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MADELYNN MELENDEZ

Locally Conformal Kähler Geometry Cambridge University Press
Among all the Hamiltonian systems, the integrable ones have special geometric properties; in particular, their solutions are very regular and quasi-periodic. This book serves as an introduction to symplectic and contact geometry for graduate students, exploring the underlying geometry of integrable Hamiltonian systems. Includes exercises designed to complement the expositiont, and up-to-date references.
Lectures on Symplectic Geometry Springer Nature
The present work grew out of a study of the Maslov class (e. g. (37]), which is a fundamental invariant in asymptotic analysis of partial differential equations of quantum physics. One of the many in terpretations of this class was given by F. Kamber and Ph. Tondeur (43], and it indicates that the Maslov

class is a secondary characteristic class of a complex trivial vector bundle endowed with a real reduction of its structure group. (In the basic paper of V. I. Arnold about the Maslov class (2], it is also pointed out without details that the Maslov class is characteristic in the category of vector bundles mentioned pre viously.) Accordingly, we wanted to study the whole range of secondary characteristic classes involved in this interpretation, and we gave a short description of the results in (83]. It turned out that a complete exposition of this theory was rather lengthy, and, moreover, I felt that many potential readers would have to use a lot of scattered references in order to find the necessary information from either symplectic geometry or the theory of the secondary characteristic classes. On the otherhand, both these subjects are of a much larger interest in differential geome try and topology, and in the applications to physical theories.

Symplectic Geometry

Springer

The main goal of this book is to establish the fundamental theorems of the subject in full and rigourous detail. In particular, the book contains complete proofs of Gromov's compactness theorem for spheres, of the gluing theorem for spheres, and of the associatively of quantum multiplication in the semipositive case. The book can also serve as an introduction to current

work in symplectic topology.

Contact and Symplectic Topology Springer

This introductory book offers a unique and unified overview of symplectic geometry, highlighting the differential properties of symplectic manifolds. It consists of six chapters: Some Algebra Basics, Symplectic Manifolds, Cotangent Bundles, Symplectic G-spaces, Poisson Manifolds, and A Graded Case, concluding with a discussion of the differential properties of graded symplectic manifolds of dimensions (0,n). It is a useful reference resource for students and researchers interested in geometry, group theory, analysis and differential equations.This book is also inspiring in the emerging field of Geometric Science of Information, in particular the chapter on Symplectic G-spaces, where Jean-Louis Koszul develops Jean-Marie Souriau's tools related to the non-equivariant case of co-adjoint action on Souriau's moment map through Souriau's Cocycle, opening the door to Lie Group Machine Learning with Souriau-Fisher metric.

Research Directions in Symplectic and Contact Geometry and Topology Oxford University Press

This book highlights a number of recent research advances in the field of symplectic and contact geometry and topology, and related areas in low-dimensional topology. This field has experienced significant and exciting growth in the

past few decades, and this volume provides an accessible introduction into many active research problems in this area. The papers were written with a broad audience in mind so as to reach a wide range of mathematicians at various levels. Aside from teaching readers about developing research areas, this book will inspire researchers to ask further questions to continue to advance the field. The volume contains both original results and survey articles, presenting the results of collaborative research on a wide range of topics. These projects began at the Research Collaboration Conference for Women in Symplectic and Contact Geometry and Topology (WiSCon) in July 2019 at ICERM, Brown University. Each group of authors included female and nonbinary mathematicians at different career levels in mathematics and with varying areas of expertise. This paved the way for new connections between mathematicians at all career levels, spanning multiple continents, and resulted in the new collaborations and directions that are featured in this work.

Introduction to Symplectic Topology Springer Science & Business Media

"And what is the use," thought Alice, "of a book without pictures or conversations in it?" - Lewis Carroll This book is written for modem undergraduate students - not the ideal stu dents that mathematics professors wish for (and who occasionally grace our campuses), but the

students like many the author has taught: talented but ap preciating review and reinforcement of past course work; willing to work hard, but demanding context and motivation for the mathematics they are learning. To suit this audience, the author eschews density of topics and efficiency of presentation in favor of a gentler tone, a coherent story, digressions on mathe maticians, physicists and their notations, simple examples worked out in detail, and reinforcement of the basics. Dense and efficient texts play a crucial role in the education of budding (and budded) mathematicians and physicists. This book does not presume to improve on the classics in that genre. Rather, it aims to provide those classics with a large new generation of appreciative readers. This text introduces some basic constructs of modern symplectic geometry in the context of an old celestial mechanics problem, the two-body problem. We present the derivation of Kepler's laws of planetary motion from Newton's laws of gravitation, first in the style of an undergraduate physics course, and x Preface then again in the language of symplectic geometry. No previous exposure to symplectic geometry is required: we introduce and illustrate all necessary con structs.

Holomorphic Curves in Symplectic Geometry

Cambridge University Press

Symplectic geometry is the geometry underlying

Hamiltonian dynamics, and symplectic mappings arise as time-1-maps of Hamiltonian flows. The spectacular rigidity phenomena for symplectic mappings discovered in the last two decades show that certain things cannot be done by a symplectic mapping. For instance, Gromov's famous "non-squeezing'' theorem states that one cannot map a ball into a thinner cylinder by a symplectic embedding. The aim of this book is to show that certain other things can be done by symplectic mappings. This is achieved by various elementary and explicit symplectic embedding constructions, such as "folding", "wrapping'', and "lifting''. These constructions are carried out in detail and are used to solve some specific symplectic embedding problems. The exposition is self-contained and addressed to students and researchers interested in geometry or dynamics.

An Introduction to Contact Topology

American Mathematical Soc.

This first edition of this book quickly became an established text in this fast-developing branch of mathematics. This second edition has been significantly revised and expanded. It includes a section on new developments and an expanded discussion of Taubes' and Donaldson's recent results.

Gauge Theory and Symplectic Geometry

Springer Science & Business Media

This volume contains the proceedings of the

conference "Colloque de Goometrie Symplectique et Physique Mathematique" which was held in Aix-en-Provence (France), June 11-15, 1990, in honor of Jean-Marie Souriau. The conference was one in the series of international meetings of the Seminaire Sud Rhodanien de Goometrie, an organization of geometers and mathematical physicists at the Universities of Avignon, Lyon, Mar seille, and Montpellier. The scientific interests of Souriau, one of the founders of geometric quantization, range from classical mechanics (symplectic geometry) and quantization problems to general relativity and astrophysics. The themes of this conference cover "only" the first two of these four areas. The subjects treated in this volume could be classified in the follow ing way: symplectic and Poisson geometry (Arms-Wilbour, Bloch-Ratiu, Brylinski-Kostant, Cushman-Sjamaar, Dufour, Lichnerowicz, Medina, Ouzilou), classical mechanics (Benenti, Holm-Marsden, Marle) , particles and fields in physics (Garcia Perez-Munoz Masque, Gotay, Montgomery, Ne'eman-Sternberg, Sniatycki) and quantization (Blattner, Huebschmann, Karasev, Rawnsley, Roger, Rosso, Weinstein). However, these subjects are so interrelated that a classification by headings such as "pure differential geometry, applications of Lie groups, constrained systems in physics, etc. ," would have produced a

completely different clustering! The list of authors is not quite identical to the list of speakers at the conference. M. Karasev was invited but unable to attend; C. Itzykson and M. Vergne spoke on work which is represented here only by the title of Itzykson's talk (Surfaces triangulees et integration matricielle) and a summary of Vergne's talk.

Symplectic Geometric Algorithms for Hamiltonian Systems

Walter de Gruyter

"Symplectic Geometric Algorithms for Hamiltonian Systems" will be useful not only for numerical analysts, but also for those in theoretical physics, computational chemistry, celestial mechanics, etc. The book generalizes and develops the generating function and Hamilton-Jacobi equation theory from the perspective of the symplectic geometry and symplectic algebra. It will be a useful resource for engineers and scientists in the fields of quantum theory, astrophysics, atomic and molecular dynamics, climate prediction, oil exploration, etc. Therefore a systematic research and development of numerical methodology for Hamiltonian systems is well motivated. Were it successful, it would imply wide-ranging applications.

Symplectic Geometry of Integrable Hamiltonian Systems

American Mathematical Soc.

This book provides an introduction to symplectic field theory, a new and important subject which is

currently being developed. The starting point of this theory are compactness results for holomorphic curves established in the last decade. The author presents a systematic introduction providing a lot of background material, much of which is scattered throughout the literature. Since the content grew out of lectures given by the author, the main aim is to provide an entry point into symplectic field theory for non-specialists and for graduate students. Extensions of certain compactness results, which are believed to be true by the specialists but have not yet been published in the literature in detail, top off the scope of this monograph.

Symplectic Geometry

Oxford University Press

Symplectic geometry is a central topic of current research in mathematics. Indeed, symplectic methods are key ingredients in the study of dynamical systems, differential equations, algebraic geometry, topology, mathematical physics and representations of Lie groups. This book is a true introduction to symplectic geometry, assuming only a general background in analysis and familiarity with linear algebra. It starts with the basics of the geometry of symplectic vector spaces. Then, symplectic manifolds are defined and explored. In addition to the essential classic results, such as Darboux's theorem, more recent results and ideas are also included here, such as

symplectic capacity and pseudoholomorphic curves. These ideas have revolutionized the subject. The main examples of symplectic manifolds are given, including the cotangent bundle, Kähler manifolds, and coadjoint orbits. Further principal ideas are carefully examined, such as Hamiltonian vector fields, the Poisson bracket, and connections with contact manifolds. Berndt describes some of the close connections between symplectic geometry and mathematical physics in the last two chapters of the book. In particular, the moment map is defined and explored, both mathematically and in its relation to physics. He also introduces symplectic reduction, which is an important tool for reducing the number of variables in a physical system and for constructing new symplectic manifolds from old. The final chapter is on quantization, which uses symplectic methods to take classical mechanics to quantum mechanics. This section includes a discussion of the Heisenberg group and the Weil (or metaplectic) representation of the symplectic group. Several appendices provide background material on vector bundles, on cohomology, and on Lie groups and Lie algebras and their representations. Berndt's presentation of symplectic geometry is a clear and concise introduction to the major methods and applications of the subject, and requires only a minimum of prerequisites. This book

would be an excellent text for a graduate course or as a source for anyone who wishes to learn about symplectic geometry.

Symplectic Geometry Birkhäuser

This volume is the first one that gives a systematic and self-contained introduction to the theory of symplectic Dirac operators and reflects the current state of the subject. At the same time, it is intended to establish the idea that symplectic spin geometry and symplectic Dirac operators may give valuable tools in symplectic geometry and symplectic topology, which have become important fields and very active areas of mathematical research.

Symplectic Techniques in Physics Cambridge University Press

Suitable for graduate students in mathematics, this monograph covers differential and symplectic geometry, homogeneous symplectic manifolds, Fourier analysis, metaplectic representation, quantization, Kirillov theory. Includes Appendix on Quantum Mechanics by Robert Hermann. 1977 edition.

Symplectic Geometry and Fourier Analysis Springer Science & Business Media

Symplectic geometry is very useful for clearly and concisely formulating problems in classical physics and also for understanding the link between classical problems and their quantum counterparts. It is thus a subject of interest to both mathematicians and physicists, though they

have approached the subject from different view points. This is the first book that attempts to reconcile these approaches. The authors use the uncluttered, coordinate-free approach to symplectic geometry and classical mechanics that has been developed by mathematicians over the course of the last thirty years, but at the same time apply the apparatus to a great number of concrete problems. In the first chapter, the authors provide an elementary introduction to symplectic geometry and explain the key concepts and results in a way accessible to physicists and mathematicians. The remainder of the book is devoted to the detailed analysis and study of the ideas discussed in Chapter 1. Some of the themes emphasized in the book include the pivotal role of completely integrable systems, the importance of symmetries, analogies between classical dynamics and optics, the importance of symplectic tools in classical variational theory, symplectic features of classical field theories, and the principle of general covariance. This work can be used as a textbook for graduate courses, but the depth of coverage and the wealth of information and application means that it will be of continuing interest to, and of lasting significance for mathematicians and mathematically minded physicists.

First Steps in Differential Geometry Springer

Science & Business Media This volume is based on lectures given at a workshop and conference on symplectic geometry at the University of Warwick in August 1990. **Symplectic Geometry and Quantum Mechanics** Birkhauser Symplectic and contact geometry naturally emerged from the mathematical description of classical physics. The discovery of new rigidity phenomena and properties satisfied by these geometric structures launched a new research field worldwide. The intense activity of many European research groups in this field is reflected by the ESF Research Networking Programme "Contact And Symplectic Topology" (CAST). The lectures of the Summer School in Nantes (June 2011) and of the CAST Summer School in Budapest (July 2012) provide a nice panorama of many aspects of the present status of contact and symplectic topology. The notes of the minicourses offer a gentle introduction to topics which have developed in an amazing speed in the recent past. These topics include 3-dimensional and higher dimensional contact topology, Fukaya categories, asymptotically holomorphic methods in contact topology, bordered Floer homology, embedded contact homology, and flexibility results for Stein manifolds. **The Topology of Torus Actions on Symplectic Manifolds** Courier Dover Publications This textbook offers a concise introduction to

symplectic and contact geometry, with a focus on the relationships between these subjects and other topics such as Lie theory and classical mechanics. Organized into four chapters, this work serves as a stepping stone for readers to delve into the subject, providing a succinct and motivating foundation. The content covers definitions, symplectic linear algebra, symplectic and contact manifolds, Hamiltonian systems, and more. Prerequisite knowledge includes differential geometry, manifolds, algebraic topology, de Rham cohomology, and the basics of Lie groups. Quick reviews are included where necessary, and examples and constructions are provided to foster understanding. Ideal for advanced undergraduate students and graduate students, this volume can also serve as a valuable resource for independent researchers seeking a quick yet solid understanding of symplectic and contact geometry.

Symmetry in Mechanics
American Mathematical Soc.
Symplectic geometry has its origins as a geometric language for classical mechanics. But it has recently exploded into an independent field interconnected with many other areas of mathematics and physics. The goal of the IAS/Park City Mathematics Institute Graduate Summer School on Symplectic Geometry and Topology was to give an intensive introduction to these exciting areas of current research. Included

in this proceedings are lecture notes from the following courses: Introduction to Symplectic Topology by D. McDuff; Holomorphic Curves and Dynamics in Dimension Three by H. Hofer; An Introduct.

Symplectic Geometry and Topology Springer Science & Business Media

This book arises from the INdAM Meeting "Complex and Symplectic Geometry", which was held in Cortona in June 2016. Several leading specialists, including young researchers, in the field of complex and symplectic geometry, present the state of the art of their research on topics such as the cohomology of complex manifolds; analytic techniques in Kähler and non-Kähler geometry; almost-complex and symplectic structures; special structures on complex manifolds; and deformations of complex objects. The work is intended for researchers in these areas.

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