

# Critical Point Theory And Its Applications Pdf Pdf

## *Critical Point Theory and Hamiltonian Systems*

2013-04-17 Jean Mawhin FACHGEB The last decade has seen a tremendous development in critical point theory in infinite dimensional spaces and its application to nonlinear boundary value problems. In particular, striking results were obtained in the classical problem of periodic solutions of Hamiltonian systems. This book provides a systematic presentation of the most basic tools of critical point theory: minimization, convex functions and Fenchel transform, dual least action principle, Ekeland variational principle, minimax methods, Lusternik- Schirelmann theory for  $Z_2$  and  $S^1$  symmetries, Morse theory for possibly degenerate critical points and non-degenerate critical manifolds. Each technique is illustrated by applications to the discussion of the existence, multiplicity, and bifurcation of the periodic solutions of Hamiltonian systems. Among the treated questions are the periodic solutions with fixed period or fixed energy of autonomous systems, the existence of subharmonics in the non-autonomous case, the asymptotically linear Hamiltonian systems, free and forced superlinear problems. Application of those results to the equations of mechanical pendulum, to Josephson systems of solid state physics and to questions from celestial mechanics are given. The aim of the book is to introduce a reader familiar to more classical techniques of ordinary differential equations to the powerful approach of modern critical point theory. The style of the exposition has been adapted to this goal. The new topological tools are introduced in a progressive but detailed way and immediately applied to differential equation problems. The abstract tools can also be applied to partial differential equations and the reader will also find the basic references in this direction in the bibliography of more than 500 items which concludes the book. ERSCHHEIN

## **Nonlinear Functional Analysis and Its Applications**

2021-04-14 Radu Precup This book consists of nine papers covering a number of basic ideas, concepts, and methods of nonlinear analysis, as well as some current research problems. Thus, the reader is introduced to the fascinating theory around Brouwer's fixed point theorem, to Granas' theory of topological transversality, and to some advanced techniques of critical point theory and fixed point theory. Other topics include discontinuous differential equations, new results of metric fixed point theory, robust tracker design problems for various classes of nonlinear systems, and periodic solutions in computer virus propagation models.

## **Minimax Methods in Critical Point Theory with Applications to Differential Equations**

1986-07-01 Paul H. Rabinowitz The book provides an introduction to minimax methods in critical point theory and shows their use in existence questions for nonlinear differential equations. An expanded version of the author's 1984 CBMS lectures, this volume is the first monograph devoted solely to these topics. Among the abstract questions considered are the following: the mountain pass and saddle point theorems, multiple critical points for functionals invariant under a group of symmetries, perturbations from symmetry, and variational methods in bifurcation theory. The book requires some background in functional analysis and differential equations, especially elliptic partial differential equations. It is addressed to mathematicians interested in differential equations and/or nonlinear functional analysis, particularly critical point theory.

## **Critical Point Theory in Global Analysis and Differential Topology**

2014-05-14 Critical Point Theory in Global Analysis and Differential Topology

## **Introduction to Conformal Invariance and Its Applications to Critical Phenomena**

2008-09-11 Philippe Christe The history of critical phenomena goes back to the year 1869 when Andrews discovered the critical point of carbon dioxide, located at about 31°C and 73 atmospheres pressure. In the neighborhood of this point the carbon dioxide was observed to become opalescent, that is, light is strongly scattered. This is nowadays interpreted as coming from the strong fluctuations of the system close to the critical point. Subsequently, a wide variety of physical systems were realized to display critical points as well. Of particular importance was the observation of a critical point in ferromagnetic iron by Curie. Further examples include multicomponent fluids and alloys, superfluids, superconductors, polymers and may even extend to the quark-gluon plasma and the early universe as a whole. Early theoretical investigations tried to reduce the problem to a very small number of degrees of freedom, such as the van der Waals equation and mean field approximations and culminating in Landau's general theory of critical phenomena. In a dramatic development, Onsager's exact solution of the two-dimensional Ising model made clear the important role of the critical fluctuations. Their role was taken into account in the subsequent developments leading to the scaling theories of critical phenomena and the renormalization group. These developments have achieved a precise description of the close neighborhood of the critical point and results are often in good agreement with experiments. In contrast to the general understanding a century ago, the presence of fluctuations on all length scales at a critical point is today emphasized.

## *Duality and Perturbation Methods in Critical Point Theory*

1993-08-19 N. Ghoussoub The calculus of variations has been an active area of mathematics for over 300 years. Its main use is to find stable critical points of functions for the solution of problems. To find unstable values, new approaches (Morse theory and min-max methods) were developed, and these are still being refined to overcome difficulties when applied to the theory of partial differential equations. Here, Professor Ghoussoub describes a point of view that may help when dealing with such problems. Building upon min-max methods, he systematically develops a general theory that can be applied in a variety of situations. In so doing he also presents a whole array of duality and perturbation methods. The prerequisites for following this book are relatively few; an

appendix sketching certain methods in analysis makes the book reasonably self-contained. Consequently, it should be accessible to all mathematicians, pure or applied, economists and engineers working in nonlinear analysis or optimization.

## A Primer to the Theory of Critical Phenomena

2018-02-05 Jurgen M. Honig A Primer to the Theory of Critical Phenomena provides scientists in academia and industry, as well as graduate students in physics, chemistry, and geochemistry with the scientific fundamentals of critical phenomena and phase transitions. The book helps readers broaden their understanding of a field that has developed tremendously over the last forty years. The book also makes a great resource for graduate level instructors at universities. Provides a thorough and accessible treatment of the fundamentals of critical phenomena Offers an in-depth exposition on renormalization and field theory techniques Includes experimental observations of critical effects Includes live examples illustrating the applications of the theoretical material

## *Critical Point Theory*

2021-06-13 Martin Schechter This monograph collects cutting-edge results and techniques for solving nonlinear partial differential equations using critical points. Including many of the author's own contributions, a range of proofs are conveniently collected here, Because the material is approached with rigor, this book will serve as an invaluable resource for exploring recent developments in this active area of research, as well as the numerous ways in which critical point theory can be applied. Different methods for finding critical points are presented in the first six chapters. The specific situations in which these methods are applicable is explained in detail. Focus then shifts toward the book's main subject: applications to problems in mathematics and physics. These include topics such as Schrödinger equations, Hamiltonian systems, elliptic systems, nonlinear wave equations, nonlinear optics, semilinear PDEs, boundary value problems, and equations with multiple solutions. Readers will find this collection of applications convenient and thorough, with detailed proofs appearing throughout. Critical Point Theory will be ideal for graduate students and researchers interested in solving differential equations, and for those studying variational methods. An understanding of fundamental mathematical analysis is assumed. In particular, the basic properties of Hilbert and Banach spaces are used.

## **Critical Point Theory and Its Applications**

2006-09-10 Wenming Zou This book presents some of the latest research in critical point theory, describing methods and presenting the newest applications. Coverage includes extrema, even valued functionals, weak and double linking, sign changing solutions, Morse inequalities, and cohomology groups. Applications described include Hamiltonian systems, Schrödinger equations and systems, jumping nonlinearities, elliptic equations and systems, superlinear problems and beam equations.

## **Topological Methods in Differential Equations and Inclusions**

2012-12-06 Andrzej Granas The papers collected in this volume are contributions to the 33rd session of the Seminaire de Mathematiques Superieures (SMS) on "Topological Methods in Differential Equations and Inclusions". This session of the SMS took place at the Universite de Montreal in July 1994 and was a NATO Advanced Study Institute (ASI). The aim of the ASI was to bring together a considerable group of young researchers from various parts of the world and to present to them coherent surveys of some of the most recent advances in this area of Nonlinear Analysis. During the meeting 89 mathematicians from 20 countries have had the opportunity to get acquainted with various aspects of the subjects treated in the lectures as well as the chance to exchange ideas and learn about new problems arising in the field. The main topics treated in this ASI were the following: Fixed point theory for single- and multi-valued mappings including topological degree and its generalizations, and topological transversality theory; existence and multiplicity results for ordinary differential equations and inclusions; bifurcation and stability problems; ordinary differential equations in Banach spaces; second order differential equations on manifolds; the topological structure of the solution set of differential inclusions; effects of delay perturbations on dynamics of retarded delay differential equations; dynamics of reaction diffusion equations; non smooth critical point theory and applications to boundary value problems for quasilinear elliptic equations.

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