Fukaya, Kenji
Symplectic geometry. (Japanese) Zbl 1403.53001
Tokyo: Iwanami (ISBN 978-4-00-005462-1). 414 p. (2008).

This book is concerned with elements of global symplectic geometry making use of pseudoholomorphic curves. The book consists of 6 chapters. The first chapter, consisting of three sections, is a readable introduction. The first section discusses the Erlangen program and G structures, while the second section discusses the transition from "local" to "global" in symplectic geometry. The third section is a glimpse of symplectic geometry in historical perspective. Chapter 2, after explaining the first two fundamental theorems of symplectic geometry (the theorem of Darboux and the theorem of Moser), is concerned with the method of pseudoholomorphic curves, aiming at the existence theorem of pseudoholomorphic curves on $\mathbb{CP}^2$ for any almost complex structure compatible with the symplectic structure induced by the natural Kähler structure (Theorem 2.36), which is applied to Gromov's non-squeezing theorem put down as the forerunner of the emergence of *global* symplectic geometry (§2.7). Chapter 3 deals with symplectic reduction, giving a detailed account of the Morse theory of moment mappings. Chapter 4 is concerned with Lagrange submanifolds, discussing geometric quantization (§4.3) and Maslov indices as well as Lagrangian cobordism (§4.4). Chapter 5 addresses elements of Floer homology. Chapter 6 is concerned with Mirror symmetry and Gromov-Witten invariants, discussing the relationship between deformation theory and symplectic geometry.

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MSC:

53-01 Textbooks (differential geometry)
53D05 Symplectic manifolds, general
53D37 Mirror symmetry, symplectic aspects; homological mirror symmetry; Fukaya category
53D30 Symplectic structures of moduli spaces

Keywords:

pseudoholomorphic curves; Erlangen program; G structures; Gromov's non-squeezing theorem; Morse theory of moment mappings; Lagrange submanifolds; geometric quantization; Lagrangian cobordism; Floer homology; Mirror symmetry; Gromov-Witten invariants; symplectic reduction