



IEM 4010/5990: Automation and RFID Applications in Manufacturing Systems: (Towards Improving Quality and Integrity Assurance) Schedule: 9:30-10:15 MWF 316 EN

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GOALS AND OBJECTIVES

This course provides hands-on experiences to introduce the basic elements of traditional industrial automation technologies with focus on the emerging disciplines of Radio Frequency Identification (RFID), related automated sensing technologies, as well as their applications to the various aspects of manufacturing systems. RFID is emerging as a viable technology for automating the identification of monitoring of objects, as an advancement over barcodes, in many manufacturing and other enterprise systems.

TEXT AND OTHER READING/INSTRUCTIONAL MATERIALS

Required: Course Packet
Supplementary: Finkenzeller, RFID Handbook, Wiley, 2003.
Article collection mostly from MIT's AutoID Labs

EXPECTED OUTCOMES

- Ability to outline the various elements of an automated manufacturing system
- Ability to outline the various components of an RFID system
- Ability to describe the impact of an RFID on Manufacturing, Defense, Distribution, Retail and Health Sectors
- Ability to describe the data management and interpretation challenges in RFID systems
- Ability to describe the methods to abstract ("filter") information in RFID and other sensor networks
- Ability to describe the future advances to the quality and integrity of Manufacturing and related sectors resulting from the use of RFID and other sensor technologies

COURSE EXECUTION

This course will consist of a series of lectures (from both the instructor and his peers in industry and academe) to build learning experiences in various aspects of RFID systems and their applications. The in-class learning will be augmented through student-led seminars that will present the various tasks accomplished as part of their assignments. The table summarizes the tentative syllabus for this course:

COURSE PROJECT

Field Study in a particular class of industry including: Defense, Homeland Security, Manufacturing Machines Operations, Supply Networks, and Energy Industries. **The objective is to understand and detail the** Current practices, Specific challenges, Recommendations on best practices, and Analysis to justify the recommendations. Possible opportunities exist for project teams to work with specific companies to conduct their studies.

GRADING SYSTEM

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|-----------------------------|
| 1. Homework and Lab: 15 % |
| 2. Quiz: 15% |
| 3. Mid-term: 20% |
| 4. Final Exam: 20% |
| 5. Project: 20% |
| 6. Class Participation: 10% |

Overall project grade will be derived from the performances in participation (10%), presentation (10%) and the report (80%). The report will be graded based on how well the objectives and the plan will be executed.

In order to ensure consistency in grading assignments and projects, performance in the assignments, presentations and projects will be consistently evaluated on a grading scale of 1-5 with the following equivalent translations:

5-Very Good: complete work devoid of any mistakes (Grade A)

4-Good: mistakes if any are minor and the work demonstrates the efforts of the student to learn (Grade A-/B+)

3-Average, mistakes are significant but the work demonstrates some effort to learn (Grade B/B-),

2-Fair, serious problems with efforts (Grade C)

1-Poor, highly incomplete and sloppy work (Grade F).

The final grade will be derived on a relative basis using a "curve." Natural clusters separate the grade categories.

POLICIES REGARDING ACADEMIC INTEGRITY

Definition and Guidelines on academic dishonesty and misconduct provided as part of Section 6.12 of the University Academic Regulations, as published in the Oklahoma State University Catalog, as well as Industrial Engineering & Management Policy on Work Product Prepared by Students as a Submission for a Grade will be strictly followed. All work submitted is to be your/your team's independent work. Both the receipt and the provider of dishonest aid will be considered as guilty. All work copied, paraphrased or modeled from any source other than YOU must be properly cited - failure to do so constitutes plagiarism. No students are to work together or share information on any assignment, in whole or in part, without explicit permission from the course instructor.

Tentative Topics (Duration)

I. Automation Technologies 2 Weeks

Elements of Automated Manufacturing Systems

Numerical Control

Traditional CAD/CAM systems

II. RFID Introduction 3 Weeks

What is RFID technology?

What are its applications and benefits to various industries?

What are the components of an RFID System?

How does an RFID System work?

MIDTERM 1

III. RFID Tags and Technical Principles 2-3 Weeks

About RFID tags, EPC and UID standards.

IV. RFID Systems 3-4 Weeks

Applications to Object and Asset Tracking.

Supply Networks

Retail Stores

Live Stock Tracking

Depot Inventory Tracking

V. RFID Sensors 3-5 Weeks

Application to Condition Monitoring

Machine Condition

Energy System Condition

Automobile Condition

MIDTERM 2

V. Middleware and Other Issues 1-2 Weeks

VII. Project Presentations and Course Closure 1 Week

* He conducts research on Sensor-based Modeling—which is a new approach based on augmenting statistical and intelligent systems foundations of traditional monitoring systems with nonlinear dynamic systems theory—for improving quality and integrity of manufacturing machines and processes, and other real-world complex systems. His recent research pursuits are available at <http://www.okstate.edu/ceat/iem/iepeople/bukkapatnam>.