Introduction to Educational Robotics

ECOMP 5018 (3 semester credits)

An elective choice for the Master's degree in Technology in Education

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Course Description:

ECOMP 5018 introduces the principles of robotics as a subject matter and as a concrete three-dimensional tool to be used in many educational environments.

Various types of robots are optimized to illustrate how these educational assistants can impact the learning environment and problem solving challenges for math, science, language arts, industrial arts, activities for special education students and events for the gifted and talented.

This course utilizes computers to work with remote infrared programming, which is linked to vision, sonar, tactile sensors, speech, pattern recognition, voice recognition and problem solving challenges.

Experiential Description:

ECOMP 5018 is for teachers who want an expanded awareness for the application of educational robotics, computer structures, curriculum development, and hardware applications. Students will analyze the educational framework that guides the use of this exciting technology.

ECOMP 5018 is designed to provide students the opportunity to discover, think, and analyze a variety of emerging technologies that may be integrated into curriculum to motivate, inspire, and challenge their own classroom students.

Course Objectives:

- To provide hands on experience associated with various educational robots.
- To identify and understand the main hardware components of robotic units.
- To consider and explore the impact of robotics for math, science, language arts, and industrial arts.
- To provide an understanding of the use of robots with special needs students and the gifted and talented.
- To consider strategies for integrating educational robotics into the classroom.
- To determine the current "point of need" for applying study units in robotics.

Billings, MT Sept / Oct 2003

Attendance: This is a three-semester hour class requiring the equivalence of 45 hours of class time to be completed by each student. Occasionally, extenuating circumstances such as severe illness or family emergencies may prevent you from being in class. Please notify me as soon as possible to arrange for the completion of any make-up assignments. The dynamics of the classroom learning process consist of much more than just a list of assignments.

Suggested Books for Reference

Visions, How Science Will Revolutionize the 21st Century, Michio Kaku.

Dr. Kaku is a Professor of Theoretical Physics at the City College of the City University of New York. This is a terrific source for those students interested in the future of computing, robotics, genetics, and space travel.

I, Robot, Issac Asimov.

In this collection, one of the great classics of science fiction, Asimov set out the principles of robot behavior that we know as the Three Laws of Robotics. Here are stories of robots gone mad, mind-reading robots, robots with a sense of humor, robot politicians, and robots who secretly run the world, all told with Asimov’s trademark dramatic blend of science fact and science fiction.

Opportunities in Robotic Careers, Jan Boone.

Robotics in Service, Joseph F. Engelberger.

Joseph Engelberger defines what the future holds for this new technology with updates on the technology of robotics, with emphasis on intelligence and sensory capability,

potential service application, medical treatment, education, fast food preparation, faming, hazardous tasks, household work, and aids for the elderly and disabled.

Required Materials for Both Weekends:

On the first weekend you will be building a robot kit as part of the midterm project. The robot kits range from $26.00-$80.00. You will have your choice of kit to build depending on your comfort level. These are wholesale prices. I will collect that separate robot kit fee on the first weekend. Your checks should be made out to The ROBOT STORE in Milwaukee, WI.

You should bring to class on the first SATURDAY:

1. six AA size batteries
2. two nine volt batteries
3. one empty egg carton (which can hold kit parts (optional)

You should bring to class on the first SUNDAY (and second weekend):

1. one small "Phillips" screwdriver
2. one small "bladed" screwdriver
3. one small or medium size pair of pliers
4. one needle-nose type pair of pliers
5. one set of tweezers
6. one small magnifying glass (optional)
7. one small knife or modeling razor blade (for trimming plastic parts; you may also use a small wire cutter for this task)
8. six empty aluminum cans (soft drink only, cleaned with hot water and soap; you get these back) or six empty plastic soda/water bottles cleaned
9. patience and an open mind
10. sense of humor is required on Sunday

You should bring the following to class on the second FRIDAY:

1. one black magic marker
2. pair of scissors (any size)
3. two new nine volt batteries
4. six new AA size batteries
5. eight feet of poster paper – light colors or white work best

Projects and Assignments: **Work turned in late will be penalized**

Midterm Projects (in order due)

1. First SUNDAY: successfully build the in-class robotics kit…… it needs to run correctly to receive full credit (100 points)

2. Second FRIDAY: Web resource collection – (this will be approx. 3 pages when completed). Compile a collection of 15 useful websites on ROBOTICS. Sites should be chosen with your students in mind. The sites should be useful to have students work with, or to help you integrate the concepts of robotics into your curriculum. You will identify the site and compose a short paragraph description of each site. It must be 15 different sites, not multiple sections of the same site.

3. Second FRIDAY: Reaction Papers (three total, no longer than 2 pages for each paper) Research emerging technologies to find three separate articles that you find interesting and worthwhile. Write a one to two page reaction paper, NOT SUMMARY to each article. Take time to find an appropriate article. It should be an article that shows breadth of the topic. It should relate who is developing the technology, why it is being studied / investigated/ developed, and, how this will affect society in the future.

4. Second SUNDAY: Final project proposal. One page description of your final project and how it relates to your classroom.

Final Project Ideas (Choose One)

Build a large bulletin board at your school, illustrating many aspects of educational and industrial robotics. You could present photos, artwork pieces, pictures, stories, etc. Send me a series of photos via US Mail or email the montage to me with a three-page description of its development and how you utilized it in your classroom.

Develop a curriculum unit merging robotics into your grade level, classroom, department, enrichment, building, or district. (Minimum 3 lessons)

Write a prototype grant to a private funding agency, stating objectives, program activities, educational criteria, etc. This could someday turn into the real thing! The grant paper should be somewhere around four to six pages following the criteria of grant writing you developed in your Impact on Society course.

Build a second robotic kit (Advanced Level). Bring it to class on the final weekend; design a study center for your students to use the robot (and our class) on the second weekend. Write up a lesson plan and reflection on the robot study center in your class.

Build a robot from scratch. Investigate simple robotics (like the EZ 3 Axis Robotic Arm Project). Build the robot, develop a lesson plan incorporating it into your classroom curriculum and write a 2-3 page reflection on the building process and integration event.

Build a History Of Robotics study center for enrichment in your classroom. It should be a series of activities in which students can discover the history of robotics, obtain basic robotics vocabulary, discover applications for robotics in home, school, and industrial settings.

Build a programming manual for the Mindstorms Robotics Invention kit. Study the programming at length and put together a 5 + page manual for making the robotic creations behave. Please include multiple configurations for one motor, two motor, sensor programming basics. This should be a step-by-step, clear, creative paper.

Read the book Visions, I, Robot, Digital Biology. Write a three-page reflection on the major concepts and ideas of the futurists who push the envelope.

Borrow and implement three or more original lessons utilizing the Mindstorms Robotics Invention Kit in your classroom. Write up the lessons and a brief reflection on the experience with your students. Include some of your students' reactions to the Mindstorm experience. Have the students evaluate their experimentation with the Mindstorm kit.

Design a final project not on this list. It should reflect graduate level work. Write up the proposal description and outline. Submit it to me on the second SATURDAY for approval.

University Policies:

Students who find it impossible to complete the course requirements by the final due date may request and incomplete grade. To do this, you must notify your instructor, in writing, prior to the end of the second weekend class meeting and define your need for a grade of incomplete.

Depending on the circumstances, late projects may be dropped one grade level. For example, an A may be lowered to a B+, B or B-. Depending on their ability to meet coursework expectations. Grade levels are lowered at one-half steps.

Incomplete grades must be taken care of no later than the end of the semester immediately following the current semester.

Your instructor will not chase you down. You need to take care of proper submission of all late work. It is your responsibility to meet the final cut off, especially in the case of an incomplete grade request.

Special Needs for Inclusion:

Lesley University is committed to ensuring the full participation of all students in its programs. Accordingly, if a student has a documented disability, and, as a result needs a reasonable accommodation to attend, participate, or complete course requirements, then he or she should inform the instructor at the beginning of the course. For further information about services through Lesley University for students with disabilities, please contact the following Student Affairs office:

Manju Banerjee, Coordinator of Disability Services

800.999.1959, x8194

banerjee@mail.lesley.edu <mailto:banerjee@mail.lesley.edu>

These guidelines are presented in the Lesley University Graduate School Student Handbook.