# School of Industrial Engineering, Purdue University

## IE 674 Cyber Methods for Production Control

Classroom TBD

**Instructor**: Professor S.Y. Nof nof@purdue.edu

**Prerequisite**: Graduate student, background in computing, programming not required

**Reading**: Required reading list and handouts – Posted on BB
*Revolutionizing Collaboration through e-Work, e-Business, and e-Service*, Nof, Ceroni, Jeong, Moghaddam, Springer 2015; *Springer Handbook of Automation*, Nof (ed.), 2009. Both e-Books in Purdue Library.

### Course Objectives -- What we will learn:

- Automation 5.0: The theoretical foundation and relevance of advanced cyber, real-time control, computing, communication, and brain models for (1) robotics and (2) automation of planning and decisions in distributed production and supply installations, global supply, logistics, and service systems/networks.
- Current and emerging functions, algorithms, protocols, and models for future factories; how to apply them in research projects and presentations, and in the field. Focus will be on the five top levels of automation (Nof, Ch. 3, *Springer Handbook of Automation*, 2009):

| Level ↓ | Automation | Automated Human Attribute | Example |
|---|---|---|---|
| $A_8$ | Mobile machine | Guided mobility | Hovering motes |
| $A_9$ | Collaborative network | Collaboration | Hub-CI |
| $A_{10}$ | Originality | Creativity | Virtual reality game |
| $A_{11}$ | Human and animal special needs Support | Compassion | Nursing device |
| $A_{12}$ | Interactive companion | Humor | Advisory agent |

### Study and Research Topics include:

1. e-Collaborative algorithms and protocols, and active interaction theories
2. Synchronization and recovery with wireless facility networks
3. Visual analytics and informatics for supply flow decisions
4. Swarm algorithms and sensor/RFID networks
5. Human-robot interaction and collaborative robotics
6. Data mining, brain models, and machine learning in cyber-physical production and manufacturing.

### Requirements and Grading

- Bi-weekly homework -- 35%;
- Mid-term take-home exam – 30%;
- Semester project (individual) in three parts – 35%.