

# Applications of Petri Nets to Semiconductor Manufacturing Automation

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## **Abstract**

This talk presents a Petri net approach to modeling, analysis, simulation, scheduling, and control of semiconductor manufacturing systems. These systems can be characterized as discrete event systems that exhibit sequential, concurrent, and conflicting relations among the events and operations. Their evolution is dynamic over time. The system complexity is tremendous owing to the complex semiconductor manufacturing processes and test procedures. A formal approach such as Petri nets enables one to describe such complex discrete event systems precisely and thus allows one to perform both qualitative and quantitative analysis, scheduling and discrete-event control of them. The talk briefly reviews applications of Petri nets in semiconductor manufacturing automation. It then introduces definitions and concepts of Petri nets. It proceeds with a discussion of basic Petri net modules in system modeling, a modeling method and a practical system's modeling example. Next, the talk presents their properties and their implications in manufacturing systems, as well as their analysis methods. Timed Petri nets are introduced for system simulation, performance evaluation, and scheduling purposes. An application-oriented case study is presented. Finally, the talk concludes with the active research areas in applying Petri nets to design of semiconductor manufacturing systems.