

## **Abstract 1**

### **Deadlock Control in Automated Manufacturing Systems**

Deadlock is a phenomenon in which a system or a part of it remains indefinitely blocked and cannot terminate its task. Such phenomenon often implies disaster in man-made systems and, therefore, must be carefully handled by system designers, analysts and engineers. Deadlock-free operations of automated systems in manufacturing and transportation are essential. This seminar gives an overview on the theory and application of Petri nets to the deadlock control problem. It focuses on two approaches: The first approach is based on the theory and concept of *siphons*. Siphons are structural objects in Petri nets. When siphons are prevented from being empty, the nets are deadlock-free and thus live for certain classes of Petri net models of automated manufacturing systems. The concepts of elementary siphons and dependent siphons are presented. Using these concepts a much simpler controller can be synthesized than the traditional siphon-based methods. To achieve the maximally permissive controller, an iterative method based on the reachability graph of the net model is outlined. All good and bad markings are identified and then the bad markings are eliminated by an iterative addition of place monitors and invariants. The advantages and disadvantages of these two approaches are presented and the challenging research issues are discussed.