Contents

Preface		v
Teaching Plan	xv	
Part I: Th	e Theory Of Graphs	1
Chapter 1:	BASIC IDEAS	3
	History	3
	Initial Concepts	9
	Summary	15
	Exercises	15
Chapter 2:	CONNECTIVITY	17
	Introduction	17
	Elementary Results	19
	Structure Based on Connectivity	22
	Summary	24
	Exercises	25

Chapter 3:	TREES	27
	Characterizations	27
	Theorems on Trees	30
	Tree Distances	30
	Binary Trees	32
	Tree Enumeration	35
	Spanning Trees	37
	Fundamental Cycles	38
	Summary	39
	Exercises	41
Chapter 4:	TRAVERSABILITY	43
	Introduction	43
	Eulerian Graphs	43
	Hamiltonian Graphs	46
	Summary	50
	Exercises	51
Chapter 5:	PLANARITY	53
	The Utilities Problem	53
	Plane and Planar Graphs	55
	Planar Graph Representation	55
	Planarity Detection	60
	Duality	64
	Thickness and Crossing Numbers	70
	Summary	73
	Exercises	73
Chapter 6:	MATRICES	75
	The Adjacency Matrix	76
	The Incidence Matrix	77
	The Cycle Matrix	80
	The Cut-Set Matrix	84
	The Path Matrix	90
	Summary	91
	Exercises	91

.

Chapter 7:	DIGRAPHS	93
Chapter II	Connectivity	93
	Traversability	98
	Directed Trees	100
	More Digraph Matrices	100
	The Principle of Directional Duality	107
	Tournaments	108
	Summary	120
	Exercises	120
Chapter 8:	COVERINGS AND COLOURINGS	123
	Covering, Independence, and Domination	124
	Colouring	132
	Matching	134
	Summary	142
	Exercises	143
Chapter 9:	ALGORITHMS	145
	Algorithms	146
	Input	146
	Complexity	149
	Output	160
	Graph Analysis Algorithms	161
	Graph Optimization Algorithms	174
	Summary	180
	Exercises	180
Chapter 10:	MATROIDS	183
	Introduction	184
	Duality	186
	The Greedy Algorithm	188
	Summary	191
	Exercises	191