Huybrechts, Daniel
Lectures on $K3$ surfaces. (English) ｜Zbl 1360.14099｜
Cambridge Studies in Advanced Mathematics 158. Cambridge: Cambridge University Press (ISBN 978-1-107-15304-2/hbk; 978-1-316-59419-3/ebook). xi, 485 p. (2016).

$K3$ surfaces have been extensively studied over the last 60–70 years. They have been studied form various points of view (as complex surfaces, as algebraic surfaces and the latter also over non-algebraically closed fields of arbitrary characteristic.)

This book both aims at both giving an introduction to this subject and giving an overview of several current research topics. This book started from a set of lecture notes of the author for a graduate course on $K3$ surfaces, the author assumes only some basic knowledge of (complex) algebraic geometry.

The book consists of 18 chapter each discussing a topic on $K3$ surfaces.

The first three chapter contain a discussion on basic properties of $K3$ surfaces, linear systems on $K3$ surfaces and the Hodge structures of $K3$ surfaces.

This is followed by four chapters on topics related with the moduli spaces of polarized $K3$ surfaces. (Kuga-Satake compactification, the moduli space of polarized $K3$ surfaces, the Period map and the Torelli theorem.)

Then there are three chapters discussing line and vector bundles on $K3$ surface (the ample and Kähler cone, vector bundles and moduli spaces of sheaves on $K3$ surfaces).

The final eight chapters discuss various slightly more recent topics. (Elliptic $K3$ surfaces, Chow Ring and Grothendieck Group, Rational curves on $K3$ surfaces, Lattices, Automorphisms, Derived Categories, (computability of) the Picard group and (finiteness of) the Brauer group.)

The book tries to deal with $K3$ surfaces in most possible generality and contains extensive discussion of results which hold only for non-algebraic $K3$ surfaces and of results which holds only in positive characteristic or over finite fields and gives some examples of results in positive characteristic which are used to prove results in characteristic zero.

The main body of text is very much self-contained. Each chapter ends with references to the literature for further discussion and a discussion of related open questions and literature discussing these questions in more detail. In this way this book gives a nice essentially self-contained survey on current topics on $K3$ surfaces.

Reviewer: Remke Kloosterman (Padova)

MSC:

14J28	$K3$ surfaces and Enriques surfaces
14-02	Research exposition (monographs, survey articles) pertaining to algebraic geometry
14C15	(Equivariant) Chow groups and rings; motives
14D20	Algebraic moduli problems, moduli of vector bundles
14F05	Sheaves, derived categories of sheaves, etc. (MSC2010)
14F22	Brauer groups of schemes
14J10	Families, moduli, classification: algebraic theory
14J27	Elliptic surfaces, elliptic or Calabi-Yau fibrations
14J60	Vector bundles on surfaces and higher-dimensional varieties, and their moduli
32J15	Compact complex surfaces

Cited in **1** Review
Cited in **66** Documents

Keywords:

$K3$ surfaces; moduli of $K3$ surfaces; vector bundles on $K3$ surfaces

Full Text: DOI