

# **Integrated Assembly Line Balancing with Skilled/Unskilled Workers**

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## **Abstract**

In this paper, we consider the problem of designing an integrated assembly line when many skilled and unskilled workers are available. This problem arises when there are certain limited resources available such as skilled workers in which the operation time for every task is different depending on assignment of the unskilled workers to help the skilled workers. The selection of both skilled workers who have different salaries depending on their skills and unskilled workers to help a skilled worker is addressed in this problem. In addition, the assignment of tasks to workstations with precedence restrictions among the tasks is also considered simultaneously. The objective is to minimize the sum of the total annual workstation cost and annual salary of the assigned skilled and unskilled workers, given a predetermined cycle time. We developed a mathematical model and a random key based genetic algorithm for the integrated assembly line balancing problem with skilled and unskilled workers. Numerical examples demonstrate the efficiency of the developed genetic algorithm.