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Mathematics for computer scientists. With applications in computer graphics and coding theory. (Mathematik für Informatiker. Mit Anwendungen in der Computergrafik und Codierungstheorie.)

München: Carl Hanser Verlag (ISBN 978-3-446-42254-4/hbk). 300 p. (2011).

Verlagsbeschreibung: Keine Angst vor der Mathematik! Dieses Buch vermittelt auf anschauliche und anwendungsorientierte Weise die mathematischen Inhalte, die Sie für Ihr Informatikstudium benötigen. Dabei wird großer Wert auf den Praxisbezug der mathematischen Inhalte gelegt. Es wird jeweils anhand einer konkreten Aufgabenstellung der Informatik das mathematische Handwerkszeug entwickelt, das zur Lösung dieser Aufgabe erforderlich ist. So werden Themen der linearen Algebra im Hinblick auf Anwendungen in der Computergrafik erläutert. Aufgabenstellungen der Zeit- und Kalenderrechnung sowie der Kryptografie dienen zur Veranschaulichung der modularen Arithmetik. Eine große Menge an erprobten Beispielen, Übungsaufgaben und Programmierprojekten trägt zum vertieften Verständnis des Stoffes bei. Dieses Buch richtet sich an Studierende und Lehrende der Informatik, insbesondere an Fachhochschulen. Es deckt folgende mathematische Gebiete ab:Diskrete Mathematik mit Mengenlehre, Logik, Relationen und Funktionen, Kombinatorik, Graphentheorie und modularer Arithmetik,Grundstrukturen der Algebra, analytische Geometrie und lineare Algebra.

This book covers the topics needed for the study of computer science at universities of applied sciences (Fachhochschulen) in bachelor degree programs, except analysis and stochastics. The work is divided into the two parts Discrete Mathematics and Linear Algebra. Great emphasis is attached to practical applications, and each topic is introduced with a motivating example or problem. The topics of the first part are logic, sets and relations, combinatorics, modular arithmetic, algebraic structures and graphs. Typically one application is used to demonstrate several techniques, e.g. the problem of deciding which years are leap years motivates logical expressions and is revisited for Karnaugh and Venn diagrams. The applications are more or less standard: error checking numbers, switching circuits, encryption. The most important algebraic structures – groups, fields, polynomial rings – are discussed in detail. Set theory also deals with Russell's paradox and countable and uncountable sets. There are many well chosen examples and exercises, many of them appeal directly to programming tasks. For these parts a certain knowledge of programming languages, especially of Java is necessary. (Prolog is also sometimes used.) In graph theory stress is given to structures which are important for applications and data structures in computer science, including bipartite graphs and the existence of perfect matchings – the latter with complete proof. The second part starts with the question of how to select geometrical objects with the mouse within a drawing program. The necessary concepts are then developed successively. Topics are analytic geometry, linear and affine mappings (with a short glimpse on homogeneous coordinates), vector spaces and matrices. One of the main applications is descriptive geometry. In comparison this part is more abstract than the first one when discussing vector space theory. This also shows in the exercises which now seldom revert to programming tasks. But the last chapter gives a concise introduction to the construction of error correcting codes. The author is always very motivating and instructionally sensible, giving always a sound foundation. Solutions to all exercises are available online. *Dieter Riebesehl (Lüneburg)*

Classification: H15 N75 Q15 R25 K25 K35
Keywords: discrete mathematics; algebraic structures; graph theory; linear algebra; computer graphics; coding theory