Using the Internet as a Course Textbook

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Abstract

This paper describes the creation and use of an online textbook for a course in Electronics Manufacturing. This project originated when no appropriate textbook could be found in print for EET 360: CIMT in Electronics Manufacturing. Creating an online textbook in this area was possible because of the plethora of information available on the web about electronics manufacturing. Trade magazines and vendors provide a wide variety of up-to-date and in depth information, all presented in easily accessible formats. Another advantage is that students received current, up-to-date information; no printed text could stay as current. In addition to receiving the necessary information for the course, students gained life-long learning skills.

The authors created the course text by constructing web pages for each lecture using OnCourse, an Internet development platform. Each lesson page included objectives, course notes, a list of resources and hyperlinks to required and supplemental readings, and questions or other assignments. Using this format, the faculty could focus the students on the key issues and direct students to web sites that were credible. Students were able to submit most assignments electronically.

Although this course still required class meetings for laboratory experiences, some laboratory simulation tools are also available over the Internet or available for download. In the future, methods can be implemented to make this course accessible to distance learners.

Introduction

EET 360: CIMT in Electronics Manufacturing is a junior/senior elective designed to give students a broad understanding of the processes involved in producing electronic circuit boards and electronics assemblies. Lectures begin with component fabrication and selection, electronic design and analysis, and printed circuit board fabrication. Through-hole and surface mount technology assembly are studied. Students are required to write a series of short papers on material covered in class. In the laboratory, students tour facilities involved in electronics manufacturing, and learn to use various pieces of manufacturing equipment. There are three semester team projects: a circuit board layout, complete with bill of materials; a production line specification, in which students select equipment for a SMT line and present their line to industry representatives; and an actual build, when a local manufacturer opens its floor to the class to run the equipment and produce product.

There was no text book available for this class, although many handbooks and periodicals did exist. Students were frustrated when their only reference material was the lecture notes. The authors compiled a selection of articles and distributed it to students in the form of course notes, but the compilation lacked the clear step-by-step focus of text books. Handbooks designed for industry use do a good job covering all the material, but were found to assume a level of knowledge of the industry that students didn't have. Printed matter, although useful, could not keep up with the rapidly changing industry. The goal was to create a resource for students to help them learn to research topics on their own, while supplying a direction and focus to avoid getting lost on the Internet.

OnCourse

Oncourse is a password protected framework for classroom activity to occur over the web. The software requires no knowledge of HTML or web publishing and is user friendly for students and faculty. Course space is automatically created and can be filled with content, syllabus information, tutorials, and links. Tools are provided to distribute, accept and grade assignments, and conduct tests and surveys with a variety of question types. Oncourse contains chat rooms and bulletin boards that students can use to communicate with each other. Participants have the

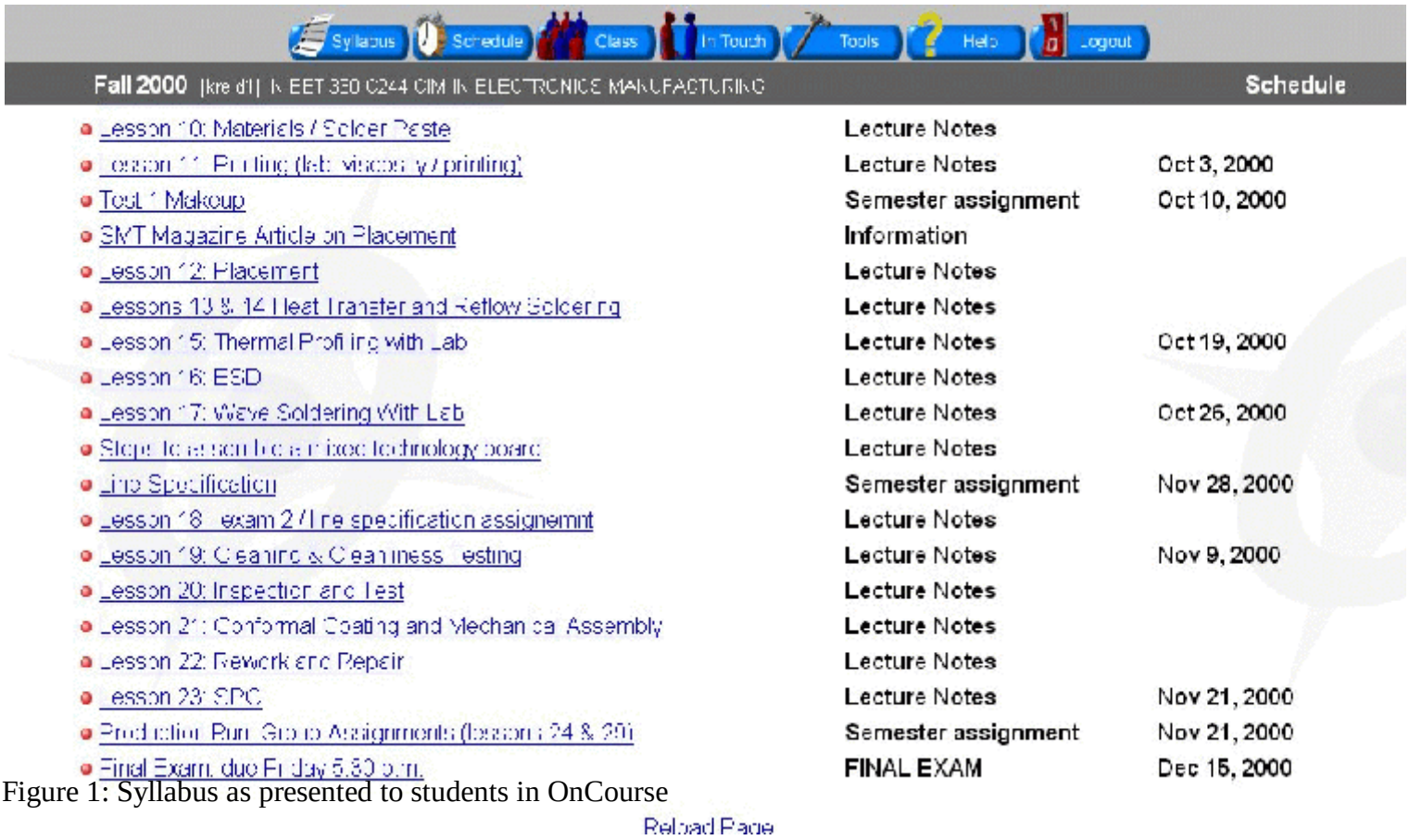

Figure 1: Syllabus as presented to students in OnCourse

ability to post information onto the web using Oncourse and can store bookmarks and files within the program.
The most important tool used for this project was the "Schedule." (See Figure 1.) This allowed content to be presented in a sequential manner. Items could include text, HTML, and attachments, or could link to another web page. The instructors used the schedule to post lecture notes, assignments, and class meeting information. Students recognized it as the central depository for all course information.

On-line Text Description

The 'text' for EET 360 consisted of one main web page per lecture. The use of OnCourse allowed a setup where a student could select "Schedule" and view a main textbook page (similar to a Table of Contents), from which s/he could select a desired lecture or lab topic (Figure 1). The layout of each page included (see Figure 2):

Objectives:

A list of specific student requirements for each lecture.

Notes:

Links to Power Point slides (when available), outlines of lecture notes, and/or images from overheads or slides. Outlines were sometimes supplied rather than complete slide presentations to prevent hundreds of pages from being printed unnecessarily.

Resources:

Links to periodical articles, industry organizations, manufacturers that related to the lecture/lab topic.

Assignment:

Any lab or homework assignments were listed here. The due date would display on the main textbook page next to the link to the topic (see figure 1).

References:

List of references that the instructors used to assemble the notes.

Inside OnCourse, links to the World Wide Web allowed for informational pages, such as maps & directions to offsite labs and tours, links to periodicals and organizations, images, and programs (shareware) which could be downloaded by the students.

The main advantage to this structure was that the instructors could present the information they felt was most relevant while requiring the students to develop or improve skills of seeking information required in lifelong learning. Students were presented with clear objectives by which to measures their knowledge of the material and with which to focus their reading.

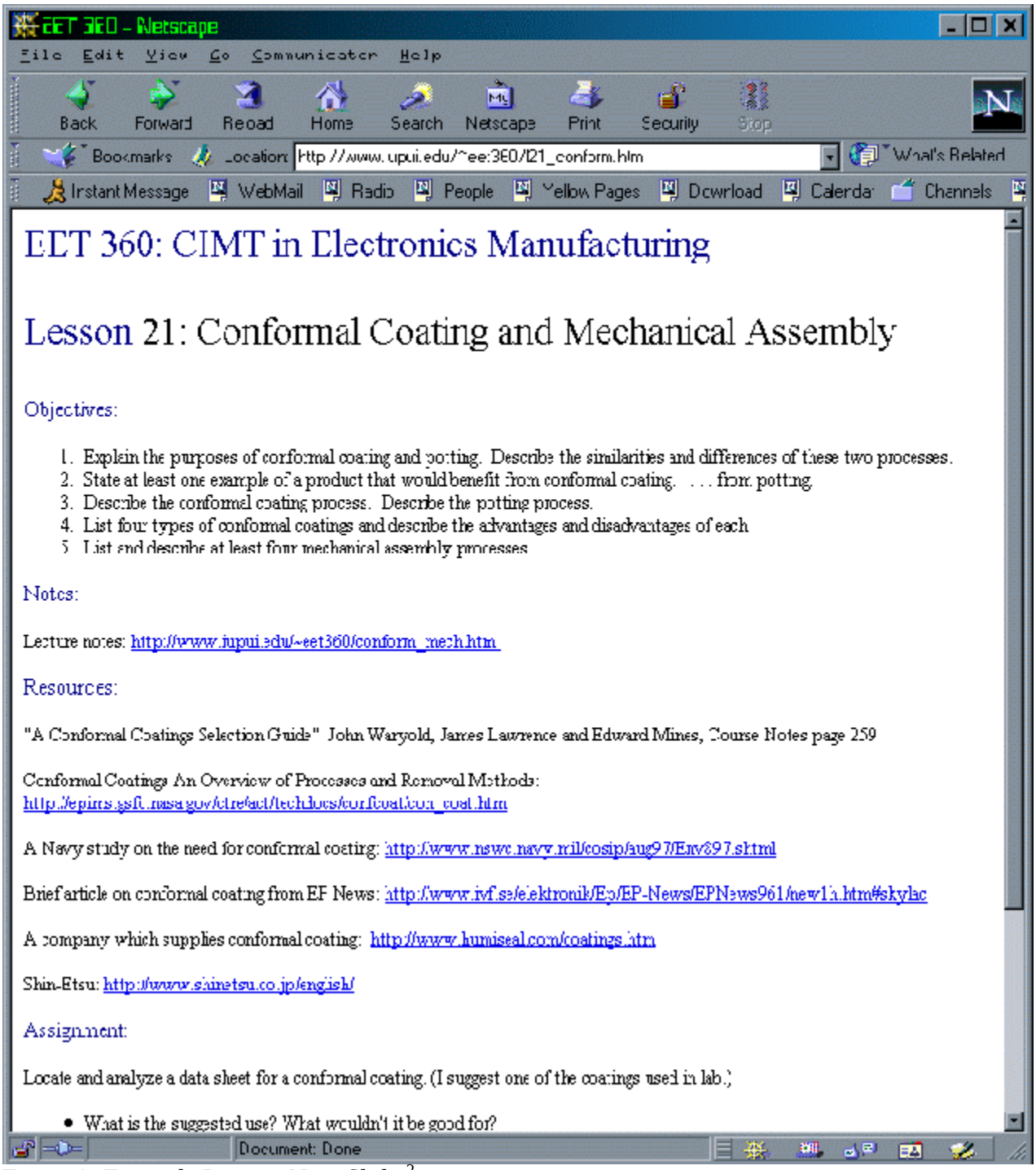

Figure 2: Example Lecture Note Slide [2]

Material presented in the lecture was reviewed, highlighting key points. The "Resources" section supplied one portal to link or locate recommended reading material. And since the text was "electronic," the latest breaking industry news could be included in the course material.

The main disadvantage was the amount of time required to maintain this site. Not only did the instructors have to prepare lecture notes, but then they had to be prepared for the Web. Notes that were adequate for the instructor to lecture from had to be augmented so others could read them and understand the main points. Graphics that took a minute to draw on the board would take an hour to create for publishing. Searching for the sites with quality, relevant material sometimes seduced the instructors to get lost in the Internet. Known sites had to be verified, changes in URLs and content monitored, and links corrected. For the most part, these disadvantages are the same for any course significantly utilizing the Internet.

Conclusions

Students who used the on-line text typically did better on exams than those who relied solely on lecture notes. Though this is no surprise, it does demonstrate that the students did not waste the time spent viewing the lecture pages. However, not much paper was saved: students would print out every lecture page, slide and article to carry around and use the same way as a printed text. It appears students are still more comfortable with the traditional paper text. Perhaps this will change as more students get more powerful, portable computers.

Overall, on-line texts could be the direction of textbooks in the future. Whether or not the Internet can replace printed texts remains to be seen; however, the Internet offers a tremendous opportunity to present supplemental material in a very organized way - much improved over large piles of paper handouts.

The demand for a course specifically in Electronics Manufacturing is driving the development of this course into a totally online course. Industry would like courses such as this, however, business is such that it is difficult for employees to leave the workplace and visit campus, and it can be difficult to design and present courses off campus. While there are still hills to climb (such as hands-on laboratory experiences), the creation of an online text is a big step in this direction.

Bibliography

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