List of Tables

		Page
2.1	Permissible Noise Exposures (OSHA, 1983)	8
3.1	Location coordinates of machines, machine noise levels,	
	and location coordinates of worker locations	31
3.2	Methods for reducing machine noise, costs, and noise reduction	31
3.3	Work assignments for four workers, $F = 7$ (Case I)	33
3.4	<i>Improved</i> work assignments for four workers, $F^* = 4$ (Case I)	33
3.5	Work assignments for five workers (Case II)	34
3.6	Work assignments for four workers (Case III)	34
4.1	Factors and levels of the full-factorial experiment	41
4.2	ANOVA table for the 8×8 problem size	42
4.3	ANOVA table for the 20×20 problem size	42
4.4	GA operations for the six treatments	43
4.5	Maximum number of generations for the nine problem sizes	43
4.6 4.7	% deviation of average $l_{\text{max}} [(l_{\text{max}}(P6) - l_{\text{max}}(LINGO))/l_{\text{max}}(LINGO)]$ Location coordinates and noise levels of the eight machines and location	45
4.7	coordinates of the eight worker locations	46
4.8	8-hour TWAs at the eight worker locations	47
5.1	Example of a <i>unbalanced</i> work assignment problem $(m = 5, n = 4)$	51
5.2	A balanced work assignment problem with a dummy worker location	31
5.2	*WL5* $(m = 5, n = 5)$	51
5.3	"Optimal" daily work assignments for the five workers (Problem 1)	56
5.4	"GA-based" daily work assignments for the five workers (Problem 1)	30
J. 1	(a) The <i>initial</i> solution	56
	(b) The <i>final</i> solution	56
5.5	"Optimal" daily work assignments for the six workers (Problem 2)	57
5.6	"GA-based" daily work assignments for the six workers (Problem 2)	υ,
0.0	(a) The <i>initial</i> solution	57
	(b) The <i>final</i> solution	57
5.7	"GA-based" daily work assignments for the eleven workers (Problem 3)	υ,
	(a) The <i>initial</i> solution	58
	(b) The <i>final</i> solution	58
5.8	Comparisons between LINGO and Heuristic GA	59
6.1	Information required for the master setup	62
6.2	Machine location coordinates, noise levels, and worker location	
	coordinates	71
6.3	Techniques for reducing machine noise, costs, and noise reduction	72
6.4	Daily work assignments for Case NC-1	75
6.5	Daily work assignments for Case NC-2	75
6.6	Daily work assignments for Case NC-3	76
6.7	Daily work assignments for Case NC-4	76
6.8	Daily work assignments for Case NC-5	76
6.9	Recommended daily work assignments for Case NC-5	77
6.10	Daily work assignments for Case NC-6	77

6.11	Daily work assignments for Case NC-/	77
7.1	Location coordinates and sound levels generated by the machines	80
7.2	Location coordinates of worker locations	81
7.3	Distances between worker location (WL) and machine location (M),	
	dm_{ii} (in m)	81
7.4	Combined noise and signal sound levels and their differences	81
7.5	Location coordinates and sound levels generated by the machines	
	(Facility with 7 machines – 4 worker locations)	88
7.6	Location coordinates of worker locations	
	(Facility with 7 machines – 4 worker locations)	88
7.7	Comparison of the combined signal sound level and the combined	
	noise level based on the heuristic $(r = 2)$ and optimization $(r^* = 2)$	
	approaches (Facility with 7 machines – 4 worker locations)	90
7.8	Location coordinates and sound levels generated by the machines	
	(Facility with 13 machines – 7 worker locations)	91
7.9	Location coordinates of worker locations	
	(Facility with 13 machines – 7 worker locations)	91
7.10	Location coordinates (in m) of the eight alarm devices	
	(Facility with 13 machines – 7 worker locations)	92
7.11	Comparison of the combined signal sound level and the combined	
	noise level based on the heuristic $(r = 8)$ and optimization $(r^* = 8)$	
	approaches (Facility with 13 machines – 7 worker locations)	92
7.12	Comparison of the solutions from the heuristic and optimization	
	approaches	93