CONTENTS

	Preface	viii
1	Introduction	1
1-1	What Is Environmental Engineering?	2
1-2	Professional Code of Ethics	3
1-3	Environmental Ethics	4
1-4	Engineering Dimensions and Units	6
1-5	Environmental Systems Overview	7
1-6	Environmental Legislation and Regulation	16
1-7	Chapter Review	19
1-8	Problems	20
1-9	Discussion Questions	21
1-10	FE Exam Formatted Problems	23
1-11	References	24
2	Materials Balances	25
2-1	Introduction	26
2-2	Unifying Theories	26
2-3	Materials Balances	27
2-4	Energy Balances	57
2-5	Chapter Review	70
2-6	Problems	71
2-7	Discussion Questions	82
2-8	FE Exam Formatted Problems	82
2-9	References	83
3	Risk Assessment	85
3-1	Introduction	86
3-2	Probability and Risk	86
3-3	Risk Assessment	89
3-4	Risk Management	105
3-5	Chapter Review	105
3-6	Problems	106
3-7	Discussion Questions	107
3-8	FE Exam Formatted Problems	108
3-9	References	108

4	Water Resources Engineering	110
4-1	Introduction	111
4-2	Fundamentals	111
4-3	Rainfall Analysis	124
4-4	Runoff from Snowmelt	129
4-5	Runoff Analysis	131
4-6	Storage of Reservoirs	155
4-7	Groundwater and Wells	159
4-8	Chapter Review	184
4-9	Problems	185
4-10	Discussion Questions	211
4-11	FE Exam Formatted Problems	213
4-12	References	213
5	Water Chemistry	216
5-1	Introduction	217
5-2	Basic Water Properties and Units	218
5-3	Chemical Reactions	225
5-4	Buffer Solutions	231
5-5	Reaction Kinetics	236
5-6	Gas Transfer	237
5-7	Chapter Review	242
5-8	Problems	243
5-9	Discussion Questions	248
5-10	FE Exam Formatted Problems	249
5-11	References	249
6	Water Treatment	250
6-1	Introduction	251
6-2	Coagulation	271
6-3	Softening	278
6-4	Mixing and Flocculation	299
6-5	Sedimentation	309
6-6	Filtration	324
6-7	Disinfection	335
6-8	Adsorption	348
6-9	Membranes	349
6-10	Water Plant Residuals Management	351
6-11	Chapter Review	365
6-12	Problems	367
6-13	Discussion Questions	383
6-14	FE Exam Formatted Problems	384
6-15	References	385

7	Water Pollution	388
7-1	Introduction	389
7-2	Water Pollutants and Their Sources	390
7-3	Water Pollution in Rivers	396
7-4	Water Pollution in Lakes	426
7-5	Water Pollution in Estuaries	435
7-6	Groundwater Pollution	436
7-7	Chapter Review	440
7-8	Problems	442
7-9	Discussion Questions	450
7-10	FE Exam Formatted Problems	451
7-11	References	452
8	Wastewater Treatment	455
8-1	Introduction	456
8-2	Characteristics of Wastewater	457
8-3	Wastewater Treatment Standards	460
8-4	Municipal Wastewater Treatment Systems	464
8-5	Unit Operations of Pretreatment	465
8-6	Primary Treatment	473
8-7	Unit Processes of Secondary Treatment	476
8-8	Disinfection	522
8-9	Tertiary Wastewater Treatment	523
8-10	Land Treatment for Sustainability	528
8-11	Sludge Treatment	531
8-12	Alternative Sludge Disposal Techniques	552
8-13	Chapter Review	557
8-14	Problems	559
8-15	Discussion Questions	573
8-16	FE Exam Formatted Problems	574
8-17	References	574
9	Air Pollution	578
9-1	Air Pollution Perspective	579
9-2	Physical and Chemical Fundamentals	579
9-3	Air Pollution Standards	582
9-4	Effects of Air Pollutants	588
9-5	Origin and Fate of Air Pollutants	597
9-6	Micro and Macro Air Pollution	604
9-7	Air Pollution Meteorology	623
9-8	Atmospheric Dispersion	631
9-9	Indoor Air Quality Model	643
9-10	Air Pollution Control of Stationary Sources	647
9-11	Air Pollution Control of Mobile Sources	674

9-12	Chapter Review	681
9-13	Problems	683
9-14	Discussion Questions	693
9-15	FE Exam Formatted Problems	694
9-16	References	694
10	Noise Pollution	701
10-1	Introduction	702
10-2	Effects of Noise on People	714
10-3	Rating Systems	728
10-4	Community Noise Sources and Criteria	731
10-5	Transmission of Sound Outdoors	738
10-6	Traffic Noise Prediction	747
10-7	Noise Control	757
10-8	Chapter Review	771
10-9	Problems	772
10-10	Discussion Questions	781
10-11	FE Exam Formatted Problems	782
10-12	References	782
11	Solid Waste Management	785
11-1	Perspective	786
11-2	Collection	794
11-3	Interroute Transfer	808
11-4	Disposal by Municipal Solid Waste Landfill	812
11-5	Waste to Energy	834
11-6	Resource Conservation and Recovery for Sustainability	838
11-7	Chapter Review	847
11-8	Problems	849
11-9	Discussion Questions	862
11-10	FE Exam Formatted Problems	863
11-11	References	863
12	Hazardous Waste Management	866
12-1	Introduction	867
12-2	Definition and Classification of Hazardous Waste	870
12-3	RCRA and HSWA	877
12-4	CERCLA and SARA	884
12-5	Hazardous Waste Management	888
12-6	Treatment Technologies	893
12-7	Land Disposal	920
12-8	Groundwater Contamination and Remediation	926
12-9	Chapter Review	936
12-10	Problems	938

12-11	Discussion Questions	951
12-12	FE Exam Formatted Problems	952
12-13	References	952
13	Sustainability and Green Engineering	955
13-1	Introduction	956
13-2	Water Resources	960
13-3	Energy Resources	986
13-4	Chapter Review	1003
13-5	Problems	1004
13-6	FE Exam Formatted Problems	1005
13-7	References	1005
14	Ionizing Radiation Available at the text website www.r	mhhe.com/davis
14-1	Introduction	
14-2	Biological Effects of Ionizing Radiation	
14-3	Radiation Standards	
14-4	Radiation Exposure	
14-5	Radiation Protection	
14-6	Radioactive Waste	
14-7	Chapter Review	
14-8	Problems	
14-9	Discussion Questions	
14-10	FE Exam Formatted Problems	
14-11	References	
	Appendix A	1011
	Properties of Air, Water, and Selected Chemicals	
	Appendix B	1019
	Noise Computation Tables and Nomographs	
	Appendix C	1022
	U.S. Customary System Units Conversion Factors	
	Index	1023