Preface

This monograph is based on the ten lectures I gave at Iowa State University in Ames during the week of July 12-16, 2010. The purpose of the lectures was to show the fascinating and mutually beneficial relationship between matrices and graphs (the nonzero pattern of a matrix): (i) knowledge about one of the graphs that can be associated with a matrix is used to illuminate matrix properties and to get better information about the matrix, and (ii) linear algebraic properties of one of the matrices associated with a graph is used to get useful combinatorial information about the graph. The lectures were not intended to be comprehensive on any of the topics treated; they could not have been within the time framework imposed by ten one-hour lectures. Nor were the lectures intended to cover all instances in which the interplay between matrices and graphs has turned out to be useful; again an impossibility within the time framework. The particular content of the lectures was chosen for its accessibility, beauty, and current relevance, and for the possibility of enticing the audience to want to learn more. It was, of course, influenced by the author’s personal interests and expertise.

In this monograph, I have stayed within the context of the lectures, and have avoided writing a more comprehensive book. In most cases I have not given original references for results if they are readily available in one or more books referenced. Just as we did for the lectures, we assume that the reader is familiar with many of the basic concepts and facts of matrix theory and graph theory. We define some standard terms but many are presumed known and can be found in most elementary and advanced books.

I am indebted to Leslie Hogben and Bryan Shader for organizing this CBMS Regional Conference and for suggesting me as principal lecturer. They did a superb job, from recruiting a diverse group of participants to arranging a stimulating and fun daily schedule with afternoon and evening activities. I would also like to express my gratitude to the participants for their attention, stimulating questions, and camaraderie. Finally, I want to thank the Department of Mathematics of Iowa State University for hosting the conference and the National Science Foundation under grant number DMS 0938261 for financially supporting it.