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New IEEE AP-S Education Web Site: Course/Lab Notes, Scholarships, K-12 Outreach

http://www.ece.utah.edu/~cfurse/APS/course.htm

Greetings from the Snowy West! This month I am pleased to announce a new effort on the part of the IEEE Antennas and Propagation Society Education Committee to collect course and laboratory links relevant to the AP-S community, and compile them in a central location where they can be easily accessed.

On Line Course/Lab Materials
www.ece.utah.edu/~cfurse/APS/course.htm

The next time you are preparing a new course or lab, upgrading an existing course, or just wondering what other people are teaching and how they are teaching it, check out the IEEE AP-S Web site. Links to materials from courses of interest to AP-S members around the country and world are being compiled. If you have online course materials that could be linked for access by other AP-S members, please e-mail the link to cfurse@ece.utah.edu.

This month, 18 introductory electromagnetics courses have been linked to the Web site. Additional course materials are being compiled for EM-type laboratories, and courses on EMC, antennas, microwave engineering, computational electromagnetics, wireless communication, and senior design. Any additional suggestions are welcome. Courses that are taught online for a fee are also welcome, but please make a note of this when you submit the link.

K-12 Outreach
http://www.ece.utah.edu/~cfurse/K12.html

The next time you are asked to visit a middle or high-school Career Day, your kids' kindergarten teacher convinces the class that radios are simply magic, or you just want to help share some of the excitement that got you into engineering in the first place, check out the K-12 links on the AP-S Education Web Site. There are numerous hands-on science projects related to electrical engineering and a host of other things, too. "Jell-O Optics" is one of my favorites. Using double-strength clear gelatin (from the grocery store), cut into convex and concave lenses, and two laser pointers, you can demonstrate refraction and reflection (and calculate the index of refraction, if you want to get that precise), can see how near- and far-sighted vision causes the focal point to be in the wrong place, and how corrective lenses can solve the problem. You can also demonstrate how a fiber-optic cable works, and the concept of total internal reflection. And all of this works for a sixth-grade class (just have lots of Jell-O and laser pointers).

This month's tutorial article describes an extensive outreach project, exposing high-school girls to engineering through the Lego Mindstorm® Robotics Kits and a good dose of creativity.

IEEE AP-S Undergraduate Research Awards
www.ece.utah.edu/~cfurse/APS/scholarship ad 2003-4.pdf

Each year, undergraduate research applications are sought in November and April. The advertisement is permanently linked to the Web site. Please have your students apply for these $1000 scholarships, available internationally.

Tutorials
http://www.ece.utah.edu/~cfurse/Tutorials/tutorialsUofU.htm

Several tutorials of interest to EM students are linked on this site. These include how to use Agilent's Advanced Design System (ADS)™ software for basic microstrip circuit and antenna design, Remcom's *XFDTD*™, and *MATLAB*™. Additional tutorial links from professors or vendors are welcome. Please send them to cfurse@ece.utah.edu.

Teaching Resources, Hardware and Software Links, and More

In time, this Web site will include a variety of teaching resources, and links to EM demonstration software, labs, and hardware demonstrations suitable for use in EM courses. Watch for upcoming additions!

Robots and Girls

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Despite the efforts of the education community to encourage girls to pursue math, science, and engineering careers, age-old prejudices like "girls don't have the ability or interest to do technical work" persist. Our personal experience has been that girls often tell teachers in both high school and college that they are not going to study engineering because they would rather go in to a field that "helps people." Obviously, engineering helps society in many ways, but we felt that it was important to provide an experience that would drive home the point that engineering has a human side as well as a technical side. We chose Lego Mindstorm® Robots to introduce engineering concepts to a high-school physics curriculum at an all-girls' school to see if we could interest more girls in studying engineering. Besides overcoming prejudices, other objectives were to apply physics concepts, introduce design skills, teamwork, and engineering concepts.

The project lasted about four weeks. The equipment and framework for the program was provided by the Wireless Integrated Micro Systems (WIMS) Research Center at the University of Michigan. None of the girls in the two physics sections had any experience with Legos, and only a few had building or "fixing" experience. The projects centered on the theme that WIMS devices improve people's lives and, in this case, would introduce the girls to the basic elements used in these small devices. The cochlear implant was picked as the device around which the projects were loosely based because most of the girls seemed particularly interested in biological applications, and because the cochlear implant helps individual people.

The course consisted of several sections, as follows:

1. Graduate students from the University of Michigan gave presentations about their research on cochlear implants, which provided a connection other than the teacher.

2. The girls then studied circuits using prepackaged kits by Gibson Technologies® that use solder-less boards, which gave an understanding of the basic electronics behind WIMS (Figure 1).

3. The girls experimented with motors and sensors provided in the Mindstorm kits, which, like WIMS devices, have sensors and actuators (motors).

4. The girls then built a variety of simple robots using directions from Lego that reinforced their sense of "I can" about engineering/technological activities.

5. The girls' final challenge was to build a robot that simulated at least one human movement, to tie in the overall theme that engineering is a field that helps people on a personal level (Figure 2).

6. Each team wrote a *PowerPoint* presentation that described the steps they took to build their robot, to emphasize the need for communication.

7. The capstone experience was to visit the clean rooms at the University of Michigan, where they went through several of the steps that are used to make WIMS devices, in this case, a vibration sensor. They were asked to write a short paper about what they learned at that time, an alternative evaluation activity to a test.

The girls initially were very intrigued by the cochlear implant. The researchers explained the physiology of hearing loss, as well as the engineering portions of the devices used to restore

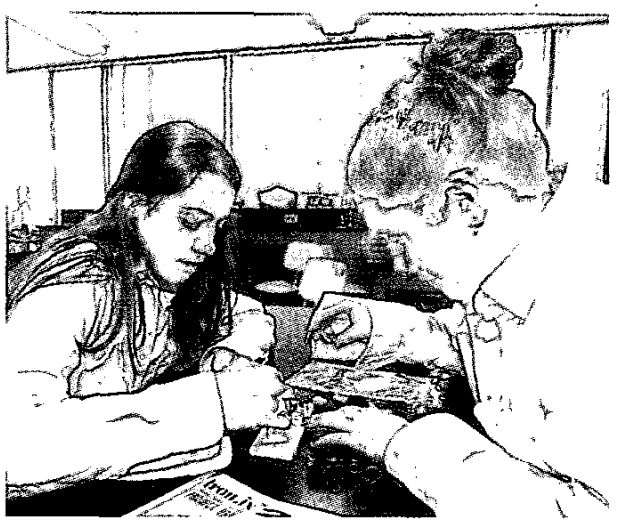

Figure 1