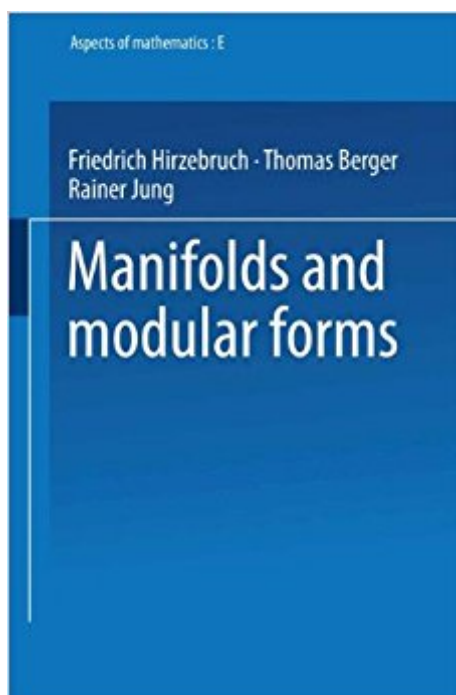


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Manifolds And Modular Forms, Vol. E20 (Aspects Of Mathematics)



Synopsis

During the winter term 1987/88 I gave a course at the University of Bonn under the title "Manifolds and Modular Forms." I wanted to develop the theory of "Elliptic Genera" and to learn it myself on this occasion. This theory due to Ochanine, Landweber, Stong and others was relatively new at the time. The word "genus" is meant in the sense of my book "Neue Topologische Methoden in der Algebraischen Geometrie" published in 1956: A genus is a homomorphism of the Thom cobordism ring of oriented compact manifolds into the complex numbers. Fundamental examples are the signature and the A-genus. The A-genus equals the arithmetic genus of an algebraic manifold, provided the first Chern class of the manifold vanishes. According to Atiyah and Singer it is the index of the Dirac operator on a compact Riemannian manifold with spin structure. The elliptic genera depend on a parameter. For special values of the parameter one obtains the signature and the A-genus. Indeed, the universal elliptic genus can be regarded as a modular form with respect to the subgroup $\Gamma(2)$ of the modular group; the two cusps 0 giving the signature and the A-genus. Witten and other physicists have given motivations for the elliptic genus by theoretical physics using the free loop space of a manifold.

Book Information

Series: Aspects of Mathematics (Book 20)

Paperback: 212 pages

Publisher: Vieweg (1992)

Language: English

ISBN-10: 3528064145

ISBN-13: 978-3528064143

Product Dimensions: 6.1 x 0.5 x 9.2 inches

Shipping Weight: 12.5 ounces (View shipping rates and policies)

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