Automated Manufacturing
IT 444
Spring 2007

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Course Credit: 3 Semester Hours

Prerequisite: I.T. 236, IT331 and a 200-level Computer Science

Class Location: Room 120, Anzalone Hall

Course Description:

> This course presents the industrial and engineering applications of robotics involving the use of robots and computer-integrated manufacturing systems. It is an overview of the electronic and mechanical construction of representative types of industrial, personal and educational robots. It is also a review of the economic feasibility and human considerations including safety in robotics applications.

Textbook: *Introduction to Robotics in CIM Systems*, by James A. Rehg, 1999, Prentice-Hall, Inc., Englewood, NJ.

Attendance Policy:

This is a lecture/lab class and your presence for the entire class is essential. Attending the lecture and leaving is ***not*** an ***acceptable*** alternative. The classes are 3 hour and 20 minutes long and you are expected to be present the entire time. You will be marked absent if not in full attendance, unless outside class assignments are made by the professor, or specific arrangements are made with the professor.

Lab Work:

You may not be able to complete all assigned work during the class time. We will plan other times during the semester on an as needed basis. It may be necessary that you use other labs in the department (ie Drafting rooms, CAD lab, wood shop, metal lab, etc.) to prepare for experiments and presentations. If that is the case the following guidelines must be followed to properly abide with department and university policies.

1. Obtain proper permission to go in the lab from the professor(s) in charge of the lab
2. Never disturb a class in progress
3. Have complete approved working drawings for specimen preparation

Course Objectives:

1. The student will demonstrate knowledge of the evolution of robotics.

2. The student will describe the advantages and disadvantages of automated systems.

3. The student will understand the electrical power, computers, and the auxiliary equipment needed to run computerized equipment.

4. The student will set up and program robotics equipment.

5. The student will demonstrate and apply knowledge of Robot Controlled Systems.

Course Outline:

General

1. History and evolution of Robotic systems and equipment
2. Control circuits
3. Mathematics of Movements
4. Codes and programs
5. Computer simulation of robotics operation
6. Specifications of different robots
7. Sensors
8. Programming
9. Computer Integrated Manufacturing

Specific

1. Group Project 1. Definition and Scope of Robotics. A history of Cybernetics, educational robots, personal robots, industrial robots, power systems for robots, types of industrial robots, robot programming software, computers, teach pendants, robot parts, degrees of freedom, electronic and mechanical components. Demonstrate knowledge of various systems used in robotics. This will require research on developments in the areas of hardware, software and communications/interfacing.

2. Individual Project 1. Begin research on a topic of your choice related to automated systems, or social and economic impact of automation. Develop a topic, abstract and list of

references.

3. Group Project 2. Demonstrate a classroom robot. Objectives is to become familiar with robot types; learning to use manuals.

4. Group Project 3. Build an operable automated system. Objective is to understand the electronic and mechanical components necessary for a robotics system to function within a particular operation, and use the software to operate the system.

5. Individual Project 2. Compile the research done for IP one into a term paper, and prepare a presentation using PowerPoint.

6. Group Project 4. Design and demonstrate a robotics cell using the robots and other related equipment assigned to your team or secured from other sources. The use of other equipment must be discussed with the instructor. Compile all the information into a manual that would serve as a guide for future cell designs.

Grades:

1. Grades will be assigned according with the departmental scale.

93-100 = A, Superior
85-92 = B, Very Good
77-84 = C, Average
69-76 = D, Below Average
0-68 = F, Failure

Note: Students **MUST** score a "C' or above in all courses within their major. Otherwise, they must repeat the course.

2. Basis for assigning grades:

a.) Tests (2)
200 Points

Note: All students are to take tests on the specified date and time. Students with unexcused absences will Not be able to make-up tests, quizzes and lab assignments! A grade of Zero (0) will be assigned!

b.) Projects
200 points

c.) Laboratory grade
100 points

Note: Ninety points of the lab grade will be awarded for the written laboratory assignments. Ten additional points will be awarded at the discretion of the instructor

for safe and efficient work habits, time management, the proper use of tools and equipment, and the ability of the student to work as an integral part of a team. If you have any problem with this grading system, please make an appointment to talk with me immediately!

d.) Article reviews
20 points

Important Dates and Notes:

1. Students will **NOT** automatically be dropped from class. Students who choose to drop must do so by the semester deadline! **Friday, March 16, 2007** is the last day to **withdraw** from classes.

2. The **Final Exam** for this class will be on **TBA!!!**

3. **Monday, March 19 –Thursday March 22, 2007** is **early registration** for the **Summer 2007** Semester. **Monday, April 2 –Thursday April 5, 2007** is **early registration** for the **Fall 2007** Semester.

4. If you are a qualified student with a disability seeking accommodations under the Americans with Disabilities Act, you are required to **self-identify** with the office of Disability Services, Room 203, Student Union. No accommodations will be granted without documentation from the Office of Disability Services.

5. Student behavior/Classroom decorum: "Free discussion, inquiry, and expression is encouraged in this class. Classroom behavior that interferes with either (a) the instructor's ability to conduct the class or (b) the ability of students to benefit from the instruction is not acceptable. Examples may include routinely entering class late or departing early; use of beepers, cellular telephones' or other electronic devices; repeatedly talking in class without being recognized; talking while others are speaking; or arguing in a way that is crossing the civility line." In the event of a situation where a student legitimately needs to carry a beeper/cellular telephone to class, prior notice and approval by the instructor is required." Otherwise,

   ALL BEEPERS, CELLULAR TELEPHONES' AND OTHER ELECTRONIC DEVICES ARE TO BE TURNED OFF BEFORE YOU ENTER THE CLASSROOM.

   Classroom behavior that is deemed inappropriate and cannot be resolved by the student and the faculty member may be referred to the Office of Judicial Affairs for administrative or disciplinary review as per the Code of Student Conduct which may be found at http;//WWW.SELU.EDU/Student Affairs/Handbook/.

6. Academic Integrity: Students should note that repercussions of academic integrity are discussed in the university catalogue. "Cheating on examinations, plagiarism, improper acknowledgment of sources in essays and the use of a single essay or paper in more than one course without permission are considered very serious offenses and shall be grounds for disciplinary action".

7. The students Southeastern Louisiana University e-mail address **MUST** be used for all e-mail communication between students and faculty/administration/staff. Students are encouraged to check their Southeastern e-mail frequently for important communications from the university.

8. University policy states that the lab is not a place for children. Students are not to bring their children to the lab.

Course Requirements:

Adherence to Departmental policies and procedures, a copy of which you were provided.

Regular and punctual class attendance. Students who have unexcused absences will receive the grade of zero ("0") for all tests, quizzes, and/or lab experiments missed.

Students must provide their own safety glasses or goggles. Glasses or goggles **MUST** meet standard Z87 to be considered "Safety" glasses or goggles. Only those glasses or goggles with Z87 clearly imprinted on them are acceptable. Also, they **MUST** be equipped with side shields, **MUST** be clear and untinted, and **MUST** be in good condition. All forms of eye protection **MUST** be inspected and approved by the instructor prior to their initial use in the lab.

Sandals or other forms of "open" footwear are **NOT** permitted in the Materials lab.

Students who are not properly attired or do not posess approved eye protection will **NOT** be allowed in the lab and will receive a grade of zero (0) for the days' activity. Students must realize that their safety and that of their classmates is most important!

Students are to complete lab assignments in a timely fashion. Students are to turn in the study questions of each lab experiment completed by the **beginning** of the next class period. Students are to begin and end labwork according to the class schedule. Students, who fail to utilize their time effectively, perform incomplete experiments, who begin their work late, who leave the lab early or who submit their experiments late will have their lab grade penalized.

Useful references for the course:

The students are encouraged to visit traditional libraries and online sources of information regularly. Many of the course assignments require such visits, but the visits should not be limited to completion of assignments. The following references are but a few, which may prove to be helpful in finding valuable Robotics/CNC information.

Bone, J. Opportunities in CAD/Cam Careers. NTC Publishing Group. October 1993

Jami J. Shah, Martti Mantyla. Parametric and Feature Based CAD/Cam: Concepts, Techniques, and Applications. Wiley, John & Sons, Incorporated. October 1995

Kunwoo, Lee. Principles of CAD/CAM/CAE Systems. Addison Wesley, Longman, Inc. January 1999

Mikell P. Groover, Emory W. Zimmers. CAD/Cam: Computer-Aided Design and Manufacturing. Prentice Hall PTR. February 1997

Soenen, R. and Olling, G. Advanced CAD/Cam Systems : State-of-the-Art and Future Trends in Feature Technology. Chapman & Hall. April 1995

Also the following online sources:

http://www.antenen.com/htdocs/frame.html

http://www.isa.org/

http://www.robotics.org/

http://www.fanucrobotics.com/

http://www.discover.com/feb_00/feat3dfax.html

http://www.manufacturing.net/

http://www.deskeng.com/articles/01/mar/cover/index.htm

http://www.caenet.com/res/archives/CAE-200105/feature1.html

Group one: HARDWARE COMPONENTS

Group two: SOFTWARE TYPES

Group three: COMMUNICATION/INTERFACING METHODS