IE 574 INDUSTRIAL ROBOTICS and FLEXIBLE ASSEMBLY

Instructor: Professor S.Y. Nof, Grissom 255, Tel.: 765-494-5427, nof@purdue.edu

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Prerequisites: Graduate student in engineering or Senior IE students.

Class: M, W, F 11:30-12:20 POTR 264

Texts: All optional, NOT REQUIRED

Optional: *Industrial Assembly*, Nof, Wilhelm, & Warnecke, Chapman & Hall, 1997

Optional: *Handbook of Industrial Robotics*, 2nd ed., Nof (Ed.), Wiley 1999

Optional: *Springer Handbook of Automation*, Nof, (Ed.), 2009

Lab handouts: Available on the class website.

Class Website: BlackBoard Vista

Course Objectives:

Industrial robots (as opposed to toy robots) have come a long way: Beyond manufacturing, transportation and construction, they are applied in healthcare, exploration, environmental protection and other field and service applications, with exciting and significant impact on industry and society. In this course we will learn how to design, select and operate intelligent robots and autonomous systems, and how to plan effective implementation and application of robotic automation.

The course topics:

1. Fundamental principles of robot Mechatronics;
2. Lab demos with robot and vision systems, from simple to intelligent;
3. IE methods/algorithms to plan robotic cells, lines, teams, swarms;
4. Robot simulators;
5. Robot cognition, interaction, intelligence, and social behavior;
6. Human-robot interaction; Humanoids, biologically-inspired, and evolutionary robots;
7. Robots & sustainability: Eco-robots; renewable energy-powered robots.

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Assignments and Grading:

- Homework and labs 35%;
- Mid-term (take Home) exam 30%;
- Class Project (as final exam) 35%. Individual project will be assigned early in the semester and can be research projects or lab-projects.

Labs:

1. Basic (Pick-and-Place) automation and off-line programming
2. Trajectory and motion planning; Mobile robot navigation
3. Robot simulators
4. Machine collaboration models; performance estimation methods
5. Complex motion under time and process constraints (ex. robotic welding; search-and-rescue)
6. Vision, monitoring and inspection; sensor integration