in general; can work over an arbitrary commutative ring if the moduli spaces admit coherent R-orientations	if $\omega \cdot \pi_2(M) = 0$, then can work over $\mathbb{Z}/2$, and over $\mathbb{Z}$ after choosing coherent orientations. In general, must work over a Novikov ring Λ_R.[3]

[1] Mod 2 unless we assume that $c_1(TM) \cdot \pi_2(M) = 0$

[2] As we briefly discussed in class, Floer cohomology can still be defined in the presence of sphere bubbles, but this requires much more sophisticated methods.

[3] Typically, one must assume that R contains $\mathbb{Q}$, which also requires a choice of coherent orientations. This can be avoided under some assumptions, such as M being Calabi–Yau.