

Using the World Wide Web to Support Teaching in Manufacturing Engineering Technology

Henry W. Kraebber

Purdue University, Mechanical Engineering Technology

Abstract: The Internet is a modern wonder of the computer age. The number of people using the Internet is doubling every few months. The growth is remarkable, unlike anything seen before in the computer age. It has tremendous power to provide students with a wealth of information and communications opportunities. The question for engineering educators seems to be one of how to harness the power of the Internet, not whether it should be used or not.

This paper presents the story of how the Internet has been used to support a series of courses in the Computer Integrated Manufacturing Technology program at Purdue University. It is a story of the implementation of the basics. The work involved is not complicated and does not involve an extraordinary commitment of faculty time. The use of the Internet and the World Wide Web can become somewhat obsessive. It is an exciting and fun technology that has unlimited possibilities where actions on one page can easily lead to the creation or revision of several others. This paper presents a simple "no frills" approach to using the Internet to enhance teaching. Emphasis is placed on the use of electronic mail and the use of course pages on the World Wide Web.

The students in the School of Technology have a fairly high level of computer literacy. Most of the students have access to a computer where they live as well as during class and lab time on campus. Computers in most of the campus computer labs allow students to make a direct connection to the Internet. Students in the residence hall system at Purdue have the ability to make a direct connection to the campus backbone of the Purdue University Computing Center. The majority of students in the CIMT program are users of e-mail and the World Wide Web. Within the first 14 days of the start of the fall semester nearly 75 % of the students in an introductory course on CIM Technology had e-mail addresses. 90% of the students in an upper division undergraduate course reported that they use e-mail regularly.

The use of electronic mail as a tool in CIMT classes is increasing. The primary uses of e-mail in CIMT classes include the following:

- "One-on-one" communication between the instructor and a student.
- Sending information and assignments to an entire class through an instructor maintained distribution list.
- Submission of completed assignments to the instructor's account.

- Use of e-mail "listserv" utilities created for students, faculty and graduates of the CIMT program.
- Subscriptions to other "listservs" related to manufacturing (such as MFG-INFO from Michigan State University).

Student response to the growing use of e-mail has been very positive. 97% of the students I work with in undergraduate and graduate courses reported that they liked sending and receiving messages with the instructor. E-mail communication saves the students and faculty time. Problems related to inconvenient office hours and "telephone tag" have been greatly reduced.

The use of instructor developed "course pages" on the available on the World Wide Web has been a new development during the fall semester of 1997. The growing list of new web based course documents includes:

- A syllabus "home page" for each course.
- A posting of the latest version of the daily course plan.
- Creation of a "links to other sites" serving several courses with information about the companies that support the CIMT program and laboratories.
- Linking to files containing weekly editions of course handouts, assignments and lecture notes.
- Posting of the current grade spreadsheet.
- Posting of additional information, papers and pictures that supplement the content of the lectures and labs.

The procedures used to create "no frills" web pages and links to other files are not difficult to copy. My first pages were in fact copies of another instructor's source code in hypertext markup language (.html) for a page with titles, pictures, text and links to other sites. A sample of the .html code and the simple page it produces can be found in figures 1 and 2 at the end of this paper. New web pages can be developed quickly by using the source code from an existing page as a template. New text and links can be added as needed to build the new page. The template code provides the "program" base and format for the page. The instructor provides the course specific information to plug into the template. Much of the actual materials may already exist in other documents and files. The template approach makes web page creation easy. Text from an existing course documents can be quickly copied into a web page template. A course specific web page can be created with just a few minor changes to call out different pictures and adjust the links to desired pages. Page development can be completed and tested off-line at the instructor's workstation. The new page is then ready to post to the web server.

During a two-day period at the start of the semester I was able to complete my annual syllabus revision and the generation of web page programs for three classes and three other page projects. The pages created are not fancy, but they have proven throughout the semester to be very functional. Additional links have been added which allow visitors to the site to open documents prepared for class and lab sessions using Microsoft Windows or Excel. Linking weekly course notes and assignments to a course page can be done in less than five minutes. The maintenance of the course page programs takes less than 30 minutes per week.

Saving the .html and other related files is not as easy as it could be! The School of Technology made a commitment to upgrade software throughout the school to Microsoft's Office97 during the fall of 1997. This powerful suite of programs for office applications provides many great new features. The new features that make it easier to work with the World Wide Web. Older versions of Word can not, however, open documents saved using the latest Office97 version. Keeping track of the files and making sure all "saves" are done in an older version is not hard, but it does require attention! It is easy to forget to make the save to an older version, and post files that people with software versions older than the Office97 software can not open. This software version problem may never really go away, and must be managed.

The actual programming work with the "html" tags is minimal. The basic tag commands in "html" to create paragraphs, underline text, create bold type and create lists for my links to other sites can be learned easily. My network administrator helped me get the authorization needed to place web page documents in the public directory of the server used by my department. I can do all the needed file transfers to add and maintain web pages on the server from the computer in my office. Changes, updates, enhancements and additions to existing pages can be made quickly and easily.

The new generation of software in the Microsoft Office97 suite of programs provides for the saving of files as .html as a menu option. The "save as html" option automatically generates the codes it needs to produce a file with the .html ending. I have not found that the .html program always produced output in the form that I wanted, but it often provides a good starting point for customization. It is fairly easy to add a few html tags to generated source code to make the output right.

Web page creation can become an obsession. The html code and new web page creation tools provide many program features that can be use to improve the look of the completed page. Look around on the web and you will see many examples of page styles, formats, backgrounds and features that can "jazz up" your site. I encourage new web users to start out with something simple, then make additions that will make it fancy. The content of the page is really much more important than all the flashy graphics. The following URL will take you to my current "Course Page": <http://www.tech.purdue.edu/cimt/facstaff/hwkraebber/personal/courses.htm>

During the fall semester I surveyed the students in two classes with new web pages to try to assess the value they found in them. The student response to the use of the web and e-mail as teaching tools in my classes was very positive! The results are summarized in Table 1 on the following page.

The Internet proved to be a valuable asset to the students and the instructor. E-mail helped open communications between the students and the instructor. Connections to the World Wide Web, such as the ones found at the URL listed above, provided students access to a number of great sites that provided current information on products and systems supporting CIM. The combination of e-mail and the Internet allowed the class to "see" more and do more. Many industrial and technological leaders provide outstanding information and resources on their corporate web pages. Students had fun using the technology as a tool of this class. It saved

students time. It gave the instructor additional contact opportunities throughout the semester that would not have been possible any other way. These tools are not a cure all for problems, but the student response to this “first try” of integrating the use of the Internet into a course did get a good overall response.

Table 1: Results of Student Surveys

	Undergrad	Grad	Comb
The use of the WWW and e-mail are a positive addition	100.0%	100.0%	100.0%
Find course specific material on web helpful	95.2%	56.3%	78.4%
Found relevant and interesting info about CIM on the web	57.1%	93.8%	73.0%
Think this is an important addition to traditional class handouts	100.0%	75.0%	89.2%
Check course web site weekly	71.4%	25.0%	51.4%
Usually print copies of posted lecture notes	85.7%	6.3%	51.4%

The benefits to the students and the instructor do not come free. There was a start-up cost related to learning how to make it work, and associated ongoing maintenance time required from the instructor. Once past the start-up period the additional time required for maintenance of the web pages did not seem like much of a burden.

Instructors should be encouraged to give it a try. There are no hard and fast rules to go by, but keep the following suggestions in mind. Keep the page design simple in the beginning. Follow the “KISS principle.” Work from a “standard template” that provides a basic framework that meets your needs. Take your systems support people to lunch and get them to help you! Work with other faculty to team up on the web development activities. (Two heads are often better than one when planning and implementing a new page.) Don’t get frustrated and give up. Recognize that you may be at the bottom of a steep learning curve. I think you will find the benefits are well worth the effort required.

HENRY W. KRAEBBER has fifteen years of experience and leadership in manufacturing operations, engineering, quality and management. He is now an Associate Professor and teaches courses in manufacturing operations, manufacturing quality control and integrated systems which support the degree program in Computer Integrated Manufacturing Technology. BSIE from Purdue University. MS Engr. from Iowa State University.

Figure 1: Listing of HTML code for a simple course page.

```
<!DOCTYPE HTML PUBLIC>
<html>
<head>
<title>Prof. Henry Kraebber's Courses</title>
<meta name="author" content="Henry Kraebber">
<meta name="description" content="course index">
<meta name="keywords" content="CIM, manufacturing, MRP, systems">
</head>

<body>
<h1>Courses and Class Links </h1>
<p><b>Henry W. Kraebber, PE, CPIM</b> </p>
<p>Mechanical Engineering Technology Purdue University - Knoy Hall of Technology West
Lafayette, Indiana 47907 765-494-5039</p>
<p><b>e-mail: hwkraebber@tech.purdue.edu </b></p>

<p></p>
<p>Henry Kraebber at the wheel of the VIPER Indy Pace Car! Taken at the Chrysler Viper
Assembly Plant in April 1997. </p>

<hr align="center">
<h3 align="center">Links to course information and "manufacturing" sites of
interest... </h3>
<ul>
<li><a href="http://www.tech.purdue.edu/cimt/staff/hwkraebber/lab-poly.htm">CIMT Lab
Policies for Students</a> </li>
<li><a href="http://www.tech.purdue.edu/cimt/courses/cimt100">CIMT 100</a> </li>
<li><a href="http://www.tech.purdue.edu/cimt/courses/cimt246">CIMT 246</a> </li>
<li><a href="http://www.tech.purdue.edu/cimt/courses/cimt400">CIMT 400</a> </li>
<li><a href="http://www.tech.purdue.edu/cimt/facstaff/hwkraebber/personal/tech-581.htm">TECH 581C</a>
</li>
<li><a href="http://www.tech.purdue.edu/cimt/">CIM Technology Homepage</a> </li>
<li><a href="http://www.apics.org/">APICS - Online with APICS </a></li>
<li><a href="http://www.lionhrtpub.com/">APICS - Lionheart Publishing for The Education
Society for Resource Management </a></li>
<li><a href="http://www.tech.purdue.edu/cimt/staff/hwkraebber/wabash.htm">APICS Wabash
Valley/Purdue Chapters</a> </li>
<li><a href="http://www.winman.com/">TTW - Developers of the WinMan ERP System used in the
School of Technology </a></li>
<li><a href="http://www.tech.purdue.edu/cimt/staff/hwkraebber/index.html">Prof. Kraebber's
Homepage</a> <hr>
</li>
<li><a href="http://www.rockwell.com/">Rockwell Automation and "Allen-Bradley"</a>
</li>
<li><a href="http://www.adept.com/Index.html">Adept Technologies Homepage</a> </li>
<li><a href="http://www.atlantic.net/~candyman/links/computing/autocad.htm">Links to AutoCAD
and Cadkey Homepages</a> </li>
<li><a href="http://www.iams.org">Institute of Advanced Manufacturing Sciences - MetCAPP and
CutDATA</a> </li>
<li><a href="http://www.mastercam.com">Mastercam by CNC Software, Inc.</a> </li>
<li><a href="http://www.sandvik.com">Sandvik Corporation - Tooling for machine tools</a> </li>
<li><a href="http://www.milacron.com">Cincinnati Milacron Corporation</a> </li>
<li><a href="http://www.bpt.com/default.htm">Bridgeport Machines, Inc.</a> </li>
</ul>

<hr align="center">
<i>
<p align="center">Created by Henry Kraebber. Last update: November 24, 1997.</p>
</i>
</body>
</html>
```

Figure 2: Basic Course Page generated from the source code shown in figure 1.

Courses and Class Links

Henry W. Kraebber, PE, CPIM

Mechanical Engineering Technology Purdue University - Knoy Hall of Technology West Lafayette,
Indiana 47907 765-494-5039

e-mail: hwkraebber@tech.purdue.edu



Henry Kraebber at the wheel of the VIPER Indy Pace Car! Taken at the Chrysler Viper Assembly Plant in April 1997.

Links to course information and "manufacturing" sites of interest...

- [CIMT Lab Policies for Students](#)
- [CIMT 100](#)
- [CIMT 246](#)
- [CIMT 400](#)
- [TECH 581C](#)
- [CIM Technology Homepage](#)
- [APICS - Online with APICS](#)
- [APICS - Lionheart Publishing for The Education Society for Resource Management](#)
- [APICS Wabash Valley/Purdue Chapters](#)
- [TTW - Developers of the WinMan ERP System used in the School of Technology](#)
- [Prof. Kraebber's Homepage](#)
- [Rockwell Automation and "Allen-Bradley"](#)
- [Adept Technologies Homepage](#)
- [Links to AutoCAD and Cadkey Homepages](#)
- [Institute of Advanced Manufacturing Sciences - MetCAPP and CutDATA](#)
- [Mastercam by CNC Software, Inc.](#)
- [Sandvik Corporation - Tooling for machine tools](#)
- [Cincinnati Milacron Corporation](#)
- [Bridgeport Machines, Inc.](#)

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