Introducing Freshmen to Manufacturing Engineering Technology and the University

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Abstract: New students in engineering and technology may not understand what the academic program they have entered is really about. Students often get started in a program and find after a semester or two that it is not right for them. Too often students are forced to stay an extra year or more because of changes in their degree objectives and have a significant loss of credits. Students can easily get lost on a big university campus and become frustrated. Some students leave the university because they just never felt like they fit in. The transition to life on campus and the rigors of higher level academics is not always easy.

This paper presents a review of a new introductory course required for students entering the Computer Integrated Manufacturing Technology (CIMT) program at Purdue University. This one credit course (meeting once a week throughout the semester) has been designed to help prepare students for the academic life ahead of them. Students are presented with a variety of different views of the CIMT major, the current trends in industry, and to some of the resources and activities available to them while they are here on campus. Class meetings provide an in-depth look at what Computer Integrated Manufacturing is all about and what will be coming as the students' progress. Some examples are:

- How CIM can address many of the problems of manufacturing companies.
- A look ahead at the plan of study for the next four years.
- Introductions to the faculty, administrators and courses that make up the program.
- Visits to various sites on campus.
- Presentations about the CIM related student organizations and support services on campus.
- A look at some of the history and customs of the Purdue campus.

The course helps students get to know each other and start off with a better understanding of the challenges and opportunities which lie ahead.

Background: During the early 1990s a major effort was made to develop the infrastructure and facilities supporting the new Purdue degree program in Computer Integrated Manufacturing Technology (CIMT). CIMT is an ABET accredited degree program following the criteria of Society of Manufacturing Engineers. The focus on the development of the CIMT laboratory facilities led to corporate donations of nearly $4 million supporting a unique teaching laboratory

for manufacturing. During 1994 a team of undergraduate students helped make the equipment come to life to produce the first products from the CIMT model factory.

During 1994 the number of students entering the last two years of the CIMT program reached a surprisingly low level. The strength of the facilities and the growing demand for graduates of CIMT and the declining number of students just did not make sense to the faculty. Action by the faculty supporting the CIMT program was needed to address this difficult problem. Students found themselves facing the bulk of their CIMT course work in the last 3 semesters of the original plan of study. In fact, the majority of the CIMT courses for most students were scheduled during the last 2 semesters. The faculty members teaching the senior level CIMT courses found that most students had developed a very narrow view of CIM, and often considered CIM to be just process automation.

CIMT Curriculum Committee work in 1993 began to concentrate on a major curriculum redesign that would maintain the strength areas of the program and make it more "student friendly". The curriculum revision became effective with students entering the CIMT program in the fall of 1995. One of the features of the new plan of study was the addition of a course for beginning students with a focus on what Computer Integrated Manufacturing and the CIM Technology major are about.

An introductory course for Manufacturing Engineering Technology: CIMT 100, the introduction to Computer Integrated Manufacturing, is a new, required, one hour course for students starting in CIMT. The course meets once each week throughout the semester. Class sessions are varied and designed to expose the students to a variety of topics related to the CIMT program, the School of Technology, and Purdue University. Faculty members supporting the CIMT program are invited to be the featured speakers to this class. Administrative leaders and staff members from across the campus make presentations on a variety of CIM and Purdue University topics. Recent graduates of the CIMT program are invited to speak to the class.

The students are given reading assignments from The Machine that Changed the World throughout the semester. This book tells the story of how manufacturing in the automobile industry has started to change with the implementation of “lean production” methods. The assigned chapters address the problems of traditional manufacturing methods and challenges of changing to the new manufacturing methods. Coverage includes discussion of recent history, the rise of the Japanese companies, and changes for the shop floor, design efforts, and the "supply chain." Students send brief responses to the readings to the instructor using electronic mail. Questions from the students on the examples and information given in the book proved to be good starting points for class discussions.

Communications using electronic mail are stressed from the opening day of the course. The students are required to get an e-mail address and figure out how to use the available mail systems on campus. A majority of the students have computers in their rooms and come to class knowing their e-mail addresses. Electronic mail is particularly helpful for the instructor to communicate with the students directly and avoid the problems of trying to make contact with students by telephone. Messages are regularly sent to the entire class using a mail directory.

Messages typically included information on assignments, or campus activities, job postings, and internship possibilities. Response to the use of this form of communication has been very favorable. Students reported that they like to use e-mail. A listserv for CIMT major was also created, and the students of CIMT 100 were among the first to subscribe. The listserv expands the possibility for enhanced communications by students with other students at all semester levels, faculty, and even graduates of the CIMT program.

Assignments were made early in the course that required students to look at CIM related sites on the World Wide Web. The students were assigned to visit the web sites of the major corporate sponsors of the CIM program. Links to these sites were included on a special course page for CIMT students to assure easy access. Students found the information at the corporate sites to be very interesting and informative. Information found included current news from our industrial partners, product information, company overviews, career information, and often job postings. The corporate sites have proven to be a great source of relevant information for the CIMT students. See the following URL: http://www.tech.purdue.edu/cimt/facstaff/hwkraebber/personal/courses.htm

The major written assignment for the semester is a two-part exercise that begins with the preparation of a resume and posting it to the World Wide Web. Part two of the assignment requires the students to prepare a typed summary (one to two pages) of their interests and expectations for their CIM education. They are asked to discuss the areas of CIM that are of the most interest and where they want their CIM education to lead them. The organization and quality of the preparation of the resume and the short paper are emphasized. Students are encouraged to think through this work carefully before starting to write. Proof reading and spell checking is a must to prepare a professional paper that could be given to a prospective employer or “boss”.

Several "fun" activities have been planned at various sites away from the scheduled classroom. Students need to develop a sense of the University overall. CIMT students are also a part of a leading university that provides many opportunities for student activities and participation. The students visited the athletic department facilities for football and basketball. The visit included a tour of the team meeting rooms, weight room, indoor practice facilities, and a walk out on the field of the football stadium. One of the early sessions took the class to the “training table dining room” for a discussion of Purdue University traditions and stories about the University. These sessions help students make a connection to the University at-large.

A design contest for a logo for CIMT was included in the course. The class votes for the entries submitted by the class members. The winning design will be used to make screen printed shirts and sweatshirts that will be offered for sale to students, faculty, and alumni. The student submitting the winning design will receive the first edition of the shirt produced and recognition as the contest winner. Several exciting designs were submitted this semester.

The current class of CIMT 100 includes nearly 50 students. Half of the class members are new freshmen entering the CIMT program. A fairly large number of students initiate a Change Of Degree Objective (CODO) from other major areas into CIMT. Nearly 25% of the students in CIMT 100 this fall come from other programs on campus or from other two-year schools. The

remaining 25% of the class are upper-class students in Mechanical Engineering Technology that are taking the additional courses needed to earn an Associates Degree in CIMT. The CODO and upper-class students already have some experience with the campus and have been excused from several sessions that address topics they are already familiar with. Many of the "excused students" have continued to attend all the scheduled sessions.

Grading for the course is based primarily on the resume/course summary assignment, class attendance and the e-mail responses to the reading assignments. The course is now a "letter graded" course. A proposal to change this class to a "pass/not pass" grading system is now being prepared for the CIMT Curriculum Committee. The "pass/not pass" format may be a better fit with the intent and structure of this course. There now appears to be a need for a "class exemption" for some of the upper-class students in their 6th, 7th or 8th semester who are working to complete the Associates Degree in addition to a Bachelors degree. These areas will require additional faculty consideration.

The course outline shown in figure 1. was implemented during the fall of 1997. This was the second offering of the course, and the content and plans for the course continue to develop and improve.

Figure 1. Course Topic Plan Fall 1997 Rev 11/97

Week 1: **Overview of what is ahead in CIMT.** A look at this course… Counselor Introductions… Tutoring program…

Week 2: **Defining CIM… The SME "CASA Wheel"** What we think CIM is… The CIMT Curriculum… Comments on CH 1-3.

Week 3: **Purdue Traditions!** Meet at the "Training Table" Dining Room in Cary Hall - NE. Featuring Former VP of Housing and Food Service

Week 4: **The CIMT/MET Connection.** Featured speakers: Assistant Dean, Head of MET Department, Prof. of Manufacturing Processes, MET Dept.

Week 5: **CIMT Core course Profiles…** Featured speakers: Director of the Manufacturing Center, Prof. of Process Control, MET Dept.

Week 6: **You can't study all the time…** An Inside Look at Purdue Athletics at the "Football Team Meeting Room" on the 3rd floor.

Week 7: **Student Organizations and leadership…** Featuring representatives from SME, APICS, ASQ, Rube Goldberg, Technology Student Council.

Week 8: **CIMT and Technical Graphics** Featured speaker: Prof. of Graphic Systems, Technical Graphics Dept.

Week 9: **Co-op and Internship opportunities.** Featuring Co-op Coordinator for MET/CIMT.

Week 10: **The CIMT/ IT Connection and course overview.** Featured speakers: Prof. of ADC, and Prof. of Plant Layout, Industrial Technology

Week 11: **Library Tour…** Company information resources in the Krannert Library. Featured Speaker Prof. Management Library Staff.

Week 12: **Placement Services and Power Resumes…** Featured Speaker: Director of the Purdue Placement Office

Week 13: **Resume Workshop…** Writing a resume and getting your resume on the Internet!

Week 14: **CIMT Graduate Success Stories…** Featured speakers include recent graduates of the CIMT program.

Week 15: **Meet the Boss!** Featured Speaker: Dean of the School of Technology

Conclusions: The new introductory course in CIM has been well received and has produced

benefits for the students and faculty. The students have gained important skills and have a new understanding of the manufacturing issues they will be facing in future courses. The faculty members are seeing the benefits of better prepared students entering sophomore level CIMT technical courses. The counselors are seeing fewer freshmen transfer out of CIMT to other majors. The faculty members gain contact with students earlier in the program and are able to generate new excitement for the work ahead. Communications between students and the faculty and staff that support the CIMT program are more open and improved. Students have had the chance to see some of the special features of the Purdue campus and learn more of the traditions that go with being a "Boilermaker." The course has had a very favorable impact on its participants. See figure two below to see student feedback to an e-mail question following the completion of the fall

We have just started to learn from this effort about the special needs of our freshman students. The transition from high school to the university is not easy. Students transferring in from other major areas also need help to adjust and "fit in" with a new major area. Students need to have more opportunities to work together and develop lasting bonds with each other and the university. We will continue to learn more from this effort as we begin to better understand the concerns of the students entering our program.

Figure 2. Student responses to an e-mail question about the value of the course one month later

Student A: "The CIMT class did help me understand exactly what I would be covering in the CIMT plan of study. The tours of certain parts of the university helped to make us more familiar with the campus on which we would spend the next four years. I think that CIMT 100 strengthened my commitment to the CIMT program. The text in the class was also helpful. I was able to relate the context of the book to the manufacturing that we do in the family business in Chicago. The text helped us to realize part of what we are doing wrong and what we need to do in order to improve things. My dad even went out to buy the book to read on how to better the business."

Student B: "I feel the curriculum in CIMT 100 is beneficial in explaining the broad perspective of a career in CIM. I feel that to improve the course, the different areas of CIM should be explored further. The course helped reinforce my choice (to major) in CIM."

Student C: " CIMT 100 taught me a lot about my major, I didn't know as much as I thought I knew about my major until this class. It showed me that there are many different job opportunities waiting for me when I graduate (from Purdue)."

Student D: "I think in a major that isn't known very well like this (CIMT), the speakers were an asset, as well as the handouts on what we will learn by graduation and what we will probably do. I have shown that sheet to a lot of people in industry to get my name and major out."

Student E: "CIMT 100 helped me to really understand what it (the CIMT major) was all about. I came into it only knowing that CIMT was about computers and now I understand how complex and diverse it really is. It also got me a lot more interested in it because I now realize that CIMT contains MET, EET, and CPT which are all very interesting also."

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