

# DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING

## INEN 455 - PRINCIPLES OF PROGRAMMABLE AUTOMATION

### Course Description:

Comprehensive treatment of the principles of computer numerical control, computer-aided part programming industrial robots, and logic control; emphasis on the operations and applications of CNC machine tools and industrial robots in modern manufacturing systems. Laboratory exercises using CAD/CAM software, table-top machine tools and robots, robotic programming languages, and PLC training units will be performed. Exposure to VR environments and VRML may be considered as the course evolves.

**Course Text:** Asfahl, C. R., *Robots and Manufacturing Automation*, 2<sup>nd</sup> Edition, John Wiley and Sons, New York, NY, 1992.

**Ref. Texts:** Groover, M. P., Weiss, M., Nagel, R. N., and Odrey, N. G., *Industrial Robotics*, McGraw-Hill, New York, NY, 1986.

Chang, T. C., Wysk, R. A., and Wang, H. P., *Computer-Aided Manufacturing*, Third Edition, Pearson-Prentice Hall, Upper Saddle River, NJ, 2005.

Groover, M.P., *Automation, Production Systems, and Computer-Integrated Manufacturing*, Prentice Hall, Upper Saddle River, NJ, 2001.

Ames, A.L., Nadeau, D.R., and Moreland, J.L., *VRML 2.0 SourceBook*, John Wiley, 1997.

Koren, Y., *Computer Control of Manufacturing Systems*, McGraw-Hill Book Co., New York, NY, 1983 (out of print).

**Helpful** CAD experience (e.g., AutoCAD)

**Background:** Knowledge of a high level programming language (e.g., C, Pascal, BASIC)  
Linear Algebra

<b>Course</b>	Introduction	(Chapter 1)
<b>Topics:</b>	Building Blocks for Automation	(Chapter 2)
	Numerical Control	(Chapter 5, Notes)
	NC Programming	(Notes, Lab)
	Industrial Robotics	(Chapters 6, 7)
	Industrial Logic Control Systems	(Chapters 11, 12)
	Programmable Logic Controllers	(Chapter 13)
	Other selected topics from reference texts – handouts to be provided as needed	

<b>Grading:</b>	Midterm	20%	Friday, March 9 (tentative)
	Final	25%	Monday, May 7, 10:30 – 12:30
	Homework/Labs	25%	
	Final Project	25%	
	Participation	5%	

**Exams:** You may bring one 8.5" × 11" page of handwritten notes to each exam (you can write on both sides). The specific format for the midterm will be determined later. The final exam will be comprehensive and will be held during the exam period specified

for the course by the University. As the course evolves, we may consider an optional and/or take-home final if the scope of the project (described below) becomes large and/or interesting.

**Project:** The course includes a comprehensive design project that will be done in groups of three or four. This project will involve the design and development of a product and the design of a programmable automation system to manufacture the product. Details of the project requirements will be provided and project groups will be set during the first or second scheduled lab session. An integral part of the project will be a 30 minute project presentation given at the end of the semester. Since the course is stacked with INEN 655, we will explore the possibility of pairing each team with a graduate student to work on a more comprehensive project.

**Homework:** Homework will be collected at the beginning of the class period at which the homework is due. Late homework will be penalized 10% per day for up to 3 days. Homework late more than three days will not be accepted.

**Copyright Notice:** The handouts used in this course are copyrighted. By "handouts," I mean all material generated for this class, which include but are not limited to syllabi, exams, lab problems, in-class materials, review sheets, web pages, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.

### **Americans with Disabilities Act (ADA) Policy Statement**

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Disability Services in Room B118 of Cain Hall or call 845-1637 or email [disability@tamu.edu](mailto:disability@tamu.edu) or visit <http://disability.tamu.edu>.

### **Aggie Honor Code**

*"An Aggie does not lie, cheat, or steal or tolerate those who do."*

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System.

**REPRESENTED BY:** Andy Banerjee

**DATE:** September, 2010