PLASTIC TECHNOLOGY (AAS)

PLASTICS ENGINEERING TECHNOLOGY (BS)

ACADEMIC PROGRAM REVIEW

2002-2003

MEMORANDUM

DATE: November 21, 2002

TO: Academic Senate

FROM: Academic Program Review Council

RE: Recommendations for:
Bachelor of Science Degree in Plastics Engineering Technology
Associate in Applied Science Degree in Plastics Technology

CC: Bob Spiers, Bob Marsh, Weilin Chang, Laurie Chesley, Thomas Oldfield, Barbara Chapman

DESCRIPTION OF PROGRAMS:

BS Degree in Plastics Engineering Technology

Established in 1982, this is the premier plastics engineering technology program in the United States. Students with an associates degree in plastics from Ferris or other institutions are given the opportunity to greatly enhance their career opportunities and improve their earnings potential. The focus of the curriculum is on manufacturing, but graduates are routinely employed as engineers, designers, supervisors, and sales/marketing personnel, with many graduates achieving high-level management positions. Excellent salaries are offered by employers ranging from small companies to international corporations. Placement of graduates is consistently 100%.

State-of-the-art machinery and equipment are used in the laboratories to support and supplement the concepts in lectures and individual discussions.

An active student chapter of the Society of Plastics Engineers (SPE) provides activities such as field trips, contacts with plastics industry professionals, and structured social activities. Fundraising supports trips to periodic national plastics conventions and expositions. These include ANTEC (annual) and the National Plastics Exposition (tri-annual). Admission requires an associate degree in plastics technology (or equivalent) with a cumulative 2.5 GPA, a 2.5 GPA in required math courses, and a 2.7 GPA in plastics courses.

Admission is competitive. Application must be submitted before March 1 for admission to the program in the following fall semester.

Graduates must complete all Ferris general education requirements as outlined in the General Education section of the University catalog.

AAS Degree in Plastic Technology

Established in 1969, this is one of the largest and most comprehensive associates of applied science (AAS) degree programs in plastics technology available in the United States. This is the major preparatory program for the FSU bachelors in plastics engineering technology and is also used as the first two years of program laddering for students seeking

manufacturing engineering technology, product design technology, sales/marketing and production management bachelors degrees.

Students who choose not to continue in a bachelors program can be employed as technicians and first-line supervisors with plastics processing companies and large multi-disciplined corporations. Placement is consistently 100%.

An understanding of processing techniques is the foundation for operation of major plastics processing machinery. The student also learns about auxiliary equipment, assembly, decoration, tooling, controls, testing and materials selection and properties. There is related coursework in the physical sciences, general education, product design, and mechanical principles. Laboratory experiences are used to provide practical applications for the concepts presented in lectures.

An active student chapter of the Society of Plastics Engineers (SPE) provides activities such as field trips, contacts with plastics industry professionals, and structured social activities. Fundraising supports trips to periodic national plastics conventions and expositions, such as ANTEC (annual) and the National Plastics Exposition (tri-annual).

The requirements for admission are a 2.0 GPA in high school and college work, plus high school algebra (ACT=19). The entering student should be mathematically, mechanically, and scientifically inclined.

Graduates must complete all Ferris general education requirements as outlined in the General Education section of the University catalog.

COST INFORMATION:

According to the 1999-2000 report from institutional research:

	Total cost per SCH
BS Degree in Plastics Engineering Technology	$222.13
AAS Degree in Plastic Technology	$189.84
	Total program cost
BS Degree in Plastics Engineering Technology	$14,216.32
AAS Degree in Plastic Technology	$12,149.46

RECOMMENDATIONS:

We recommend that the programs be continued.

(1) The program has a number of important strengths:

- They are central to Ferris' mission.
- The BS program is unique (1 of 10 in the country). Both the BS and AAS degree programs are the largest in the country. These programs are highly visible to industry.
- Through the placement of graduates, these programs provide an essential service to the state, nation, and world.
- The students and alumni rate the quality of instruction as high.
- There is a very high demand for graduates of the program as is evidenced by the almost 100% placement rate of students. There is every indication that for the immediate future the demand will continue.

- According to survey data, the average starting salary for 2001 graduates was $49,840.
- The programs are housed in a modern well-equipped facility.
- The faculty is enthusiastic and has a high level of expertise.
- The faculty is involved in continuing education and consulting activities.
- The faculty is invested in these programs, continually updating the curriculum to meet the needs of industry.
- The faculty has been able to acquire equipment and software programs through donations as a result of their close working relationship with industry.

(2) We recommend that the following steps need to be taken to maintain the quality of these program:

- The program faculty and the administration of the College of Technology should continue to work with University Advancement in developing effective recruitment activities. Recruitment activities should focus the attention of prospective students on the nature of the job responsibilities and rewards in the field rather than on the tools of the trade.
- The faculty should continue to maintain and expand relationships with alumni and industry to facilitate the recruitment of students and the acquisition of additional equipment.
- These programs should have an adequate annual equipment maintenance budget.
- The University should provide access for students and faculty to computers that are adequate to utilize the complex software that has been donated to the University.

Criteria Summary for:
BS Degree in Plastics Engineering Technology
AAS Degree in Plastic Technology

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- **CENTRALITY TO FSU MISSION:**
  AAS Degree in Plastic Technology and the BS Degree in Plastics Engineering Technology are central to the mission of Ferris State University. The emphasis on preparation for a career clearly reflects the historic roots of the University.

- **UNIQUENESS AND VISIBILITY OF PROGRAM:**
  The BS program is unique. It is the only such program in the state and one of nine in the nation. It is the largest undergraduate plastics program in the U.S. This program produces approximately one quarter of the graduates in BS programs in plastics in the country.

  There are 20 other colleges that offer similar AAS degrees. Ferris is the largest of these. Most of these programs are in community colleges and most of their students are not degree seeking. Almost all of the students in the Ferris program continue on into the BS program.

  These programs are highly visible to employers due to their excellent reputation for producing "career-ready" graduates.

- **SERVICE TO STATE, NATION, WORLD:**
  The BS program graduates 40 to 50 individuals per year most of whom take jobs in industries in the state of Michigan, particularly the automobile industry. More than 800 graduates of these programs are employed in the state, across the country and through out the world.

- **DEMAND BY STUDENTS:**
  Historically there has been a significant demand by students for this program, however, in the last few years, following a national trend, there has been a moderate decline in enrollment in the program.

- **DEMAND FOR GRADUATES:**
  The demand for graduates is high.

- **PLACEMENT RATE AND AVERAGE SALARY OF GRADUATES:**
  Placement of graduates of the BS program approaches 100%. The recent down turn in the economy has reduced the number of job opportunities, but all students who seek employment in the field are able to find jobs. The average starting salary of 2000/2001 graduates was $47,840.

- **SERVICE TO NON-MAJORS:**
  The programs offer an introductory course in plastics. The possibility of offering minors for business students is being explored.

- **QUALITY OF INSTRUCTION:**
  The quality of instruction as measured by the surveys of students and graduates is high.

- **FACILITIES AND EQUIPMENT:**
  The programs occupy a recently renovated and expanded state of the art facility and are well equipped. Some equipment is on consignment from industry and therefore its availability is not always guaranteed. A significant portion of the equipment is obtained through Vocational Educational funding which is not always a reliable source of income. There does not appear to be an adequate budget for maintenance of equipment.

- **LIBRARY INFORMATION RESOURCES:**
  The library resources appear to be adequate for the needs of the program.

- **COST:**

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- **FACULTY:**
  - **QUALIFICATIONS:**
    The full time faculty is qualified with considerable experience in industry.
  - **PROFESSIONAL AND SCHOLARLY ACTIVITIES:**
    The full time faculty is active in professional organizations and does extensive consulting.
  - **QUANTITY:**
    The number of faculty appears to be adequate for the needs of the programs.

- **ADMINISTRATION EFFECTIVENESS:**
  The administration appears to be supportive of the programs.

MEMORANDUM

DATE: November 21, 2002

TO: Academic Senate

FROM: Academic Program Review Council

RE: General Recommendations for Programs reviewed in the 2002-2003 review cycle

CC: Vice-Presidents Chapman, Oldfield, and Chesley; All Deans

Approximately one year ago 12 panels charged with reviewing a total of 18 programs were formed. These panels were composed of program faculty and friends of the program. The panels collected information, analyzed that information, and wrote thorough and rigorous reports that detailed the status of the programs. These reports also identified needs of the programs. Based upon the written documents submitted to the Academic Program Review Council, the answers to written questions generated by the Council, and discussion with panel members and program administrators, the APRC has generated specific recommendations for each program reviewed. These recommendations have been submitted as separate memos. On behalf of the entire University, the APRC extends its appreciation and gratitude for the work done by the program review panels.

GENERAL RECOMMENDATIONS

The following recommendations are derived from our collective review of the programs and represent our suggestions for addressing concerns that affect more than one program in the University. A review of general recommendations from previous Academic Program Review Council reports reveals that, although progress has been made, some programs still encounter the same or similar difficulties observed in previous years. It is clear many of these problems must be solved at the institutional level. If a similar recommendation was made previously, the years are indicated in parentheses.

THERE SHOULD BE A MORE THOROUGH PROOFREADING OF THE UNIVERSITY CATALOG BEFORE IT IS PUBLISHED.

At the beginning of each recommendation memo, under the section titled program description, a statement concerning each program is reproduced exactly as it appears in the online catalog. Often, the first impression of the University that is gained by prospective students and the general public is obtained through the Catalog. Therefore, it is a matter of concern when there are misspellings and examples of poor use of language in one of the most visible documents of the University.

THE ANNUAL REPORT ON THE CUMULATIVE IMPACT OF ACADEMIC PROGRAM REVIEW RECOMMENDATIONS SHOULD LIST THE RECOMMENDATIONS MADE BY THE COUNCIL AND THE SPECIFIC ADMINISTRATIVE RESPONSE TO THEM.

The Academic Program Review Council would like to thank Vice-President Chapman for providing the Senate and the Council with an Annual Report on the Cumulative Impact of Academic Program Review, which was in the form of a memo dated August 5, 2002. The Council recognizes that it may not be possible for the University to completely address all of the recommendations made by the Council in a calendar year and appreciates the efforts of the administration to follow up on the issues that are raised. The Council notes, however, that some of the actions taken do not directly correspond to the actual recommendations of previous Councils. For the sake of clarity of communication, the Council requests that in future updates, starting with the current review cycle, there be a list of the specific recommendations of the Council and the administrative response to them (2001-2002). There is a precedent for this in the memo from Teshome Abebe, former Provost and Vice-President for Academic Affairs dated July 30, 1996 in which he provided a status report on the progress that had been made concerning the Senate-approved APRC recommendations for programs reviewed in 1995-1996.

OTHER DIVISIONS OF THE UNIVERSITY SHOULD BE REVIEWED WITH RESPECT TO THE QUALITY OF SERVICE THAT THEY PROVIDE TO ACADEMIC PROGRAMS AND THE EDUCATIONAL MISSION OF THE UNIVERSITY. FEED BACK CONCERNING THE OUTCOME OF THESE REVIEWS SHOULD BE SUPPLIED TO THE ACADEMIC SENATE AND THE ACADEMIC PROGRAM REVIEW COUNCIL.

The Council appreciates the decision by the administration to develop a review process for University Advancement and Marketing and the computer consortia. The council would like to point out, however, that the focus of these reviews as described in the memo from Dr. Chapman dated August 5, 2002 does not completely address the concerns of previous Academic Program Review Councils. Hopefully the QI2000+ Committee mentioned in the document will establish a thorough process of review of divisions in the University that support and serve academic programs so that, when problems arise because of policy or implementation of policy, a mechanism will be in place to correct the problems and allow affected programs input in the development of new policies. The purpose of this request is to ultimately improve the quality of academic programs (2000-2001, 2001-2002).

THE UNIVERSITY SHOULD REVIEW THE POLICIES ASSOCIATED WITH THE ISSUING OF STUDENT ID CARDS AND THE PROCEDURES FOR ASSIGNING STUDENT BARCODES.

Students still have trouble accessing library databases from off-campus. Barcode numbers needed for database login are not tracked when ID's are issued so students must call the library to have their barcode entered before they can access the databases from off-campus. The FLITE staff has worked diligently to alleviate some of these problems, however, much of the difficulty could be avoided by coordination between Telcommunications and FLITE.

THE UNIVERSITY AND, IN PARTICULAR, THE COLLEGE OF ARTS AND SCIENCES, SHOULD ENSURE THAT AN ADEQUATE NUMBERS OF COURSES, OFFERED IN AN APPROPRIATE FORMAT (12 WEEKS), ARE OFFERED DURING THE SUMMER SEMESTER.

The curricular design in several of the colleges (particularly Allied Health and Business) requires that students build a full load schedule during the summer. While offering courses of varying lengths during the summer may be convenient for faculty, such an arrangement makes it extremely difficult for students to achieve a full load of classes. That in turn may cause the student to choose a course based on the timeframe in which it is offered rather than the its educational value.

THE UNIVERSITY SHOULD REQUIRE THAT THE ADMINISTRATIVE PROGRAM REVIEW FORMS SHOULD BE FILLED OUT ACCURATELY AND COMPLETELY.

The Administrative Program Review documents provided to the council by the program panels varied significantly with respect to their completeness and reliability. In several cases, questions on the form were not answered and data related to enrollment according to class standing and the number of graduates in a given year was not listed. The Council relies heavily on this document in assessing the status and viability of each program.

THE DESIGN AND DISTRIBUTION OF SURVEYS FOR ACADEMIC PROGRAM REVIEW SHOULD BE PROCESSED THROUGH A CENTRAL UNIVERSITY OFFICE WITH INPUT FROM THE PROGRAM REVIEW PANEL.

The academic program review process relies extensively on information gathered through surveys. It is apparent to the council that this type of activity should be coordinated through a central office, which provides services to panels for programs undergoing review. Most program faculty are not trained or experienced in survey methodology. This often results in poorly designed surveys, low response rate, and information of dubious validity. This problem is compounded by the fact that other divisions within the University are sending out different surveys, in many cases to some of the same individuals. It is true that different divisions within the University may be interested in obtaining different kinds of information, however there is certainly a basic core of information that is important to all units within the University. A standardized survey form should be designed and distributed utilizing established survey methodology. This form should allow individual programs or units in the University to ask additional specific questions related to information unique for their needs. The staff of this central office should provide support for follow up procedures to ensure adequate response rates. They should also assist the program review panels in the use of applicable statistical procedures to insure proper interpretation of the data.

THE UNIVERSITY NEEDS TO HAVE A CENTRAL DATABANK THROUGH WHICH ALUMNI AND GRADUATES OF PROGRAMS ARE TRACKED.

Most panels reported that significant numbers of surveys were returned due to an incorrect address. There is no question that in this mobile society it is difficult to keep track of individuals, however, if there is a cooperative approach to collecting data from various sources on campus, it should be possible to increase the reliability of existing databases.

INSTITUTIONAL RESEARCH SHOULD COMPILE THE INFORMATION REQUIRED BY PROGRAM FACULTY AND ADMINISTRATORS FOR THE PROGRAMS UNDERGOING THE ACADEMIC PROGRAM REVIEW PROCESS.

The document titled Academic Program Review: A Guide for Participants lists some specific types of information that are required for the review process. Currently, the seeking out and collecting of relevant programmatic information on an individual basis is an inefficient process and is an inordinately consuming use of program faculty and administrator's time. The previous Academic Program Review Council did meet with a representative from Institutional Research last spring to discuss their methods of data collection and how they arrived at their interpretation of the data. At that time, this individual expressed a willingness to work with the Panels in obtaining the information that they need. The current Academic Program Council should develop a specific list of the information that is required and communicate this to the staff in Institutional Research. The council requests administrative approval for this expansion of duties by the staff of Institutional Research (2001-2002).

THE UNIVERSITY SHOULD CONTINUE TO EXPLORE WAYS IN WHICH IT CAN HELP PROGRAMS MAINTAIN AND ACQUIRE NEW EQUIPMENT AS THE NEEDS OF INDUSTRY CHANGE.

The Council appreciates the response of the administration documented in Dr. Chapman's August 5, 2002 memo to previous recommendations concerning maintenance and acquisition of equipment. The Council also recognizes there is no way that the University can fund all of the equipment requirements of all of the programs at the University. With a few exceptions, most of the programs reviewed this cycle had adequate facilities and equipment. However, concern was expressed by several program panels related to funding for maintenance, replacement of equipment items, and the purchase of new equipment. Updating of computers to handle increasingly sophisticated software continues to be a problem. The University should continue to provide support for the maintenance of equipment and establish funds the upgrading of equipment. The procedures for requesting such funds should be widely communicated throughout the campus. In addition, the University should continue to encourage and support the efforts of faculty and program administrators as they seek off campus sources of equipment and resources. (1995-1996, 1997-1998, 1998-1999, 1999-2000, 2001-2002)

THE UNIVERSITY SHOULD INVEST IN PROGRAM SPECIFIC ENROLLMENT AND RECRUITING EFFORTS:

The current guidelines for the academic program review process require the APRC to evaluate enrollment in programs as a part of the review process. Low enrollment in a program does have a direct impact on program cost and faculty productivity (as defined by the business operations of the University), particularly in programs that are laboratory and technology intense. Low enrollment does not necessarily have a direct relationship to the quality of education that is delivered to students.

As far as the Academic Program Review Council was able to determine, at least with respect to the programs that were reviewed this year, low enrollment levels were unrelated to the quality of instruction, the availability of jobs in the field, the potential salaries of employees in the field, and even the availability of financial aid in the form of scholarships to students. Some of the under-enrolled programs that were reviewed this year have few or no competitors in the state of Michigan and in some cases in the country. The faculty in several

of these under-enrolled programs has made an intensive recruiting effort, which seems to have had only a limited impact on increasing student numbers. On the other hand, new degree initiatives in the College of Education and Human Services and in the College of Arts and Sciences have resulted in programs with rapidly increasing enrollments but limited opportunities in the job market. The difference seems to be the visibility of programs to prospective students.

It has become apparent to the members of the Council, particularly those who have served several years, that allocating a few marketing dollars to a program with enrollment difficulties and creating an attractive brochure does little to increase student numbers. Asking faculty to spend increasingly more time in recruitment efforts is not a particularly productive or effective approach to solving the problem. Typically faculty members have had little, if any, training in marketing techniques, demographic analysis, and brochure design. Most faculty members choose teaching because of their love of their subject area and their desire to share their knowledge with students, not because of an interest in the marketing of their program to prospective students.

If the University is truly committed to its historic mission of preparing students for a career and wishes to continue to serve the state of Michigan by providing graduates who are prepared to work in vital areas of our economy such as heavy industry or health care and yet maintain the fiscal viability of the University, it must address the issues related to the marketing low enrollment programs at an institutional level. It must supplement the efforts of faculty and administrators in programs with low enrollment through the use of institutional resources for focused marketing that increases the visibility of low enrollment programs and increases the awareness on the part of prospective students that many of the programs at Ferris State University lead to career options in vital industries in which high paying jobs are going unfilled.

THE ACADEMIC SENATE SHOULD REVIEW ITS CHARGE TO THE ACADEMIC PROGRAM REVIEW COUNCIL.

The Academic Program Review Council has begun the second round of program review. It is time to review and to reevaluate the criteria that are utilized as the basis for recommendations that are listed in the document Academic Program Review: A Guide for Participants. The academic program review process should focus on the quality of instruction offered in each program. Some of the criteria mentioned previously seem to have a marginal relationship to that goal, at best. For example, the focus on enrollment, productivity, cost of instruction, demand for graduates and the salaries they achieve are certainly of interest and importance to the administration. The question that arises is whether the academic program review process is the appropriate medium to collect and tabulate that data. Perhaps the academic program review process should focus more directly on what skills or competencies are required of graduates, how effectively programs deliver instruction that provides students with those skills and competencies, how the programs assess the skills and competencies of their students and graduates, and what hinders the programs in their attempts to fulfill their responsibilities to their students.

The Academic Program Review Council, 2002-2003

Jack Buss, Arts and Sciences , Chair
Douglas Fonner, Arts and Sciences
Carrie Forbes, Library and Information Services
Michael P Keating, Optometry
Richard Kowalkoski, University College
Jim Mayhew, Allied Health Sciences
Connie L Morcom, Education and Human Services
Norwood "Woody" Neumann, Pharmacy
Dan Skurski, Technology
William Smith, Business
Randy Stein, Technology

Questions for APR Panel
AAS Degree in Plastics Technology
BS Degree in Plastics Engineering Technology

1. Please list the primary skills, abilities, and knowledge base that you expect that a graduate of your program would possess.

2. For each skill, ability or knowledge base listed above, identify the major component(s) of your curriculum that are designed to develop that characteristic in your graduate.

From 1990 to 1993 an extensive task assessment was performed in order to determine what skills were essential for plastics engineering technologist. The task lists were over 10 pages of specific skills. Once reviewed and modified by the plastics advisory committee, these skills were implemented into existing courses or new courses were developed. In 1993 an extensive curriculum change was submitted and approved by the University.

Again in 1997 after the 1996 Academic Program review, the same exercise occurred and the curriculum was modified to reflect suggestions from the advisory board and the alumni. A curriculum modification with all the "new required skills" was implemented in 1998 and it has just completed a 4-year cycle.

The major skills have been addressed in the courses outlines supplied in the 2002 APR. A summary of the major skills/objectives is as follows:

Skill/Ability	*Curriculum component*
1. *Knowledge of terms used in the plastics industry*	*PLTS 110*
2. *An understanding of plastics materials science including*	*PLTS 320*
▪ *Basic Chemistry*	*PLTS 320/CHEM121/211*
▪ *Characterization procedures*	*PLTS 223/PLTS 320*
▪ *Materials handling procedures*	*PLTS 121/PLTS 211*
▪ *Data analysis*	*PLTS 223/PLTS 300*
3. *Knowledge and operation competency in of all major Plastics fabrication techniques*	*PLTS110/PLTS121/PLST211/PLTS 321 EEET201*/EEET301*/MECH250*
4. *Understanding of project management tools*	*PLTS 300*
5. *Technical communication (written and verbal) skills*	*PLTS300/COMM121/ENGL311 (& All PLTS classes)*
6. *Knowledge of Plastics design techniques*	
▪ *Mold design*	*MFGT150/PLTS 212/PLTS 312*
▪ *Die design*	*MFGT150/PLTS 212*
▪ *Product design/development*	*PLTS212/PLTS 312/MECH340/PHYS211*
▪ *Understanding of computer aided engineering tools*	*ETEC140/PLTS 212/PLTS312*
7. *Knowledge of cost estimation techniques*	*PLTS 410*
8. *Knowledge of package development*	*PLTS 410*

9. *Knowledge and understanding of quality assessment tools PLTS 223/PLTS 300/MFGE353*
10. *An understanding of manufacturing and production management MFGE351/MFGE353/MFG451*
11. *Knowledge of finishing and decoration techniques in the plastics industry PLTS 411*

**EEET201/301 have replaced EEET227/317*

3. Approximately how many of the students who enter the AAS program fail to meet the admission criteria for the BS program? See page 3. Are they informed of that possibility upon admission to the AAS program? What are the job prospects for an AAS student in the Plastics Technology program who fails to meet the academic criteria for entrance into the BS program? Since other AAS programs in plastics have closed, does that improve the job prospects for your AAS students? See page 50. Is there a significant difference between your AAS students and those that are enrolled in plastics programs in community colleges?

About 15% of the students who are awarded their A.A.S. degree leave without entering the B.S. program. This represents 6 – 8 students per year. In addition, there are currently about 15 students who are taking classes to raise their qualifications to meet the entrance requirements.

Students are continually informed about the requirements. No one has ever pleaded ignorance of the rules.

A.A.S. graduates enter jobs that are traditionally held by experienced, non-degreed personnel. P. 50 estimates that, on an annual basis, there are about 100 plastics A.A.S. graduates nationally who do not obtain their B.S. degree. P. 54 shows about 37,000 people working in the U.S. plastics industry in positions appropriate for these graduates. The opportunity is very large in relation to the number of graduates, and a few graduates, more or less, have no effect.

We believe that our graduates are better prepared in the processing and design of plastic products, but it is arguable whether industry puts a premium on our degree.

4. On page 3 you describe a recruiting plan that includes visits to AAS science oriented programs in CAS. How long would it take for an AAS student in a program other than plastics to graduate with a BS in Plastics Engineering Technology?

It would likely take a CAS A.A.S. graduate 3 years to earn a B.S. in Plastics Engineering Technology.

5. On page 4 you state some objectives of the academic program review. What progress have you made toward meeting these objectives?

Five primary objectives were identified in March as part of the review process. The following is a brief status of each of the items.

A. *Curriculum development: The curriculum committee for the plastics programs has started meeting this semester to discuss potential changes as reflected by alumni. The committee is reviewing suggestions and determining how to best implement them in the current curriculum.*
B. *Improve quantity and quality (recruiting) of incoming students: An understanding of how students are attracted to the programs has been obtained (Most enroll based on a combination of personal contact from someone in the industry and the attractive employment prospects). The program faculty has identified different recruiting strategies to augment active personal contact though HS visits with alumni.*
C. *Develop information for input into a program model: This is an on going project, more information is necessary to completely develop a program model. The faculty have been encouraging development of a working model which would allow all parties an understanding of what is the ideal enrollment and equipment usage.*
D. *Increase and broaden program visibility: Plastics program faculty have become more active in national professional societies and groups. Faculty are involved as NSF reviewers, founders of a Plastics educators group within the Society of Plastics engineers and are attempting to attend more professional society meetings (as development funding permits).*
E. *There has been a question since the inception of the Rubber technology programs about the relationship between the two programs. The plastics faculty survey stated quite clearly that the programs should remain separate and retain their own identity. The relationship has been defined.*

6. What are your fall enrollment numbers? On page 6, in the administrative report, a few off campus students are listed as being enrolled each year. Please elaborate on your off campus efforts.

The 02F enrollment in PLTS110 (1st semester freshmen) is 54, 2 less than in 01F. Total enrollment, including B.S. "pre's" (who are raising their qualifications to enter the B.S. program) is 190 in 02F vs. 211 in 01F.

We offered a plastics B.S. program in Grand Rapids in the mid-1990's. This was discontinued because it primarily attracted GRCC A.A.S. graduates who would have come to Big Rapids for their plastics B.S. degree. Classes were typically 6 – 8 students.

7. What is the status of the testing program as a part of outcomes assessment that is mentioned on page 9?

An A.A.S. Outcomes Assessment test was developed by PLTS faculty as recommended in our 1997 (?) program review. The test has been administered as a pre-test to all incoming freshmen beginning in the F'00 semester. Beginning in the W'02 semester the test has been administered as a post-test to all sophomores exiting the A.A.S. Plastics Technology program.

The test consists of 99 questions in four categories - "Non Injection Molding", "Injection Molding", "Tooling", and "Testing". Summary data is available with results from all tests.

8. How do you interpret the concerns raised in the Advisory Committee Survey? See pages 11-13

Four of the 12 members of the board members made meaningful comments. The only repetitive comment (made by 2 respondents) questioned whether the University is giving enough support. The advisory board concerns will be discussed at the program advisory next meeting.

9. Please describe the internships in your programs. Are they paid or unpaid? How are they supervised? How does the AAS internship differ from the BS internship? Do any students leave the program because they receive job offers from the companies that sponsor the internship? Is their any coordination between internships in the Plastics programs and the Rubber programs?

Internships are paid. PLTS193 students typically earn $8 – 12/hr, while PLTS393 students typically earn $12 – 16/hr. In some cases, companies will also provide housing.

Faculty receive summer contracts to supervise the interns. They are in contact with the students, who write weekly reports and a final report. Faculty visit the interns if they are working in greater Michigan.

The A.A.S. internship is the first industrial experience for most students. Most of them perform routine tasks in production or in a testing laboratory. The B.S. internship places the student in a position of greater responsibility, where they typically work as a "junior" engineer, and they must have decision-making authority.

It would be extremely rare for students to leave the program before graduation with a B.S. because their internship employer hired them away. Students' job experience and consistent input from faculty reinforce the great financial rewards that result from a B.S. degree.

Most companies tend to be either plastics or rubber. However, there is somewhat of a trend for companies to expand into the "other" field. In this case, a company may hire either a plastics or rubber intern. Freudenberg-NOK hired 4 rubber interns and 2 plastics interns in 02S.

10. In the faculty survey on pages 33 through 37 there appear to be some issues concerning teaching assignments and supervision of the internships. Would you please elaborate on these issues?

Question 2 on the survey relates to an indication from the University administration that labs are interchangeable. It has been suggested that one faculty teach the lecture for all sections of a course, with other faculty teaching some of the labs. The survey shows that 100% of the plastics faculty are against this, as the lectures and labs are integral.

Question 42 raises the issue of having a centralized (within the college or department) internship system or continuing the current method of several faculty from within the program "teaching" internship course sections. There is strong sentiment for maintaining the status-quo.

11. From your perspective, please discuss the pros and cons of seeking accreditation. See page 50.

There is only one accredited Plastics Engineering Technology program in the country (Penn State, Erie). Ironically this program was modeled off the FSU plastics program.

The FSU plastics faculty has continually wrestled with accreditation and based on input from our advisory board, have never pursued it. The reasons behind not pursuing accreditation are:

A. Accreditation would constrain and/or reduce the Plastics course offerings. (An increase in Engineering technology related courses would required credits to be eliminated and there are very few areas where a reduction can be easily justified.)

B. Accreditation has not been an issue for employment.

C. Accreditation could increase the academic rigors (more basic math and science) required and cause a reduction in enrollment.

The faculty is continually looking at accreditation. Recently a plastics faculty attended an ABET continuous improvement seminar which will be discussed at a future program curriculum meeting.

12. Please discuss your attrition rates and the relationship between enrollment numbers and number of graduates in the AAS program. See page 53.

In the long-term, over 70% of entering freshmen earn their A.A.S. degree. The chart on p. 53 reflects a one-year low in A.A.S. graduates combined with a near-record freshman enrollment.

13. Please elaborate on the negative comments concerning CHEM 211. See page 61.

Plastics students perceive CHEM211 to be irrelevant and do not relate to the pedagogical approach.

This course is very relevant, as evidenced by the alumni who wish they had more chemistry. Some of the complaining students will undoubtedly also wish they had a better chemistry background once they graduate.

Professor Balanda is aware of student concerns on the course approach, and is addressing the issue.

14. On page 62, in the student surveys, there appears to be some dissatisfaction with the advising process. Has this issue been addressed?

Plastics faculty are experienced advisors, and there have been no repetitive issues that have needed corrective action. Some students have unrealistic expectations. However, the survey has raised the awareness of possible problems, and we will pay close attention to this in the future.

When exceptions to the status quo occur, they are discussed in program meetings and all the advisors have input on the decision made.

15. On page 63 the issue of the computer facilities and student access to computers was raised. What needs to be done to remedy this situation?

Computers in the NEC lab were purchased in December 2000, and are adequate for all the course software. It is unrealistic for students to expect more frequent replacements.

The department and the college, in conjunction with the BCT, are working to develop a better replacement plan for computers throughout the college.

16. On page 83b you discuss the equipment in the department. How representative of the current state of the industry is the equipment that you use in instruction? What obstacles do you face in obtaining such equipment? Have you established relationships with industry that allows you to obtain state of art equipment? Have you included equipment

requests in unit action plans and small caps proposals? Do you qualify for Vocational Education funds this year?

The plastics program's equipment is adequate to educate a new plastics technologist or engineering technologist. Not all the equipment is "state of the art, but it is sometimes important to have examples of older equipment that the graduates will commonly see in industry."

The plastics faculty have worked hard with industry developing relationships that will lead towards donations of vital state-of-the-art equipment. Because of the cost, these equipment donations take a long time to come to fruition. The economy also plays a large part on "new" donations, as large equipment manufacturers normally only donate when they are profitable and not while the economy is sluggish.

The single biggest hurdle to overcome is financial. State-of-the-art plastics manufacturing equipment is very expensive; often one small machine could cost $100,000 (or $20,000/yr. Lease). The programs' S&E is not adequate to support this magnitude of support; in fact it is barely enough to maintain the equipment.

The plastics programs are eligible for vocational education funds. These funds are often lower than the funding required. In 2000 the plastics programs were awarded for a $75,000 vocational education funding to purchase a machine. The faculty worked with major suppliers of equipment to make the best of this funding. Negotiations lead to the purchase of two machines.

17. Please describe the PLTS 499 course.

PLTS499 is 1 lecture hour per week, and focuses on skills needed to evaluate and obtain entry-level professional positions in the plastics industry. It also focuses on issues that will help students better-understand their role in their chosen company, their company's broader role and balancing their career and life goals.

The plastics courses require many student projects that eliminate the need for the traditional capstone project course.

18. On page 129 you mention that the entrance requirements for the BS program should be reevaluated. Please elaborate.

Questions have been raised regarding reduction of the entrance requirements for the B.S. degree (completion of the A.A.S., 2.5 overall GPA, 2.7 GPA in plastics and 2.5 GPA in MATH116/126) could potentially increase overall enrollment by 10 – 15 students. There is no statistical basis for these requirements. In the past, alumni, faculty and the advisory board have supported maintaining these requirements. Survey results for this program review continue to support the

current requirements. This issue will be discussed at the next advisory board meeting, and faculty will determine whether changes should be considered.

19. Apparently the faculty believes that the Plastics and the Rubber programs should remain separate. See page 138. Please elaborate. Are the programs in competition with each other? Are there any cooperative efforts between these programs? Are there students who are dual majors in the Plastics and the Rubber BS programs? If so, how many?

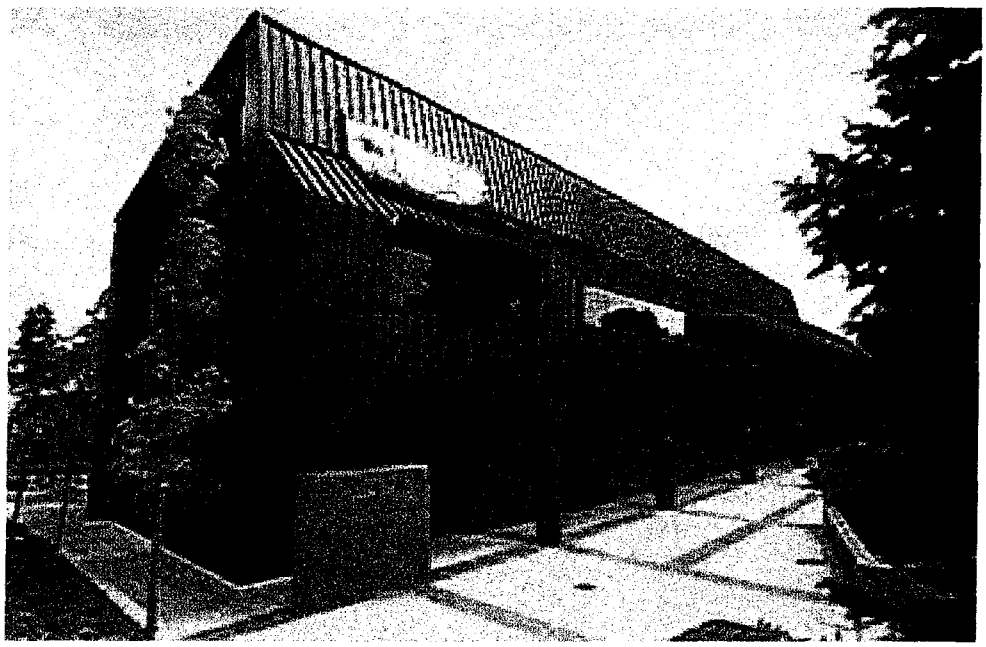
First and foremost there is a cooperative coordinated effort between the plastics and rubber faculties.

There are students who are dual majors but generally these students declare the second major once enrolled on campus. Currently there are 8 dual majors. The statement on page 138 revolves around central internship management. The plastics faculty believe plastics students should be "taught" by plastics faculty and rubber students should be "taught" by rubber faculty. There has been discussion of centralizing the internships between the department seniority pool and not the programs seniority pool.

PLASTIC TECHNOLOGY (AAS)

PLASTICS ENGINEERING TECHNOLOGY (BS)

ACADEMIC PROGRAM REVIEW



PLASTIC TECHNOLOGY (AAS)

PLASTICS ENGINEERING TECHNOLOGY (BS)

ACADEMIC PROGRAM REVIEW

Sept 18, 2002

Program review panel Members:

Program review chair: Bob Speirs
Program director: Bob Marsh
Program faculty: Bob Pierce
Greg Conti
Individual with special interest (Principle of WAK plastics): Chris Whalen
Faculty member from outside the College of Technology: Tom Brownell (College of Arts and Sciences)

Table of Contents

SECTION I

Plastics (engineering) technology

Plastics (Engineering) Technology Overview

The Ferris State University plastics technology (AAS) program started offering degrees in 1971. In addition to degree offerings courses were also written and offered for the manufacturing engineering technology program. In 1983 a Bachelor of Science in plastics engineering technology was added to the plastics curriculum.

Support from industry grew, and enrollment increased. The programs outgrew their space in the Industrial Building. In 1987, largely from industrial funds, the 18,000.sq ft. plastic building was built on the Ferris campus next to the Swan Building.

The rubber industry, observing the success of the plastics industry, contacted FSU to develop a rubber technology (AAS) and a rubber engineering technology (BS). In 1998 a second floor and a 5000 sq ft. laboratory addition was added to the "plastics" building to house both the Plastics and the Rubber degree programs. The second floor containing classrooms and offices was also added at this time. The building was later renamed as the "National Elastomer Center".

Since 1996 (the most recent academic program review) one faculty has retired (Gene Whitmore) and two were added, Robert Pierce (1996) and Larry Langell (1997). In addition, based on suggestions from the Academic Program Review Council, a full-time Department Director (Robert Marsh) was also added to the plastics staff. Currently there are 7 plastics faculty, along with a department director, a full time Administrative assistant and an administrative Technician who are shared with the rubber programs.

Students of the Plastics Engineering Technology program are virtually guaranteed a professional position in the industry when they graduate. For the past fifteen years there has been virtually 100% placement of graduates, the exceptions being the few students who would/could not leave their hometown. Graduates obtain positions all over the country in industries ranging form automotive to military research. The majority of the graduates (an estimated 65%) obtain positions in Michigan and after three years about half of the remainder (an additional 18%) come back to Michigan.

History has allowed the Plastics programs at FSU to obtain an excellent national reputation. The testament to this is when placement professionals contact the Plastics programs with job descriptions that state "...a Ferris State type plastics engineer".

Enrollment in the AAS plastics program has been fairly strong over the years. The following is a break down of AAS Admissions (a range is reported as it varies from year to year):

True freshman	20 to 40%
Campus transfers	15 to 30%
Transfer students from off campus	40 to 60%
Returning to college	10 to 20%

Incoming Baccalaureate students come predominately from the FSU AAS degree. Those that do not "go on" tend to be students who were not accepted based on academic criteria. There are also a number of Grand Rapids Community College students who transfers with their AAS degree, and occasionally a student will also come from St. Clair County Community College. Many of the community colleges that had a plastics program have closed their programs citing expensive to operate and low enrollment as the two most prevalent problems.

Freshman enrollment has dipped for the past two years. The six "top" plastics programs in the country have all had dramatic decreases in enrollment. There is a lot of speculation on what caused the decrease. Some speculate the industry is not glamorous. Others think the negative publicity caused by environmental groups has scared potential students away. Another reason could be the lack of interest in an industry that is "dirty", these student see the computer as a career tool not a molding machine. The recent recession may have reduced the number of students who come because of referrals, with greater employment uncertainty.

Based on the enrollment changes at FSU, an aggressive recruiting plan is being developed and portions implemented. Among the recruiting efforts: plastics faculty will visit the AAS programs in the College of Technology, AAS science oriented programs (College of Arts and Sciences) to interest graduating associates students in the plastics programs and presentations will be made to career explorations students. In addition, an aggressive High School recruiting program will be implemented. First efforts at recruiting high school students included a mailing to students in Michigan who achieved higher then a 22 on their math ACT. In addition, current plastics students are encouraged to visit high schools and encourage the high school students to consider a career in rubber and/or plastics.

OBJECTIVES OF THE ACADEMIC PROGRAM REVIEW

In March the program review committee met to determine its objectives in addition to those required by the University for the Academic review. After extended discussion the following are the program's objectives:

A. Curriculum development
    a. Understand the current trends in the industry toward new technologies in order to develop technical electives
    b. Understand how desired curricula flexibility would be for faculty and students
B. Improve the quantity and quality (academic preparation) of incoming students
    a. Develop an understanding of what keeps students in the program (retention)
    b. Improve/develop recruiting strategies
C. Develop information for input into a "program model" including optimization of:
    a. Current facility
    b. Student & Faculty schedules
    c. Class/laboratory size
    d. Program growth
    e. Equipment needs
D. Increase or broaden the program's visibility
E. Establish a defined relationship between the Rubber and plastics programs

Final conclusions will be based on these objectives.

SECTION II

Administrative program review

ADMINISTRATIVE PROGRAM REVIEW: 2001

(final version – 10/24)

Program/Department: **Plastics Technology/Plastics Engineering Technology**
Date Submitted: **November, 2001**

Please provide the following information:

Enrollment

	Fall 1997	Fall 1998	Fall 1999	Fall 2000	Fall 2001
Tenure Track FTE	7	7	7	7	7
Overload/Supplemental FTEF	.50	.45	0	.34	0
Adjunct/Clinical FTEF (unpaid)	0	0	0	0	0
	132/75	141/58	130/75	138/80	127/74
Freshman	20/0	45/0	39/0	57/2	31
Sophomore	30/0	34/1	46/0	41/0	63
Junior	32/4	31/9	26/12	31/18	19/16
Senior	35/67	31/48	19/63	9/60	14/58
Masters	0	0	0	0	0
Pre-Tech	13/16	17/9	19/2	7/7	4/8
Pre-Professional Students	0	0	0	0	0
Enrollment off-campus*	03	0/4	0/2	0/1	0/2
Traverse City	0	0	0	0	0
Grand Rapids	3	4	2	1	0
Southwest	0	0	0	0	0
Southeast	0	0	0	0	0

*Use official count (7-day)
If there has been a change in enrollment, explain why:

Capacity:
Estimate program capacity considering current number of faculty, laboratory capacity, current equipment, and current levels of S&E.

132/96 students

What factors limit program capacity?

Financial

Expenditures*	FY 97	FY 98	FY 99	FY 00	FY 01
Supply & Expense	$13,961	$58,593	$54,145	$47,692	$40,983
Faculty Prof. Development					
General Fund					$1,745
Non-General Fund					-0-
UCEL Incentives					$1,932
FSU-GR Incentives					$770
Equipment					
Voc. Ed. Funds	$44,411	$47,473	NA	NA	$4,945
General Fund	$26,073	$451.64	$1,451.86	-0-	$13,493
Non-General Fund	$17,935.84	$3,204.14	$1,000	$3,225	$5,335
UCEL Incentives					-0-
FSU-GR Incentives					-0-

*Use end of fiscal year expenditures.

ADMINISTRATIVE PROGRAM REVIEW: 2001

If you spent UCEL and FSU-GR incentive money for initiatives/items other than faculty professional development and equipment, what were they? Explain briefly. Please also include amounts spent on each initiative/item.

Revenues	FY 97	FY 98	FY 99	FY 00	FY 01
Net Clinic Revenue	0	0	0	0	0
Scholarship Donations	0	0	0	0	0
Gifts, Grants, & Cash Donations	$30,237.50	$83,615	$68,299	$165,105	$3,415
Endowment Earnings	0	0	0	0	0
Institute Programs/Services	0	0	0	0	0
In-Kind	$17,790	$60,472	$47,262	-0-	$5,479

Other

	AY 96/97	AY 97/98	AY 98/99	AY 99/00	AY 00/01
Number of Graduates* - Total	52/69	49/55	19/56	53/48	40/45
- On campus	52/69	49/55	19/56	53/48	40/45
- Off campus	0	0	0	0	0
Placement of Graduates	100%	100%	100%	100%	100%
Average Starting Salary	$37,500	$41,682	$42,093	$44,894	----
Productivity - Academic Year Average	306	298	267	303	364
- Summer	118	126	151	132	118
Summer Enrollment	41/51	56/38	57/56	71/48	66/38

* Use total for full year (S, F, W)

1. a) Areas of Strength:
   - **Graduates are very well prepared for employment in the plastics industry due to:**
     - **"hands-on", laboratory-intensive coursework**
     - **required industrial internships**
     - **active advisory board and strong program commitment to continuous improvement**
   - **Great demand for graduates at higher-than-average pay for positions nationwide**
   - **Considerable financial support from industry**
   - **Outstanding reputation generally fills enrollment capacity**
   - **National Elastomer Center is an outstanding facility**

   b) Areas of Concern and Proposed Action to Address Them:
   - **Laboratories are dependent on donations of materials and equipment. Action: continued "courting" of industrial supporters.**
   - **Addition of Rubber program threatens enrollment as students have another option in a very similar industry. Action: More emphasis given to recruiting for both Plastics and Rubber programs.**

2. Future goals (please give time frame)
   - **Fill enrollment capacity, with 72 new AAS students and 50 new BS students each year. Timing: Ongoing**
   - **Average 55 AAS degrees and 45 BS degrees per year. Timing: Ongoing**
   - **Continuously improve curriculum and facilities. Timing: Ongoing**

3. Other Recommendations:
Continue to work with UCEL to create summer seminar series at National Elastomer Center
Work with UCEL and FSU-GR to offer off-campus learning experiences as justified by need.
Continue to nurture relationships with industry to maintain donations of needed equipment and materials.

4. Does the program have an advisory committee? **YES**

a) If yes, when did it last meet? **10/19/01**

b) If no, why not? By what other means do faculty receive advice from employers and outside professionals?

c) When were new members last appointed? **9/00**

d) Are there non-alumni/ae on the committee? How many? **5**

5. Does the program have an internship or other cooperative or experiential learning course? **YES**

a) If yes, is the internship required or recommended? **Required**

b) If no, what is the reason for not requiring such an experience?

6. Does the program offer courses through the web? **NO**

a) Please list the web-based (fully delivered through the internet) courses the program offered last year?

b) Please list the web-assisted (e.g., WebCT) courses the program offered last year.

7. What is unique about this program?

a) For what distinctive characteristics is it known in the state or nation?
Largest undergraduate plastics program in the U.S.
Excellent reputation for producing "career-ready" graduates

b) What are some strategies that could lead to (greater) recognition?
Support student projects for presentation at national technical meetings.

8. Questions about Program Outcomes Assessment (attach additional sheets, if necessary):

a) What are the program's learning outcomes?
Graduates will have a broad understanding of the materials, processes, design principles and engineering systems utilized in the plastics industry. They will also have well-rounded general education skills.

b) What assessment measures are used, both direct and indirect?
Percent job placement and starting salaries.
Feedback from employers on interns and graduates.
Testing of students will be fully implemented by 03W.

c) What are the standards for assessment results?
100% placement with salaries at or above COT average.
Employers that are well-satisfied with our students' career preparation.

d) What were the assessment results for 2000-01?
100% placement of graduates at an average salary of $44,900 (99-00 B.S. grads)
Excellent feedback from employers on the career preparation of our grads and interns.

e) How will / how have the results been used for pedagogical or curricular change?
A course added to the curriculum in 00-01:
PLTS 410, Plastics Industry Financial Practices

9. Questions about Course Outcomes Assessment:

a) Do all multi-sectioned courses have common outcomes? **YES**

b) If not, how do you plan to address discrepancies?

c) Do you keep all course syllabi on file in a central location? **YES**

*If you have questions about the outcomes assessment portions of this survey, please contact Laurie Chesley (x2713).

Form Completed by R. Marsh, Department Director
Name and Title

Reviewed by Dean_____
Name and Date

H:Office/adminProgram Review01Plastics

SECTION III

Advisory board survey

SECTION III

Advisory board survey

Ferris State Plastics Programs' Advisory Board Survey
7 of 12 Surveys were returned

How many years have you served on the advisory board? Average = 8.57 (range = 1-26)_____

Did you attend classes in the Ferris State Plastics Program? YES (5) NO (2)

Has your company hired plastics interns or graduates from Ferris? YES (7) NO (0)

1= Very Good 2 = Good 3 = Improving 4 = Needs improvement 5 = Poor

INSTRUCTIONAL PROGRAM CONTENT & QUALITY:						
1. Is keeping with industry trends and changes:	1	2 (71%)	3 (29%)	4	5	Don't Know
2. Satisfies a broad range of industries (auto, furniture, household, etc.):	1 (43%)	2 (57%)	3	4	5	Don't Know
3. Has a good balance of hands-on vs. theory instruction:	1 (71%)	2 (29%)	3	4	5	Don't Know
INSTRUCTIONAL EQUIPMENT AND MACHINERY:						
1. Is updated to reflect latest technology used in industry:	1	2 (29%)	3 (43%)	4 (14%)	5	Don't Know
2. Is maintained in good running condition:	1 (14%)	2 (29%)	3	4 (14%)	5	Don't Know (43%)
3. Is sufficient for the number of students enrolled (students/machine in lab, number of rooms, etc.):	1 (14%)	2 (43%)	3 (14%)	4 (29%)	5	Don't Know
4. Meets health and safety standards:	1 (14%)	2 (29%)	3 (14%)	4	5	Don't Know (43%)
5. Is appropriately funded by the university (excluding grants and gifts from industry):	1	2 (14%)	3	4 (43%)	5 (43%)	Don't Know
6. Represents sound industry standards (house keeping, procedures, etc.):	1 (29%)	2 (57%)	3	4 (14%)	5	Don't Know
THE PLACEMENT SERVICES FOR THIS PROGRAM:						
1. Knows the level of need for professionals in the plastics industry:	1	2 (86%)	3	4	5	Don't Know (14%)
2. Are valuable to the student for finding employment and help students evaluate good vs. bad positions/companies:	1	2 (57%)	3 (29%)	4	5	Don't Know (14%))
3. Shows that industry comes to FSU looking for students:	1 (14%)	2 (57%)	3 (29%)	4	5	Don't Know
STAFF/PROGRAM MANAGEMENT:						
1. Is adequate in student to instructor ratio:	1 (14%)	2 (43%)	3 (14%)	4	5	Don't Know (29%)
2. Has sufficient opportunity to grow with industry (technology, etc.):	1	2 (57%)	3 (43%)	4	5	Don't Know
3. Is represented by strong leadership practices and has a voice in the university operations:	1	2 (29%)	3 (29%)	4 (29%)	5	Don't Know (14%)
4. Is actively promoting the FSU plastics program to industry	1 (14%)	2 (43%)	3 (29%)	4 (14%)	5	Don't Know
ADVISORY BOARD:						
1. Time is used wisely and input is considered/utilized:	1 (14%)	2 (43%)	3 (14%)	4 (29%)	5	Don't Know

2. Meeting agendas are representative to tasks at hand:	1	2 (57%)	3	4 (43%)	5	Don't Know
3. Meets often enough to provide proper direction to the program:	1	2 (57%)	3	4 (43%)	5	Don't Know
4. Is provided adequate and proper direction to function efficiently:	1	2 (43%)	3 (43%)	4	5	Don't Know (14%)
5. Do you feel feedback provided to the staff and program management is reviewed appropriately and given adequate consideration: Comments:	1 (14%)	2 (43%)	3	4 (14%)	5	Don't Know (29%)

Comments:

1. None

2. I feel the advisory is a good link between the university and industry. I do not feel that FSU has supported and promoted the plastics program as well as they could. FSU still is one of the premier programs in the USA but is not marketed as so. I do think the program has lost ground (status wise) since Henry Tschappat left.

3. I have not been a member of the advisory board long enough to fully appreciate the level of activity, and/or utilization of the feedback from the advisory board is being considered.

4. I'd like to see some updates during meetings regarding the status of equipment, do we conform to SPI safety standards on equipment, what degree of university funding are we receiving vs. our program overhead, feed back on comments and suggestions from previous meetings. I also feel it is a mistake to cut these board meetings back to once per year. I would also be curious what our recruitment efforts have yielded as well as what those efforts have been?

5. None

6. The advisory meetings that I have attended seem to be more of a "reporting" function, rather than a device used to guide the program. As a member, it is good to know what is going on in the program, what events are taking place, what each faculty member is doing, etc. However, the current format does not take advantage of the advisory team's experience and extension into the industry.

   Most of the decisions have already been made. Only the results are shared. I believe that each of the members would be willing to be more involved in the decision making process. The most impact that the advisors have (in the meetings currently) is sharing the student's voice (reporting what the students say when the faculty are out of the room).

   Perhaps, if the faculty holds monthly staff meetings, the minutes could be shared with the advisory members. It is possible that a board member will have input or resources available to address a topic in the meeting minutes. Doing this activity, and others, would allow the advisory members to be more involved during the year, when help is needed

7. College funding is insufficient for program needs.

Summary:

Of the 12 members on the advisory board, 7 responded to the survey, which consisted of 21 statements requiring the respondent to rate their concurrence to the statement. In addition, there was a request for comment section at the end of the survey in with 5 of the 7 responding members noted comments.

The survey results indicate a continuance of the plastics programs strong performance in hands-on versus theory instruction, satisfying a broad range of industries utilizing plastics, as well as a good keeping with the industry trends and changes. Placement services for this program are also viewed as very good to improving, which is also supported by the high placement rates and salaries for graduates.

The primary areas that continue to be of concern to respondents are the university's support of the program, both in marketing and financial support, and the extent to which the plastics program is represented by strong leadership practices and has a voice in the university operations.

SECTION IV

Plastics Alumni survey

Alumni survey

Surveys were mailed to alumni going all the way back to 1971, the first graduating class from the plastics program. We sent 822 surveys and 39 were "returned to sender" resulting in 783 surveys in the hands of alumni. 148 surveys or 18.9% were returned. No follow up mailings were attempted, due mainly to financial constraints.

The somewhat large response, spanning all the graduating classes, would appear to make the data significant. Attached is the cover letter that was enclosed with the survey, the survey and a summary of the results. The survey has total responses bolded when appropriate.

Number of responses (percentage) per period

YOG	BS raw number(percent)	AAS raw number(percent)
2000+	25 (17%)	3 (2%)
95-99	44 (30%)	2 (1.3%)
90-94	30 (20.5%)	4 (2.7%)
85-89	17 (11.5%)	3 (2%)
80-84	2 (1.3%)	5 (3.5%)
Before 80		12 (8.1%)
TOTAL	**118 (80.3%)**	**29 (20%)**

FERRIS STATE UNIVERSITY

June 30, 2002

Hello FSU Plastics alumni;

I hope this mailing finds you healthy and happy. Also, I hope you and your family are prospering in all your endeavors.

As most of you have experienced in the past, the University requires our program to conduct an extensive review every 6 years. This review entails gathering data from employers, current students, labor market statistics, our advisory board and the programs' alumni. We view the alumni as a valuable resource in the review process mainly because you have experienced the program curriculum and are now applying your skills in industry. We need your help! To assure statistical significance, we need your response. Please fill out the enclosed survey now and return to FSU in the postage paid envelope. For those of you who would like to "reflect" prior to responding we would appreciate your response by July 31, 2002. If you are a procrastinator you can also fax your response to the Plastics program (231) 591-2642.

If you have any questions you can contact Jill (yes she is still here!) in the Plastics and Rubber program offices at (231) 591-2640. Of course all of the faculty would enjoy hearing from alumni, if you just feel like *touching base,* feel free to call any one of us!

On an important note our freshman class has not completely filled for this fall. If you know of any perspective students have them contact the plastics program office.

Since I have your attention I would like to inform you of two important dates.

1. The FSU SPE golf outing (This has all but become an alumni event, get your old gang together for a great day!) September 20th at Falcon Head ("the creek") golf club, Big Rapids
2. NPE (plastics) alumni reunion. Tuesday June 24, 2003
   Piece Restaurante, 1927 W. North Ave., Chicago, IL
   Still in the early planning stages see "plastics web site" (www.ferris.edu/plastics) for more information. It will also be posted at the NPE.

Sincerely;

Robert Speirs
Program review Chair

NATIONAL ELASTOMER CENTER
PLASTICS AND RUBBER ENGINEERING TECHNOLOGY DEPARTMENT
COLLEGE OF TECHNOLOGY
919 Campus Drive, NEC 211, Big Rapids, MI 49307-2277
Phone 231 591-2640 Fax 231 591-2642

Ferris State University
Plastics Program Review – Alumni survey Tally

1. When did you receive your "Plastics" degree(s) from Ferris?
   A. A.A.S. _____
   B. B.S. _____

2. What is the highest degree you have earned? Please complete all of the following.

Diploma	Degree Title (major)	College University	Year
AAS	_____	_____	____
BS	_____	_____	____
MBA	_____	_____	____
MS/MA	_____	_____	____
Doc. Sci.	_____	_____	____
PHD	_____	_____	____

3. Are you currently employed in the Plastics industry?
   A) Yes B) No

   If you are not in the plastics industry, why did you leave?

   _____

4. How many years have/were you employed in the plastics industry? _____

5. How many job changes have you made since graduating from FSU? _____

6. Check the following which best describes the function you perform

A) Sales and Marketing	(24)	H) Quality control/ quality assurance	(7)
B) Process/production eng.	(33)	I) Cost estimating	(1)
C) Management Title: _____	(13)	J) Purchasing	(1)
		K) Mold design	(1)
D) Product design and dev.	(19)	L) Mold making	(1)
E) Technical service	(6)	M) Mold repair and maintenance	(1)
F) Education and training	(4)	N) Partner/owner	(4)
G) Project management	(34)	O) Contract engineer	(1)
		P) Other	(7)

7. Check the title that is closest to yours:

A) Engineer	(61)	G) Production manager	(1)
B) Senior engineer	(20)	H) Plant manager	(2)
C) Eng. supervisor/manager	(14)	I) Vice president	(2)
D) Engineering consultant	(5)	J) President	(2)
E) Sales and marketing rep.	(10)	K) Owner	(3)
F) Sales and marketing mgmt	(12)	L) Other: _____	(7)

8. Check all the processes your company has in house

A) Injection molding	(107)	B) Compression molding	(13)	C) Transfer molding	(4)
D) Thermoforming	(30)	E) RIM	(13)	F) Decorating	(47)
G) Assembly	(88)	H) Blow molding	(24)	I) Composite constr.	(8)
J) Extrusion	(30)	K) Other _____	(0)		

9. Check all the processes your company uses (external) to satisfy its customers

A) Injection molding	(81)	B) Compression molding	(13)	C) Transfer molding	(1)
D) Thermoforming	(38)	E) RIM	(9)	E) Decorating	(47)
G) Assembly	(61)	H) Blow molding	(24)	I) Composite constr.	(8)
J) Extrusion	(40)	K) Other _____	(0)		

10. What is your employment location? City/State? _____

11. What industry segment do you work in?
    A. Automotive
    B. Furniture
    C. Medical
    D. Computers/electronics
    E. Recreational products
    F. Household goods
    G. Packaging
    H. Other (specify) _____

12. Have you attended additional courses or seminars since you left FSU?
    A) Yes B) No Course/seminar title: _____
    (If more room is required add list to the reverse side of page)

13. Would you be interested in a "refresher" course offered by FSU plastics? If yes what subject(s) would you like covered?
    A) Yes B) No Course/seminar title: _____
    (If more room is required add list to the reverse side of page.)

14. How would you rate the following? (Circle)
    1= Very Good 2= Good 3=OK and improving 4=OK but worsening 5= Poor to terrible

(3.3)	A).	1 2 3 4 5	the economy
(2.5)	B).	1 2 3 4 5	Environmental issues affecting your company
(3.1)	C).	1 2 3 4 5	Ability to hire additional technical employees
(2.7)	D).	1 2 3 4 5	Salaries
(2.8)	E).	1 2 3 4 5	Benefits
(2.3)	F).	1 2 3 4 5	Career choice
(2.3)	G).	1 2 3 4 5	Health of the plastics industry
(2.5)	H).	1 2 3 4 5	Job change opportunities within the industry
(2.3)	I).	1 2 3 4 5	Career growth opportunities

15. While attending FSU, how do you feel you were treated about the following subjects? (Circle)
    1= Received extra attention 2= Very good 3= Acceptable
    4= Needs improvement 5= Very poor

(2.6)	a) 1 2 3 4 5	Scheduling support and advising
(2.5)	b) 1 2 3 4 5	Schedule (prerequisites) flexibility of plastics courses
(2.6)	c) 1 2 3 4 5	Schedule (prerequisites) flexibility of all required courses
(2.6)	d) 1 2 3 4 5	Course offerings, time of day
(2.7)	e) 1 2 3 4 5	Course offerings, number of sections
(2.1)	f) 1 2 3 4 5	Size (number of students) of "plastics" lectures
(2)	g) 1 2 3 4 5	Size (number of students) of "plastics" labs
(2.6)	h) 1 2 3 4 5	Size of "other" courses attended at FSU
(2)	i) 1 2 3 4 5	Plastics faculty availability for extra help
(2.2)	j)1 2 3 4 5	Understanding of the internship program
(2.5)	k)1 2 3 4 5	Availability of internship positions

16. Please address the following issues, which are being discussed as possible changes at FSU and give them a rating.

1= Strongly agree 2= Agree 3= No opinion
4= Oppose 5= Strongly oppose

a) 1 2 3 4 5 Increasing the global focus of the curriculum (2)
b) 1 2 3 4 5 Increasing the entrance requirement for all incoming Freshmen (2.5)
c) 1 2 3 4 5 Increasing the entrance requirements for all "Plastics" freshmen (2.5)
d) 1 2 3 4 5 Reduce the entrance requirements for all "Plastics" freshmen (3.7)
e) 1 2 3 4 5 Reduce or eliminate the GPA requirements to advance from the A.A.S. program into the B.S. program (4)

17. Please review the following methods to support the plastics programs and identify those areas which you are willing to help with by rating each area.

Would you like us to contact you? Yes No (If yes, we need the contact information below.)

1= Willing to help 2= Will help if arm is twisted 3= Not willing

a) 1 2 3 Influence employer to make a financial donation
b) 1 2 3 Influence employer to make an equipment donation
c) 1 2 3 Assist in developing student scholarships
d) 1 2 3 Assist in recruiting local perspective students
e) 1 2 3 Improve increased plastics program visibility on campus
f) 1 2 3 Improve increased plastics program visibility in your region

18. In reviewing the attached course check sheet, which courses would you add or expand? Which would you delete?

19. We have seen declining enrollment for the past 2 years. Most of our students choose plastics because of personal referrals. Are you less likely to recommend the Ferris Plastics Program than you were two years ago? Yes No

If "Yes", why? ___ Lack of employment security
___ Too much stress in this industry
___ Concerns regarding the quality of the Ferris Plastics Program
___ _____

Optional – address (Database for alumni to contact past classmate)

Personal information:

Name: _____

Address: _____

_____

E-mail: _____

Phone: _____

Thank you in advance for you assistance!

Robert G. Speirs, Professor-Plastics programs, FSU

Summary of results:

Of the respondents polled 80% were Bachelors graduates in Plastics Engineering Technology while 19.7% were Associates graduates. As shown in table #1, the ratio of BS to AAS graduates was very high in recent years, while before 1980 only AAS graduates responded. There are two facts one can draw from this information. First, there was only an AAS offered before 1983, and second many enrolling students now intend on receiving a BS at entrance and will do whatever necessary to achieve this goal, including retaking courses to improve their GPA.

Distribution of survey reponsents.

Table #1

				Still in Plastics	
YOG	BS	AAS		Y	N
2000+	25	3		27	1
95-99	44	2		40	6
90-94	30	4		27	7
85-89	17	3		18	2
80-84	2	5		6	1
Before 80		12		7	5
TOTAL	118	29		125	22

An interesting piece of information was the results of question #3: "Are you still employed in the plastics industry?". Twenty two (see table #1) of the respondents or 14.9% said they were no longer employed in the plastics industry. Reasons ranged from "I am a full time mom" to "That is a good question". Many stated that their career path took them away from the plastics industry while still in the same company.

Regarding additional education, 19.7% of the respondents received additional degrees after receiving their "plastics degree." Table 2 list the degrees received by FSU Plastics graduates. In the early years, before the BS, many of the students went on at FSU and received degrees in Marketing and Management. More recently, many alumni continue their education by earning an MS in management or MBA, as demonstrated by 20 of the survey respondents (13.6%) stating they received one of these degrees. The survey also identified one alumnus who is working towards a Phd in Engineering.

Table #2

Advanced degrees obtained by FSU Plastics Graduates	**Number earned**
Master in Business administration	11
Masters in technology management	7
Master of Science	3
Executive management training	1
PHD	1
Additional BA/BS	6
TOTAL	29

"Years of experience" ranged from less then 1 to 30 years of experience. There is no surprise in this data but it does depict a good cross section of alumni. The majority of the respondents (68%) had 10 or less years of experience. See Table 3.

Table 3

YOG		Years of plastics industry experience																									
2000+	<1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	30
95-99	8	9	8	1		1																					
90-94	1		3	3	7	9	10	5	4		1				1												
85-89	2					1		3	5	2	8	4	5	2	2												
80-84									1	1	3	1	2	2	4	2		2	1			1					
Before 80																			3		3	1					
						3			1						1						1		1		1	3	1
TOTAL																											
	11	9	11	4	7	14	10	8	11	3	12	5	7	4	8	2		2	4		4	4	1		1	3	1

Question number 4 asks: "How many job changes have you made since gradating?". The majority had fewer than 3 job changes. A slightly disconcerting piece of information is about 10% of the alumni surveyed had switched positions 5 or more times. See table 5.

Table 4

	Job changes									
YOG	0	1	2	3	4	5	6	7	8	10
2000+	23	4	1							
95-99	13	7	13	7	3		1			
90-94	4	5	8	12	3	3	1			
85-89	3	1	2	5	5	3				
80-84		1	1	3				1	1	
Before 80	1	2	2	2	1	2	1	1		
TOTAL	44	20	27	29	12	8	3	2	1	146
					"Not in industry" 1					

Results for questions #6 though #9 can be viewed on the attached survey tool.

Question #6 discussed the job description that best describes your current position. As shown on the attached survey, the most frequently identified description are "project management" (34 responses) and "process/product engineering" (33 responses), which is the target function for an FSU plastics degree. Interestingly, the third high response description was "sales and marketing", which is an area that the plastics programs do not focus on. The other notable response was "product design and development." This is also an area that the plastics degree programs focus on.

Question #7 asked to define the "title" that best describes their current position. The vast majority (81 responses) selected either "engineering" or "senior engineer". This is no surprise as the majority of the jobs, that students apply to have "engineer" in the posting. A slight surprise was 5 alumni selected engineering consultant as the best-fit job title.

Question #8 asked what processes (identify all) "your company has in-house." Not surprisingly "Injection molding," the single latest manufacturing process used in the plastics industry, received the most responses, 86% (107), followed by assembly 70% (88) and decoration 38% (47). These processes are often used in conjunction with an injection molded product. Somewhat surprising, based on the limited exposure gained at FSU, was the number of responses for extrusion (30), thermoforming (30) and blow molding (24). Item K, "other", identified unique processes with no repetition; not surprising most of these processes are not extensively discussed in the programs' curriculum. This indicates that the program has focused on the information that is most valuable for the student.

Question 10 asked the alumnus where they current live. Not surprising 106 (72%) of the alumni live in Michigan. The majority of them are in greater Detroit following by the Grand Rapids area. Table 5 shows the states where the responders live. It should be noted that 17 different states were mentioned; this is an indication of the programs value nationally of course as a state funded institution, it is desired to see a majority of alumni stay in the state.

Table 5

ALUMNI LOCATION	Number
Greater Grand Rapids	27
Holland area	16
Northern Detroit	31
So. Detroit	5
Midland/Flint	7
No. Michigan	9
Thumb area	3
Kalamazoo area	5
Central Michigan	3
Ohio	4
Indiana	5
Minnesota	2
Wisconsin	2
Florida	2
Kentucky	3
New York	1
North Carolina	1
Washington	1
Tennessee	1
Colorado	2
Texas	1
Pennsylvania	1
Missouri	1
Oregon	1
California	1

Question #11 asks the alumni to identify the industry sectors that they work in. The automotive industry was most identified, not surprising with FSU's proximity to Detroit. Table 6 shows all the frequency the industries were identified.

Table 6

Industries working with	Times identified
Automotive	102
Computer/electronic	28
Furniture	25
Medical	20
Household	20
Recreation	20
Packaging	14
Education	4
Marine	1
Compounding	1

Question 12 and 13 discussed seminars and additional training that alumni had received since they graduated. Table 7 identifies the most frequently mentioned training attended and table 8 are the "suggested" training alumni would come to FSU to attend.

Many of the seminars attended are subject areas included in the current curriculum. Older alumni may have had these subjects in their curriculum, and though they were covered well, but many of the newer alumni stated that the courses, although valuable, did not adequately cover the desired subjects. It is important to note that much of the training subjects alumni attended are included in the current curriculum. It is plausible that some of the respondents did not retain the information shared or the subject was identified using an acronym the alumni have not heard.

Table 7

Most frequent seminars attended by alumni	Frequency
RJG Technologies (Injection molding training)	17
Project/program management	8
GD & T	6
Design of Experiments	5
Mold making and design	5
Injection Molding (advanced)	4
ISO training	3
Management	3
6 sigma	2
FMEA	2
Plastics product design	2
Hydraulic Maintenance	2
Negotiation skills	2
Problem solving	2
40 Others	

Table 8 is very valuable information as it suggests FSU plastics could offer different training as part of an "outreach" or seminar series. Unfortunately the number of suggestions (see table 8) is rather low, and therefore not statistically significant. But nonetheless, it still gives an indication of subject that has potential. The potential subjects include *Tool/Mold design (advanced),*

Plastics polymer selection & Characterization, Program/project Management, Advanced injection molding & Troubleshooting, and Plastics industry finance

Table 8

Suggested seminars for FSU to offer	# Times mentioned
Tool/Mold design (advanced)	10
Plastics polymer selection & Characterization	8
Program/project Management	5
Advanced injection molding & Troubleshooting	5
Plastics industry finance	5
Moldflow training	4
20 other suggestions	

Question 14 was intended to determine how the economy is perceived and if a plastics career is still viable and the plastics industry is pretty healthy. The responses generally indicated that the economy was poor and there will not be prolific hiring occurring (positions available). In addition, the consensus was that salaries and benefits are acceptable in the industry. All the alumni seemed to think plastics was still a good career choice and had a lot of career growth potential.

Question 15 asked the alumni how their experience was while attending FSU. Generally the alumni thought the scheduling and scheduling support were pretty good. They thought the number of sections offered and the times offered could be improved slightly and thought the size of the lecture and labs were good. The alumni felt strongly positive about the availability of extra help and were in full understanding of the intern program. This seems to indicate that the program schedule could be improved slightly and that the program is very good and has very attentive faculty.

Question 16 asked the alumni about how the program should change (if necessary). The alumni opposed a reduction in entrance requirements for incoming freshmen and for students moving on to the BS, Plastics Engineering Technology. They did propose however think a more "global focus" should be infused in the curriculum.

Question 17 focused on program support and recruiting. Many of the alumni did not answer these questions. In general they were interested in influencing their employer for donations (equipment or cash). Thirty percent indicated they would assist in recruiting a local student and 35% suggested that they would help increase the plastics program's visibility in their region. This indicates a pretty strong sentiment towards assisting the program in recruiting and that an alumni recruiting system should be developed to harness this manpower. Initially those alumni who identified themselves as interested in helping to recruit will be placed in a database for future use, once a viable program is devised.

Question 19 was discarded due to error in the wording and format.

Alumni were asked to review the current plastics program check sheet and develop comments about what they feel should be added or deleted. All comments attached at the end of this section. To summarize, generally there were trends identified within the comments they are:
Chemistry: Older alumni thought there should be more chemistry in the program while newer alumni suggested getting rid of chemistry 211.

Tooling: Generally, all alumni thought there should be an increase in the tooling/mold/design component of the curriculum. In addition, it was suggested to increase blueprint reading and CAD work.

Older alumni generally thought there should be more emphasis on the **MGFE** (manufacturing core) because many of them are working in plants on process optimization projects.

Program/project management: Many alumni suggested increased emphasis on project management skills including ISO standards, PPAP, PFMEA and Lean manufacturing.

There also was a little discussion regarding upgrading the program, **for accreditation**, with engineering courses like calculus and calculus based physics.

Conclusions:

1. There was an 18.9% response.
2. The survey was responded to by predominately (80%) BS graduates.
3. 80% of the alumni are in Michigan
4. 14.9% of the respondents are no longer employed in the plastics industry
5. 19.7% of the respondents have an additional degree
6. On average the respondents changed companies twice.
7. The alumni still work with plastics work most closely with injection molding (85%), plastic part assembly (70%) and decoration (38%).
8. The industries the alumni work with are: automotive industry, consumer/electronics and the furniture industry.
9. Suggested training programs should include *advanced tooling design, Plastics materials selection and characterization, program management, and Injection molding troubleshooting.*
10. Alumni generally felt
    - Industry is improving (but hiring will be sluggish)
    - Plastics is still a good career
    - The program has an acceptable class schedule (could be improved)
    - The faculty were attentive to student needs
    - Strongly against changing entrance requirements for incoming freshman or juniors.
11. Suggested adding more Tooling (and CAD), Project program management and materials to the curriculum.

    Most of the curricular suggestions is material which is already in existing courses, some of which has been added since respondents graduated.

Comment made by Alumni regarding current curriculum

(AAS '79) I have been away from plastics for 23 years. So I'll be of little helping your plastics curriculum. St. Louis Community College is starting a 2-year program in plastics. There may be recruits in a couple of years.

(AAS '75) Expand physics add plastics economics

(BS'84) Add project management advanced Material compatibility course, Reliability course, Process improvement course

(BS '85) Still think it is a good program & good school. And students can easily get a job when finished.

(BS '85) Add preventative maintenance and mod repair info (weld, grain, etc.) Delete Chem.

(BS '85) Add supervisory and/or management course & PLC ladder logic

(AAS '86) Add ISO/QS quality stds. Class, mandatory knowledge in most industries

(BS '88) More organic Chemistry. More organizational behavior classes.

(BS '88) Delete EEET 201 add CAD requirement

(BS '88) Add process simulation. Add advanced testing and materials characterization More electives (Social and cultural) out of BS.

(AAS '89) More finance, statistical processes, material selection awareness.

(BS '89) I would add some CAD courses, more Blue print reading and project management courses

(BS '89) Compounding and materials should play a bigger role in curriculum; there is too much emphasis in injection molding. I can pay a mold tech for $20K/year, but can't find an engineer who knows about materials.

(BS '94) Automotive management skills are a must, i.e. APQP, QS9000, ISO etc., GD & T relative to blueprints is a must for automotive

(BS '94) More tooling (steel types textures), more blue prints/specifications, more quality systems

(BS '94) Expand MFGE 353, MFGE 351 and EEET 301

Alumni

(BS '93) Add more polymer chemistry, polymer additives, compounding

(BS '94) Expand EEET 201, PLTS 212, MECH 250,CHEM 211, and PLTS 312

(AAS '90) I like this better then what I went though ('86-90)

(BS '92) More tooling or straight tooling courses added, Microsoft "project" & "Excel" mandatory (add typing to improve efficiency)

(BS '93) Add Adhesive course, blueprint reading & interpretation, static and strengths

(BS '93) Have accredited courses!

(BS'93) Expand elastomer and rubber materials

(BS '93) Program management, PPAP process, quote process

(BS '93) Expand controls for automation and statistical quality control

(BS; 93) Expand ETEC 140, PLTS 223, PLTS 212, and EEET 301; add a course on secondary equipment.

(BS '90) Add Project management

(BS '90) The schedule looks like no change in 10 yrs. need more technical information for materials flow and six sigma & root cause investigation.

(BS '90) I think PLTS 300 is new, so that helps. Statistics and program management was weak

(BS '90) Expand tooling and public speaking

(BS '90) Add more business and financial subjects that would include financial justification. Also would include more tooling and print reading

(BS 98) PLTS 411 Expand

(BS '98) Increase focus (PLTS 211) on injection molding machine understanding

(BS '98) Expand on PLTS 320 & MFGE 353 (or add materials and quality related courses)

(BS '99) Add processing course that details thermoforming and blow molding, etc.

Alumni

(BS '99) Add/Expand Advanced injection molding & PLTS 320. Delete Fluid power, MECH 250 (waste of time)

(BS '97) Add 1 semester of Calculus and Applied logic – good for circuits and controls as well as general analytical writing.

(BS '96) Expand MFGE 351, MFGE 451 and PLTS 300. Expand PLTS 312 to include six sigma philosophy or equivalent, design for zero defects

(BS '98) Add tolerance stack ups between parts. More design

(BS '96) Add calculus 1 & 2 and Calculus based Physics and statics and strengths.

(BS '96) Add composites engineering technology (theral set resin systems and composites.

(BS '97) More Business class requirements. Industry wants engineers that can make financial decisions for their companies.

(BS '97) Recommend more CAD more project management

(BS '97) Focus on GD&T in part design or print reading class, Expand mold design, part design Cad-solid modeling remove electronics classes

(BS'97) I had no experience in Lean manufacturing, six sigma, not enough program management, estimating/quoting/negotiating, product start-up/launches (PPAP, PFMEA)

(BS '97) Additional electrical and hydraulic courses. Expand tool design.

(BS '98) Expand all processing classes and project engineering/management

(BS '98) Expand all processing course (or another added)

(BS '98) I would require an intern to be process related.

(BS '96) Stronger focus on GD&T and how part design and materials selection tie together. Add finance, add more hydraulics and programming PLC, Add maintenance component to labs, more PLTS 499 one semester sooner.

(BS '95) Expand MFGT 150, PLTS 312, PLTS 411, MFGE 353, PLTS 410, EEET 301 and add/include Moldflow, CAD, FMEA's, QS procedures, PPAP requirements/qualifications. Delete MECH 250, COMM 121, ENGL 311.

Alumni

(BS '96) Expand in fundamentals of tooling

(BS '96) Add, "Lean manufacturing to MFGE courses. Expand CAD requirements

(BS '96) Delete MFGE 340

(BS 96) Expand/add materials/compounds/buying/selling/regrind, VOCs

(BS'96) Add internships (I would have done more if I could do it over)

(BS '96) Expand Chemistry/materials aspects (but that's me)

(BS 96) More emphasis on business courses, and more automotive related courses.

(BS '95) Increase PLTS 212 & 312 increase knowledge of parting lines, draft, and tool action.

(BS '95) More plastics processing; broader- more processes.

(BS '95) Delete Statics and strengths

(BS '95) need info on hot runners/advances in injection molding

(BS '95) Delete electives (Soc. And Cult.) Add more MECH 340 and more "stats" (MFGE 353)

(BS '02) New teacher for CHEM 211, more calculus and Stats. I think there should be more of an engineering focus within the program and classes to add. I would also recommend another scientific injection molding class to better peruse what happens on a molecular level.

(BS '02) Expand fluid power, Ind., Manufacturing Engineering.

(BS '02) Expand PLTS 320, PLTS 321, and PLTS 312. Delete CHEM 211, EEET 310 (317)

(BS '00) Delete CHEM 211, ENGL 311, Expand PLTS 410 and move to earlier in the program PLTS 499.

(BS '02) Delete PLTS 499 I think students know how to write a resume and cover letter by their last semester. Class should be offered late 1st year or 2nd to benefit interns. Process labs need robotics.

Alumni

(AAS'01, BS 03?) Delete requirements on Cultural enrichment and Soc. Aware. They are pointless and keep the students here longer than needed.

(BS '01) Add Controls for automation and add a course in programming types of robots

(BS '01) Expand project management. Delete CHEM 211

(BS '01) Add more physics and general mech. Engineering Increase emphasis on PLTS 212, PLTS 312, MECH 340, PLTS 300, and MFGE 353

(BS '01) Increase mold making content

(BS '01) Add expand tooling. Delete Fluid power and control, and social awareness elective.

(BS '00) I believe the curriculum is set up well right now.

(BS '00) Delete MFGE 451, Expand EET 301 and MECH 250

(BS '00) Expand Fluid power and controls and plant engineering. Add Calculus – I need for my continued education.

(BS '00) Add statistics as a required course.

SECTION V

Perceptions of Plastics program faculty

Ferris State University Plastics Program Review Survey for the Plastics Faculty

Please take a moment to fill out this survey. It will be used together with other sources of input to obtain an accurate assessment of the plastics programs. This assessment will then be used to set a direction for the future of our plastics programs.

Faculty Perceptions on the Plastics Programs

This survey instrument uses a scale ranging from +5 to –5. You are to write into the box [ ] that precedes each statement a number between +5 an –5 to represent your opinion. +5 represents you are highly positive about (or agree with) the succeeding statement. A –5 represents you are very negative (or disagree with) that statement. A 0 then represents a neutral response (or an ambivalence). Feel free to use any integer between the extremes to represent the degree of your response. If you would like to justify any of your responses please include them in the 'Comments Area' on the last page of this survey and please identify which statement number you are referring to for each comment. When completed, please return this survey to Greg Conti. Thank You for participating.

[+5] 2. The plastics programs should use one instructor to teach the lecture and another to conduct the lab.

[4.57] 28. The plastics programs includes information which is valuable to students once they have entered the work force.

[4.14] 35. Instructional facilities meet the program objectives and students' needs, are functional, and provide maximum flexibility and safe working conditions.

[+4] 16. There are currently too many PLTS classes required in the curricula (AAS/BS).

[+4] 42. Supervising of students during their internship should be centralized.

[3.57] 25. Opportunities are provided for related work experience, cooperative education, or internship for students in the program.

3.57 30. Student-to-faculty ratio in this program is sufficient to permit optimum program effectiveness.

-3 24. Applicable supportive courses are closely coordinated with this program and are kept relevant to the program goals and current to the needs of the student.

2.86 3. The plastics programs should have two entry points (in different semesters) into the programs.

2.86 37. Instructional materials and supplies are readily available and in sufficient supply to support quality instruction.

-2.86 11. Adequate funds for faculty development are available to the plastics faculty.

2.71 32. Office and clerical assistance is available to instructors and used to ensure maximum effectiveness of instructors.

2.57 14. The plastics and rubber programs should continue to remain a department.

-2.57 17. There are adequate funds available for equipment and supplies to operate the plastics labs.

2.43 34. Equipment for this program is operational, safe, and well maintained.

2.29 31. Paraprofessionals (aides or laboratory assistants) are used when appropriate to provide classroom help to students and to ensure maximum effectiveness of instructors in this program.

2.14 10. Minors should be offered in plastics.

-2.14 12. The plastics programs should pursue an attitude of growth at the expense of quality to increase enrollment.

1.86 39. Fund allocation is consistent with the objectives of this program and based on instructor input.

1.43 19. The plastics computer labs have adequate hardware available (to run the software) for student use.

1.29 27. Potential students of this program are not discouraged by unrealistic pre-requisites.

1.29 1. The plastics programs should have only one instructor per course when possible.

1.14 23. Current follow-up data on graduates are consistently and systematically used in evaluating this program.

1.14 38. Funds are allocated to provide for new equipment as well as new equipment replacement and repair.

1 18. The plastics computer labs have adequate technology (software) installed and available for student use.

1 26. Student internship participation is well coordinated with classroom instruction and employer supervision.

1 15. The plastics advisory board has adequate input and influence in the direction and actions taken by the plastics programs.

.86 33.Equipment used in this program is current, representative of that used in jobs for which the students are being trained and in sufficient supply to meet the student's needs.

.57 5. The plastics program should get involved in certifying various skills within the plastics industry.

±.57 21. Current data on labor market needs and emerging trends in job openings are systematically used in developing and evaluating this program.

±.57 36. Scheduling of facilities and equipment is planned and used in a manner consistent with quality instruction.

±.57 41. The current number of students assigned to each advisor is manageable.

.43 4. The plastics programs should operate year round (to include the summer semester for classes as opposed to being reserved for internships only).

.43 6. The plastics program should offer certificates in plastics.

.43 7. The plastics programs should offer some of its courses for college credit via the Internet.

±.43 13. The plastics programs have adequate leadership.

±.43 22. Current data on job performance requirements and trends are systematically used in evaluating course content of this program.

±.29 8. The plastics programs should offer some of its courses off-campus (this is to include other academic institutions and facilities as well as industrial sites).

±.14 9. An advance degree is needed in the plastics program area.

±.14 20. The plastics courses in both programs are adequately integrated.

±.14 40. The plastics programs and the rubber programs should be combined.

0 29. The University has an effective system for locating jobs and coordinating placement for students in this program.

Comments:

Scheduling of classes is consistent with good learning, logic, and optimization. NO –5

Is the current level/trend of enrollment acceptable? NO –5

Are current course titles/offering optimum to meet needs (all courses) –3 We need to maintain a degree of freedom ie. sufficient electives to meet changing market

Our programs are underfunded for:

1) Faculty development
2) Lab. Equipment purchase

Statement 34 – Low score indicates processing equpment not functional ie. DIMA/Engle/cupmold

Statement 29 – Unsure

Statement 31 – Unsure

Statement 41 – No feedback indication effectiveness of our advising

Summary of Results for the Plastics Faculty Perception Survey

On September 9, 2002 the Faculty Perception Survey instrument was delivered to all seven plastics faculty members. All survey forms were returned within 24 hours and the results tabulated (see table that follows). The numerical responses were averaged per statement and then sorted by decreasing absolute numbers. This then represents a sorting by degree of response. Only the strongest (most unanimous) responses are summarized here. These are responses that averaged +/-3.0 or greater.

With an average response of 5, the faculty unanimously believe there are advantages to having the same instructor teach both lecture and all corresponding labs.

It is strongly agreed to that all information taught is of great value to students as they enter the workforce. It is also agreed to that the instructional facilities are adequate.

The faculty feel that amount of instructional time devoted to plastics topics is either adequate or may be lacking.

It is also believed that the interests of both student and employer during and internship is best served by being faculty supervised and administrated.

The industrial internship experience is integral to the plastics program.

Currently the student-to-faculty ratio allows for optimum program effectiveness.

Finally the support courses need to be more closely coordinated with the plastics program and needs to be reviewed for relevancy.

Ferris State University Plastics Program Review Survey for the Plastics Faculty

Please take a moment to fill out this survey. It will be used together with other sources of input to obtain an accurate assessment of the plastics programs. This assessment will then be used to set a direction for the future of our plastics programs.

Faculty Perceptions on the Plastics Programs

This survey instrument uses a scale ranging from +5 to –5. You are to write into the box  that precedes each statement a number between +5 an –5 to represent your opinion. +5 represents you are highly positive about (or agree with) the succeeding statement. A –5 represents you are very negative (or disagree with) that statement. A 0 then represents a neutral response (or an ambivalence). Feel free to use any integer between the extremes to represent the degree of your response. If you would like to justify any of your responses please include them in the 'Comments Area' on the last page of this survey and please identify which statement number you are referring to for each comment. When completed, please return this survey to Greg Conti. Thank You for participating.

 1. The plastics programs should have only one instructor per course when possible.

 2. The plastics programs should use one instructor to teach the lecture and another to conduct the lab.

 3. The plastics programs should have two entry points (in different semesters) into the programs.

 4. The plastics programs should operate year round (to include the summer semester for classes as opposed to being reserved for internships only).

 5. The plastics program should get involved in certifying various skills within the plastics industry.

 6. The plastics program should offer certificates in plastics.

☐ 7. The plastics programs should offer some of its courses for college credit via the Internet.

☐ 8. The plastics programs should offer some of its courses off-campus (this is to include other academic institutions and facilities as well as industrial sites).

☐ 9. An advance degree is needed in the plastics program area.

☐ 10. Minors should be offered in plastics.

☐ 11. Adequate funds for faculty development are available to the plastics faculty.

☐ 12. The plastics programs should pursue an attitude of growth at the expense of quality to increase enrollment.

☐ 13. The plastics programs have adequate leadership.

☐ 14. The plastics and rubber programs should continue to remain a department.

☐ 15. The plastics advisory board has adequate input and influence in the direction and actions taken by the plastics programs.

☐ 16. There are currently too many PLTS classes required in the curricula (AAS/BS).

☐ 17. There are adequate funds available for equipment and supplies to operate the plastics labs.

☐ 18. The plastics computer labs have adequate technology (software) installed and available for student use.

☐ 19. The plastics computer labs have adequate hardware available (to run the software) for student use.

☐ 20. The plastics courses in both programs are adequately integrated.

☐ 21. Current data on labor market needs and emerging trends in job openings are systematically used in developing and evaluating this program.

☐ 22. Current data on job performance requirements and trends are systematically used in evaluating course content of this program.

☐ 23. Current follow-up data on graduates are consistently and systematically used in evaluating this program.

☐ 24. Applicable supportive courses are closely coordinated with this program and are kept relevant to the program goals and current to the needs of the student.

☐ 25. Opportunities are provided for related work experience, cooperative education, or internship for students in the program.

☐ 26. Student internship participation is well coordinated with classroom instruction and employer supervision.

☐ 27. Potential students of this program are not discouraged by unrealistic pre-requisites.

☐ 28. The plastics programs includes information which is valuable to students once they have entered the work force.

☐ 29. The University has an effective system for locating jobs and coordinating placement for students in this program.

☐ 30. Student-to-faculty ratio in this program is sufficient to permit optimum program effectiveness.

☐ 31. Paraprofessionals (aides or laboratory assistants) are used when appropriate to provide classroom help to students and to ensure maximum effectiveness of instructors in this program.

☐ 32. Office and clerical assistance is available to instructors and used to ensure maximum effectiveness of instructors.

☐ 33. Equipment used in this program is current, representative of that used in jobs for which the students are being trained and in sufficient supply to meet the student's needs.

☐ 34. Equipment for this program is operational, safe, and well maintained.

☐ 35. Instructional facilities meet the program objectives and students' needs, are functional, and provide maximum flexibility and safe working conditions.

☐ 36. Scheduling of facilities and equipment is planned and used in a manner consistent with quality instruction.

☐ 37. Instructional materials and supplies are readily available and in sufficient supply to support quality instruction.

☐ 38. Funds are allocated to provide for new equipment as well as new equipment replacement and repair.

☐ 39. Fund allocation is consistent with the objectives of this program and based on instructor input.

☐ 40. The plastics programs and the rubber programs should be combined.

☐ 41. The current number of students assigned to each advisor is manageable.

☐ 42. Supervising of students during their internship should be centralized.

Comments Area:

SECTION VI

Employer perceptions

Employer Evaluation of Ferris State Plastics Students

Company Name: _____

Approximate Number of Employees at Your Location: _____

Approximate Number of Ferris State Graduates Hired in the last 5 years: _____

Approximate Number of Ferris State Interns Hired in the last 5 years: _____

Custom or Captive: _____

Check the main classifications of your company:

____ Injection Molding	____ Blow Molding
____ Extrusion	____ Reinforced Processing
____ Compression/Transfer	____ Thermoforming
____ Moldmaking	____ Compounding & Formulating
____ Education/Training	____ Marketing/Sales
____ Research & Development	____ Design
____ Other _____	

Instructions: For each of the following scales, please circle the work that best fits the Ferris State graduate's/ intern's performance in the corresponding category.

	Poor				**Superior**
Employee(s) problem solving skills	1	2	3	4	5
Employee(s) technical writing skills	1	2	3	4	5
Employee(s) presentation skills	1	2	3	4	5
Employee(s) interpersonal skills	1	2	3	4	5
Employee(s) technical level	1	2	3	4	5
Employee(s) time management skills	1	2	3	4	5
Employee(s) accuracy in job performance	1	2	3	4	5
Employee(s) speed in job performance	1	2	3	4	5
Employee(s) understanding of plastics equipment	1	2	3	4	5
Employee(s) contribution towards the operation's goals	1	2	3	4	5
Employee(s) understanding of plastics terminology	1	2	3	4	5

Would you hire another Ferris graduate or intern? Yes _____ No _____

Please comment on employee(s) strengths and weaknesses, especially as they relate to their educational preparedness: _____

_____

_____

_____

_____

_____

PLASTICS EMPLOYER SURVEY

Many of the 21 employers who returned surveys have hired several graduates and/or interns. Royal Plastics has hired 10 graduates and Eimo Americas (formerly Triple S Plastics) has hired 8.

The employer ratings were generally good, averaging 3.84 on a scale of 1 – 5, with 5 being the highest. We received high marks for technical level, understanding of plastics equipment, contribution towards the operation's goals and understanding of plastics terminology. The lowest scores were in speed in job performance, technical writing skills and problem solving skills.

The written comments reflect the numerical ratings, with the exception of "speed." There were several compliments on the graduates' understanding of processing and equipment, although there was one contrary opinion on this. There skills were several comments on the lack of writing and presentation skills. One employer felt that our interns were lacking skills in knowledge of quality management systems. These are covered in PLTS300, Plastics Engineering Management Systems, and MFGE353, Statistical Quality Control, which are B.S.-level courses. A.A.S. interns would not have this knowledge.

Relevant Skills	Rating (mean)
problem solving skills	3.65
technical writing skills	3.62
presentation skills	3.81
interpersonal skills	3.72
technical level	4.06
time management skills	3.70
accuracy in job performance	3.70
speed in job performance	3.59
understanding of plastics equipment	4.29
contribution towards the operation's goals	3.94
understanding of plastics terminology	4.18

Conclusions

The core of the curriculum appears to be well-received by the employers of our interns and graduates. We apparently need to have additional focus on problem-solving skills in current classes.

The issue of "speed" may not be a real shortcoming, since there were no written comments on this. The faculty will be made aware of this employer concern, so they may address it as they deem appropriate.

Communication skills need improvement. The plastics curriculum committee recently agreed to let students take ENGL211 as an option, instead of the previously required

ENGL250. The technical writing course (ENGL211) may better-prepare the students for "industrial writing." We would advise students who are considering graduate school to take ENGL250, so they will have a better background for graduate-level papers. Students are also required to submit many reports in their other classes.

COMM121, "Fundamentals of Public Speaking" is a required course, and students do make presentations in many of their other classes.

It would appear that we should redouble our efforts to emphasize writing and presentations in all classes, and work to make students better-understand the importance of these skills. Perhaps we need to also consider adding writing-intensive courses to the curriculum.

SECTION VII

Labor Market analysis

Labor Market Analysis
Plastics Technology
Plastics Engineering Technology

Plastics is the 4th largest industry in the United States, with employment estimates as high as 1.5 million[1]. The Bureau of Labor Statistics reports employment of 929,000[2] in June 2002 at companies that manufacture miscellaneous plastic products, which does not include many captive plastics operations. Of the 929,000, approximately 29,000[2] are positions for which our B.S. graduates are well suited and another 37,000[2] are positions for which our A.A.S. graduates are well suited. While it is a mature industry, plastics usage continues to grow as these materials replace metal, wood, glass, etc. because of advantages in cost, performance, and quality. Employment growth averaged 2.3% from 1980 to 2000.[3]

Michigan is 3rd in the U.S. in plastics employment[4], behind California and Ohio, with 95,000 people employed[4,5] at 1,379 facilities[5]. The automotive industry is by far the largest employer of plastics professionals in Michigan. Metropolitan Detroit may have the highest number of plastics specialists in the world. The Detroit Section of the Society of Plastics Engineers is the world's largest. Most of the significant plastic materials manufacturers and numerous plastic product manufacturers have a presence in the Detroit area. *Business Facilities Magazine* places Michigan as the 2nd top growth state in plastics manufacturing behind Texas.[6]

Bachelor of Science, Plastics Engineering Technology

There are eight U.S. colleges that offer bachelors programs similar to ours[7]. Ferris is the largest of these with over 200 students (including our "laddering" A.A.S. students) and an average of 45 graduates per year. Pennsylvania State University at Erie (The Behrend College) and Pittsburg State University (Pittsburg, KS) each have about 150 students and 30 to 35 graduates/year. The University of Massachusetts Lowell is 4th with about 25 graduates per year. We believe that the remaining schools graduate 10 to 20 per year. A reasonable estimate of the total number of bachelors degrees similar to ours that are awarded annually in the United States is 200.

The number of B.S. graduates is less than 1% of the total relevant employment. Industry growth, retirements and normal turnover create perhaps 10 times the number of positions that the schools can supply. Companies fill the rest of their needs with people who have related (i.e. engineering) degrees or unrelated degrees. In either case, considerable on-the-job training is needed to allow these "others" to perform at the level of Ferris or similar graduates. Typically, our plastics graduates have several employment offers to choose from. The 2000/2001 graduates averaged $47,840[8], the 3rd highest of bachelors degrees at Ferris, behind Pharmacy and Welding Engineering Technology. The recent recession did affect the employment demand, and students often had only one job offer. We believe that all 2001/2002 graduates are employed in the industry at comparable starting salaries to the previous year.

Common early-career positions for our B.S. graduates include process engineer, project engineer, technical service representative, manufacturing supervisor/manager, and technical sales representative (see the attached "Job Descriptions for Graduates..."). Our curriculum closely follows the background needed for the first three of these positions and is good preparation for the others. As in any profession, long-term career paths may require considerable additional training and education.

Our graduates "compete" with traditional engineering graduates for jobs and promotions. Many companies look first to Ferris for their employment needs. Some major corporations (including Dow, Ford and Daimler-Chrysler) will not consider our plastics grads for some positions for which they require ABET-accredited engineering degrees. No company has ever made an issue out of the fact that our program is not an ABET-accredited engineering technology program.

Plastics is a global industry. Daily contact with business associates in other countries is common in many positions. The countries our graduates will often deal with are Mexico, France, Germany, Italy, Great Britain and, increasingly, China. Foreign language skills, which must be obtained outside our curriculum, can be very valuable.

Associate of Applied Science, Plastics Technology

There are 20 colleges that offer associates programs similar to ours[7]. Ferris is also the largest of these, with approximately 130 students and 45 graduates/year. Most of the schools with associates programs are community colleges, and most of their students are not degree-seeking. The attached "Plastics & Rubber Enrollment Data, Michigan Community Colleges, 2000 – 2001 Academic Year[9]" shows the typically small number of graduates at these schools. A reasonable estimate of the total number of A.A.S. graduates who do not continue to a bachelors degree in plastics is 100 per year.

The number of A.A.S. graduates is well less than 1% of the total relevant employment. Industry growth, retirements and normal turnover create perhaps 30 times the positions that the schools can supply. The majority of the positions appropriate for A.A.S. grads are filled with experienced, non-degreed personnel. The overwhelming majority of our students continue into the B.S. program because the long-term career prospects are far greater (see the attached "U.S. Plastics Employment and Salaries").

Common early-career positions for our A.A.S. graduates include laboratory technician, process set-up associate (who changes production machinery to run different products), and production foreman/supervisor. Our graduates are well-prepared for the first two positions, and have the technical skills for the third. These positions are most often filled with non-degreed, experienced personnel. It is often very difficult for A.A.S. graduates to advance to professional-level positions.

Summary

The plastic industry will continue to grow, and the long-term employment prospects for our graduates are excellent. The number of available positions far exceeds the number of graduates from Ferris and comparable schools. There are no industry trends that require program or facilities changes. As our graduates each follow their diverse career paths, they are well-prepared to obtain the additional skills they will need.

References:

1. *Plastics Data Source, The Society of the Plastics Industry, Inc., www.plasticsdatasource.org/usaplastics_letter.pdf/impact.htm.*
2. *Bureau of Labor Statistics, U.S. Department of Labor, www.B.S.gov/oes/2000/oesi3_308.htm.*
3. *Plastics Data Source, The Society of the Plastics Industry, Inc., www.plasticsdatasource.org/*
4. *"Employment in the Plastics Industry," American Plastics Council, www.americanplasticscouncil.org/benefits/economic/employment.html.*
5. *"Plastics in Michigan," American Plastics Council, www.americanplasticscouncil.org/benefits/economic/michigan.html.*
6. *"Plastics Manufacturing Growth States," Business Facilities, February, 2002.*
7. *"Plastics/Polymer Programs in the United States and Canada," Society of Plastics Engineers, 4th edition, undated.*
8. *"2000 – 2001 Ferris State University Graduate Follow-Up Report," FSU, 8/20/2002*
9. *Michigan Community College Network, www.michigancc.net/.*

R. Marsh
9/5/02

JOB DESCRIPTIONS FOR GRADUATES OF
PLASTICS ENGINEERING TECHNOLOGY
RUBBER ENGINEERING TECHNOLOGY
FERRIS STATE UNIVERSITY

PROCESS ENGINEER
Develops new plastics or rubber processes, products and technologies. Performs studies to improve the cost and quality of plastic or rubber products. May develop new manufacturing methods and materials. Will often be called upon to solve manufacturing problems. Usually works at a manufacturing facility.

PROJECT ENGINEER
Manages projects to manufacture a new product, install a new process or expand manufacturing operations. Coordinates the activities of the sales department (including working with customers), materials suppliers, equipment suppliers, mold manufacturers and the plant process engineer to assure that the project is completed on time and within budget. May work in an engineering center, sales office or manufacturing facility.

DESIGN ENGINEER
Designs new products based on in-depth knowledge of manufacturing processes, tooling capabilities, materials properties and test methods. May perform computer simulations of the manufacturing process to maximize quality and minimize cost. May work in an engineering center or in a manufacturing facility.

MANUFACTURING SUPERVISOR/MANAGER
Responsible for day-to-day production operations. Hourly workers and foremen work for the Manufacturing Supervisor, who in-turn work for the Manufacturing Manager/Plant Manager. Recent graduates will typically hold supervisory positions, while more experienced graduates may become Plant Managers. Works at a manufacturing facility.

TECHNICAL SALES REPRESENTATIVE
May work for a manufacturer of plastic or rubber products, processing equipment or raw materials. Interacts with engineering, manufacturing management, purchasing, quality assurance and other functions at current or potential customers. Uses verbal and written communications skills to convince customers that your company's products are technically and economically superior to those of competitors. May work out of a sales office or an office in your home. Travel may be local, regional or international.

TECHNICAL SERVICE REPRESENTATIVE
Usually works for a materials or equipment manufacturer. Helps customers solve technical problems in using your company's products and helps them prepare for the use of new products. May work out of an engineering office, manufacturing facility, sales office or your home. Travel may be local, regional or international.

MID-CAREER POSITIONS

Senior Engineer
Engineering Manager/Director
Manufacturing Manager/Director
Project Manager
Plant Manager
Account Manager
Sales Manager/Director
Senior Designer
Technical Manager/Director

INDUSTRIES NEEDING THE SKILLS OF OUR GRADUATES
Plastic and rubber are critical to many products, so there is an opportunity to work for thousands of companies in many different industries, almost anywhere in the world. Automotive, furniture, medical, sporting goods, computers, soft drinks, cosmetics, toys and aerospace are just a few of the industries that need plastics or rubber technical graduates.

SALARIES
In the 2000 – 2001 school year, our bachelor degree graduates earned an average of approximately $45,000 per year. It is common for experienced professionals in the plastics and rubber industries to make $75,000 per year, and higher-level positions can exceed $100,000 per year.

PLASTICS & RUBBER ENROLLMENT DATA
MICHIGAN COMMUNITY COLLEGES
2000 - 2001 ACADEMIC YEAR

SCHOOL	PROGRAM	EMROLLMENT	GRADUATES
FSU	Plastics A.A.S.	139	39
FSU	Rubber A.A.S.	56	6
FSU	Plastics B.S.	81	47
FSU	Rubber B.S.	6	0
GRCC	Plastics A.A.S.	45	2
GRCC	Plastics A.A.S. --> FSU	37	9
GRCC	Plastics Certificate	4	0
KVCC	Plastics A.A.S.	37	3
KVCC	Plastics Certificate	4	0
Kellogg	Plastics A.A.S.	7	0
Kellogg	Plastics Certificate	10	2
Lake MI	Plastics A.A.S.	18	1
Lake MI	Plastics Certificate	13	0
Macomb	Plastics A.A.S.	14	0
Macomb	Plastics Certificate	3	0
Montcalm	Plastics A.A.S.	2	0
Montcalm	Plastics Certificate	1	0
Oakland	Plastics A.A.S.	1	0
St Clair	Plastics A.A.S.	19	0
St Clair	Plastics Certificate	13	1
	PLASTICS TOTALS	**448**	**104**
	PLASTICS + RUBBER TOTALS	**510**	**110**
	FSU PLASTICS/ALL PLASTICS	**49%**	**83%**

U.S. PLASTICS EMPLOYMENT AND SALARIES

(U.S. Department of Labor, Bureau of Labor Statistics)

Occupation Title	Employment	Mean Salary
Chief Executive	2900	120870
General and Operations Manager	10950	81870
Sales Managers	2890	75990
Engineering Managers	2190	74990
Industrial Engineers	5130	53630
Mechanical Engineers	3060	56690
Sales Representatives	1140	59200
Sales Engineers	1150	63580
TOTAL FOR B.S. GRADS	29410	75486

Cost Estimators	880	43510
Industrial Engineering Technicians	1800	37070
Chemical Technicians	1050	32220
First-Line Production Supervisors/Managers	33390	38050
TOTAL FOR A.A.S. GRADS	37120	37967

bls data.xls 8/1/02

SECTION VIII

Student perception survey

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

Plastics Program Only
Fill out only once.

Have you completed your 1st Internship.....____ or 2nd Internship.....____

Check the statement that best describes your objective for attending college:

-Prepare to get a job.....____
-Improve my job skills for present occupation...____
-Prepare for transfer to another college.....____
-Personal interest.....____
-Other (Describe).....____
_____

Check the statement that best describes why you picked the Ferris Plastics Program for a curriculum:

-Availability of a job upon graduation.....____
-Existing reputation of the program.....____
-Did not like program I was in.....____
-Published pay rates of the industry/career...____
-Other (Describe).....____
_____

Check your current student status in the Plastics Program:

Freshman _____ Sophomore _____ Junior _____ Senior _____

INSTRUCTIONS: Rate each of the items using the following guide: 1 – *POOR* Means item is seriously inadequate 2 – Means the item is "fair", but still at the bottom 3 – Means the item is "average", in the middle 4 – Means the item is pretty good, towards top 5 – *GOOD* Means the item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES A "comments" column is provided if you wish to explain your answer and use the "Don't Know" column for items you are unsure about.	POOR 1	FAIR 2	AVERAGE 3	PRETTY GOOD 4	GOOD 5	DON'T KNOW	COMMENTS
1. Course in the Plastics Program are: - Based on realistic industry requirements							
- Up-to-date in their content							
- A "value" to me at their current tuition cost							
2. The courses taught in Plastics have: - Written objectives which are available to me							
- Syllabi which tell me what I will learn							
-Resources built in to utilize for information							
3. The course content taught is: - In line with my needs and interests							
- Understood by the professors teaching							
4. The teaching methods used in the course: - Utilize the latest technology							
- Utilize technologies which help me understand							
-Apply knowledge from instructor experience							
5. When laboratory activities accompany lecture: -State-of-the-art equipment is utilized							
-Experiences parallel the lecture topics							
-Hands-on experiences are "paced" well							

INSTRUCTIONS: Rate each of the items using the following guide: 1 – *POOR* Means item is seriously inadequate 2 – Means the item is "fair", but still at the bottom 3 – Means the item is "average", in the middle 4 – Means the item is pretty good, towards top 5 – *GOOD* Means the item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES A "comments" column is provided if you wish to explain your answer and use the "Don't Know" column for items you are unsure about.	POOR 1	FAIR 2	AVERAGE 3	PRETTY GOOD 4	GOOD 5	DON'T KNOW	COMMENTS
6. Aside from the structured class topics/sessions: -I find the instructor's experience meaningful							
-I can gain insight into future positions							
-I am given consistent information							
7. Other Plastics Industry information: -Is attainable from past graduates whom I can contact							
-Is attainable from extra-curricular activities presented by and supported through the instructors							
-Opportunities are published through the instructors							
8. The program instructors: -Know the subject matter and occupational requirements.							
-Are available to provide help when I need it							
-Provide interesting & meaningful subject matter							
-Are fair and equal with students in general							
9. Instructional lecture and laboratory facilities: -Are up-to-date and kept that way							
-Provide a positive environment for learning							
-Are safe, functional, and well maintained							
-Include enough work stations for class size							
10. Instructional equipment such as: -Text books-are good, clear, and meet class needs							
-Sufficient lab equipment & materials for class							
-Lab equipment-is safe, functional, and maintained							
11. The elective classes required are: -Meaningful and worth-while							
-Fitting choices for the overall program and degrees							
-Taught by instructors who can relate to plastics							
-Are "in-step" with the core classes in the program							
12. The support classes required are: -Meaningful and worth-while							
-Fitting choices for the overall program and degrees							
-Taught by instructors who can relate to plastics							
-Are "in-step" with the core classes in the program							

INSTRUCTIONS:

Rate each of the items using the following guide:

1 – *POOR* Means item is seriously inadequate
2 – Means the item is "fair", but still at the bottom
3 – Means the item is "average", in the middle
4 – Means the item is pretty good, towards top
5 – *GOOD* Means the item is more than adequate, at the top

PLACE AN "X" IN THE BOX THAT APPLIES

A "comments" column is provided if you wish to explain your answer and use the "Don't Know" column for items you are unsure about.

	POOR 1	FAIR 2	AVERAGE 3	PRETTY GOOD 4	GOOD 5	DON'T KNOW	COMMENTS
13. The "internship" requirements of the program: -Are meaningful and worth-while (1st & 2nd)							
-Give insight into the expectations of the industry							
-Are faculty assisted and followed up by them							
-Are appropriate in quantity, time, or requirements.							
14. I am given adequate individual attention: -By my instructor in the laboratory (student ratio)							
-By my instructor in the classroom (student ratio)							
15. My classroom experiences include: -Adequate "challenges" given by professor							
-Adequate availability of computers							
-Adequate reference materials available							
16. I receive proper advising: -Within the program classes							
-From my professor "advisor"							
17. Overall, I would: -Choose this program again as I first did							
-Recommend the program to another							
-Rate the program							
18. When you entered the program, how did you view you career potential?							
19. How do you view your career potential now?							

Why did you originally select the Plastics program?
(Check all that apply):

Hands-on Education..... ____
Want to work in Plastics Industry..... ____
Other students excited about the program..... ____
Recommendations from others..... ____
Other students..... ____

Relative or friend..... ____
High school counselor/teacher..... ____
Ferris Faculty/ administrator..... ____
Someone in Industry..... ____
Relative or friend..... ____

Other _____

ADDITIONAL COMMENTS SPACE: (Use back of sheet if necessary)

Results and Evaluation of the
Current Student Survey of the Plastics Engineering Technology Program
From Winter Term, 2002

The students currently enrolled in the Program during the last week of the winter term 2002 took an evaluation survey of the Plastics Engineering Technology Program of Ferris State University. All students in attendance in the PLTS – 121, PLTS - 212, PLTS – 300 and PLTS – 499 completed the survey. This resulted in 133 completed surveys out of a total of 191 students in the program, or 69.6%.

The PLTS – 121, the Plastics Processing I class, was composed of 30 freshmen students (81.1%), with 5 sophomores (13.5%), 2 juniors (5.4%) and no seniors. The PLTS – 212, the Plastics Product and Tool Design I class, was composed of 39 sophomores (84.8%), 7 juniors (15.2%) and no seniors or freshmen. The PLTS – 300, the Plastics Engineering Management Systems class, was composed of 20 juniors (60.6%), with 1 sophomore (3%) and 12 seniors (36.4%) with no freshmen. The PLTS – 499, the Plastics Career Skills (capstone) class, was composed of 17 seniors (100%), with no freshmen, sophomores or juniors.

The results of each class survey are attached as appendices. The results were kept separate to try to determine if there were significant differences in the perceptions of each class. The written comments that were added to the survey sheets are also shown in the appendices.

During the process of filling out the survey, a small number of students missed questions, or otherwise left them blank. When this happened, they were tallied as "don't know " or #6 on the Scantron sheets. The majority of questions that were purposely marked "don't know" were by freshman for the questions related to internships, which they have not experienced as yet.

For the first question where the student was asked to mark which internships they had completed, the results were very different from class to class. Only 10% of students in the PLTS – 121 class marked that they had completed their first internship with only2.7% (1 student) having done their second internship. This comment is directly related to the fact that there were 5 sophomores and 2 juniors that were repeating the class for better grades. The results for the other classes were as expected: the number of students increasing as the class level increased through PLTS – 499 where 100% of the students had completed both internships.

The second set of questions was related to the reasons a student is attending college. For each survey, the most students listed to "prepare for a job" as the most important reason. The two reasons of "improve job skills for present job" and "personal interest" tied for second most marked reason. The other reasons listed were chosen at much lower levels.

Question three asked why our program was chosen. The second listed reason was chosen most for all classes. This was "existing reputation of program." In all classes, "availability of jobs at graduation" was in second place. The other possible reasons were all marked at lower levels.

Responses to question set 1 were quite uniform between classes with the exception of PLTS – 300. For PLTS – 121, 212 and 499, the responses were evenly divided between #4, "pretty good" and #5, "good" at about 45% each. In PLTS – 300, about 55% of the students answered #4 and about 30% answered #5.

Responses for question set 2 were more varied between classes. For question 2-a, "written objectives which are available to me", PLTS – 121 responses were evenly divided between #4 and #5 with 5% for #3, PLTS – 212 responses were 10% for #3, 26% for #4 and 56% for #5, PLTS – 300 responses were 12% for #3, 42% for #4 and 45% for #5, while PLTS – 499 responses were 12% for #3, 30% for #4 and 59% for #5.

The most variation was in question 2-c, "resources built in to utilize for information;"

	Poor	Fair	Ave.	Pretty Good	Good
PLTS – 121	0	2.7	13.5	54	27
PLTS – 212	0	2.1	6.5	37	54
PLTS – 300	0	3	12	42	36
PLTS – 499	0	0	35	35	23

There were no written comments to explain why there were these differences between classes. It may have been related to the specific class or to the differences between the experiences of each grade level from year to year.

For question set 3, "the course content taught is," 3-a, "in line with my needs and interests," the lower classes tended to have a lower opinion of the courses than the higher classes. This may be caused by the fact that there are many "non-traditional" students in the program who already have on-the-job experience that makes the or introductory classes seem less necessary. The upper classes have a much better opinion of the need for their classes. For Question 3-b, "Understood by the professors teaching," all levels have a high opinion of the teacher's abilities.

For question set #4, all classes were in agreement that the use of technology in the classroom and laboratories was either pretty good or good.

For question #5, the responses were slightly lower when asked if "state-of-the-art" equipment was used in the laboratories, but came back up again for the questions regarding "hands-on" experiences and whether the lab experience ran parallel to the lectures.

The students rated the instructors' experience highly and said it was useful to their learning experience. (Question set 6)

Related to the availability of "other" sources of plastics industry information, many students felt that they did not have good contact with former graduates. However, the extra-curricular activities and job opportunities announced by the instructors was rated highly. (Question set 7)

Question set 8 was related to the instructors' industrial experience and how it is applied to their courses. The students felt that it was an important component of their classes.

For question set 9, the students rated the instructional and laboratory facilities as up-to-date, clean and well organized and as having enough workstations for the number of students in the classes. The only exception was related to the computer laboratory, which one student felt needed faster processing computers.

Question 10 was related to instructional equipment. Question 10-a asked about textbooks, and there were several comments that some textbooks were not even used in class. There were also comments about textbooks costing too much. Generally the students felt that there is enough lab equipment and that it is kept in good shape.

There were a lot of comments about the elective classes for the program. A significant number of students responded to these questions with a "poor" rating, ranging from 8% to 33%. They particularly rated "taught by instructors who can relate to plastics" from 12% to 33% "poor". Because many of the negative comments were about CHEM 211, it appears that the students were confused about the difference between "elective" and "support" classes. Other comments included: "Thanks Mr. Muccio! He is the only professor that ventures into new territory", and one student felt that the program "needs options."

Question set 12 was related to the "support" classes for the program, or classes taught outside the Plastics Program. The responses to this question were somewhat better than they were for the "elective" courses. The ratings of the ability of the instructors to relate to plastics were still low, ranging from 6% to 19% as "poor". Once again there were negative comments about CHEM 211 and particularly about Professor Balanda. Students feel the class is of no value to them because it doesn't relate to the topics covered in their other plastics classes. One student commented that there should be a CHEM class between CHEM 121 and CHEM 211 to better prepare the student for CHEM 211.

Question set 13 was related to internships. Freshmen have not had an internship and many answered "don't know". Upper class students generally felt the internships were a valuable experience, but there was some feeling that there was not enough follow-up by instructors during the internships. There were some comments that students shouldn't have to pay tuition for their internships.

Most students gave high ratings to the amount of attention paid them by their instructors during laboratory and lecture. (Question set 14.) There were some dissenters in the lower level classes, with 2.5% rating "poor" for instructor attention to students. There

was one comment that more lab assistants were needed and another that they needed more help in PLTS – 211 and PLTS – 321.

High ratings were given for question set 15, for the quality of classroom experiences. Once again there was a comment that "faster computers" were needed. There was also a comment that there was too much competition from student in other programs, particularly MFG and MECH, for time on the computers in NEC.

Question set 16 about advising received some "poor" ratings. Poor ratings of the professor advisor showed up at all class levels and ranged from 3% to 12%. The majority of students rated there advising as "Pretty Good" to "Good". Comments ranged from, "Somewhat rude – unwilling to help," Mr. Muccio and Mr. Langell were very helpful.

The students would recommend the program to future students pretty strongly. There were a few, about 2.5%, who would not, however. (Question set 17.)

Question set 18 about how the student viewed their job potential when they entered the program was rated very high.

Questions set 19 about how they now viewed their job opportunities was somewhat lower, mainly because of the current economic turndown. However, the only comments were "Excited about my future, because of this program," and "Excellent."

Question set V was related to why the students originally picked the Plastics Program. The top reason for choosing the program was "recommendation of others" with hands-on education a close second. The other reasons, in order of the percent of students choosing them, were "want to work in the plastics industry," "recommended by a relative or friend,"" recommended by FSU faculty of admissions representative,"" recommendation of a high school counselor,"" recommendations of someone in industry." There were 11.9% of students who also listed "other" and made written comments, which can be reviewed in the comments pages in the appendix.

SUMMARY

Positive:

Overall, the students are happy with the Plastics Engineering Technology Program. More specifically, the predominance of responses were in the "Pretty Good" to "Good" columns. Exceptions are discussed in the "negative" below.

Most students are positive about the courses they take and the laboratory facilities. Instructor experience is felt to be a very strong point in favor of the Plastics Engineering Technology Program. Students also feel the instructor to student ratio is favorable and were happy with the personal attention received.

Students indicated strongly that they would recommend the program to future students.

Negatives:

The biggest problem seems to be related to the CHEM 211 class. This class was commented on in both the questions relating to "elective" and "support" classes. There were several derogatory comments and the lowest ratings for the survey were for question sets 11 and 12.

A second problem, that is a problem for the whole University, is the constant need for up grading of our computer facilities. There were several comments about the slow speed of the computers in the NEC computer lab. In addition, there were comments about competition for computer time for projects outside of class because of students from other programs using the NEC computer lab.

Some students felt that there is not enough opportunity for interaction with alumni of the program by current students. In response to this complaint, there is an effort to organize an active alumni association for the plastics program.

There were some comments and low score related to advising, but no specific comments to help determine the causes of the comments.

Winter Term, 2002
PLTS – 121 Student Survey
Combined Comments from All 4 Sections

III. Check the statement that best describes why you picked the Ferris Plastics Program for a curriculum: Other:
   a. "Hands-on work, less lecture"
   b. "Only program in state."
   c. "Employer paying"
   d. "Rubber major, for wider job options."
   e. "Interest in field."

1-c: Course in the Plastic Program are: A "value" to me at their current tuition cost:
   a. "Tuition is way too high."
   b. "No tuition is a value."

5-a. When lab activities accompany lecture: State-of-the-art equipment is utilized:
   a. "A few first year machines are very old – compression"

6-b. Aside from the structured class topics/sessions: I can gain insight into future positions:
   a. "I would like to know where I could go w/my degree."

8. The program instructors:
   B. Are available to provide help when I need it:
      i. "Advisor was not willing to meet me on my time."
   D. Are fair and equal with students in general:
      i. "Some teachers are harder than others."

10-a. Instructional equipment such as: Textbooks are good, clear, and meet class needs:
   a. "Not introductory."

10-b. Instructional equipment such as: Sufficient lab equipment & materials for class:
   a. "Could use more "trash cans" or buckets."
   b. "Need new hot gloves."
   c. "Rainville not good."

12-a. The support classes required are: Meaningful and worthwhile:
   a. "OK, chemistry is unnecessary."

13-a. The "internship" requirements of the program: Are meaningful and worthwhile:
   a. "Shouldn't cost as much money."

14. I am given adequate individual attention:

14-a. By my instructor in the lab:
   i. "Excellent – only 11 students."

14-b. By my instructor in the classroom:
   i. "Excellent – class."

16-b. I received proper advising: From my professor "advisor":
   a. "Somewhat rude - unwilling to help."

19-a. How do you view your career potential now?
a. "Industry slow."

IV. Why did you originally select the Plastics Program: Other
a. "Good money."

Additional Comments:
"I don't like the double internship because as with the economy I can't even get hired for one, and I still have to worry about finding another. I was told entering the program that finding a job would never be a problem."

Question	Wording	Check Data	Check %											
I	Have you completed your	x	x											
	First Internship	4	10.81%											
	Second Internship	1	2.70%											
II	Check the statement that best describes	x	x											
	your objective for attending college:	x	x											
II-a	Prepare to get a job	34	91.89%											
II-b	Improve job skills for present occupation	3	8.11%											
II-c	Prepare for transfer to another college	1	2.70%											
II-d	Personal interest	3	8.11%											
II-e	Other - see notes	0	0.00%											
III	Check the statement that best describes	x	x											
	why you picked the Ferris Plastics Program	x	x											
	for a curriculum:	x	x											
III-a	Availability of a job at graduation	13	35.14%											
III-b	Existing reputation of program	17	45.95%											
III-c	Did not like program I was in	6	16.22%											
III-d	Published pay rates of industry/career	8	21.62%											
III-e	Other - see notes	6	16.22%											
IV	Check your current student status in the	x	x											
	Plastics Program:	x	x											
IV-a	Freshmen	30	81.08%											
IV-b	Sophomore	5	13.51%											
IV-c	Junior	2	5.41%											
IV-d	Senior	0	0.00%											
		1-Poor Data	1-Poor %	2-Fair Data	2-Fair %	3-Ave. Data	3-Ave. %	4-Pretty Data	4-Pretty Good-%	5-Good Data	5-Good %	6-Don't Data	6-Don't Know-%	Base
	Start Ranking Questions	x	x	x	x	x	x	x	x	x	x	x	x	x
1	Course in the Plastics Program are:	x	x	x	x	x	x	x	x	x	x	x	x	x
1-a	Based on realistic industry requirements	0	0.00%	1	2.70%	1	2.70%	15	40.54%	17	45.95%	3	8.11%	37
1-b	Up-to-date in their content	0	0.00%	1	2.70%	4	10.81%	16	43.24%	14	37.84%	2	5.41%	37
1-c	A "value" to me at their current tuition cost	1	2.70%	2	5.41%	11	29.73%	11	29.73%	9	24.32%	3	8.11%	37
2	The courses taught in Plastics have:	x	x	x	x	x	x	x	x	x	x	x	x	x
2-a	Written objectives which are available to me	0	0.00%	1	2.70%	5	13.51%	16	43.24%	15	40.54%	0	0.00%	37
2-b	Syllabi which tell me what I will learn	0	0.00%	1	2.70%	2	5.41%	15	40.54%	19	51.35%	0	0.00%	37
2-c	Resources built in to utilize for information	0	0.00%	1	2.70%	5	13.51%	20	54.05%	10	27.03%	1	2.70%	37
3	The course content taught is:	x	x	x	x	x	x	x	x	x	x	x	x	x
3-a	In line with my needs and interests	1	2.70%	0	0.00%	5	13.51%	14	37.84%	17	45.95%	0	0.00%	37
3-b	Understood by the professors teaching	0	0.00%	1	2.70%	2	5.41%	17	45.95%	16	43.24%	1	2.70%	37
4	The teaching methods used in the course:	x	x	x	x	x	x	x	x	x	x	x	x	x
4-a	Utilize the latest technology	0	0.00%	3	8.11%	5	13.51%	19	51.35%	10	27.03%	0	0.00%	37
4-b	Utilize technologies which help me understand	0	0.00%	2	5.41%	0	0.00%	22	59.46%	13	35.14%	0	0.00%	37
4-c	Apply knowledge from instructor experience	0	0.00%	2	5.41%	1	2.70%	12	32.43%	22	59.46%	0	0.00%	37
5	When laboratory activities acccompany lecture:	x	x	x	x	x	x	x	x	x	x	x	x	x
5-a	State-of-the-art equipment is utilized	1	2.70%	3	8.11%	14	37.84%	15	40.54%	4	10.81%	0	0.00%	37
5-b	Experiences parallel the lecture topics	1	2.70%	0	0.00%	3	8.11%	21	56.76%	12	32.43%	0	0.00%	37
5-c	Hands-on experiences are "paced" well	1	2.70%	0	0.00%	2	5.41%	16	43.24%	18	48.65%	0	0.00%	37
6	Aside from the structured class topics/sessions:	x	x	x	x	x	x	x	x	x	x	x	x	x
6-a	I find the instructor's experience meaningful	0	0.00%	1	2.70%	5	13.51%	19	51.35%	12	32.43%	0	0.00%	37
6-b	I can gain insight into future positions	0	0.00%	2	5.41%	3	8.11%	21	56.76%	10	27.03%	1	2.70%	37
6-c	I am given consistent information	0	0.00%	2	5.41%	3	8.11%	18	48.65%	13	35.14%	1	2.70%	37
7	Other Plastics industry information:	x	x	x	x	x	x	x	x	x	x	x	x	x
7-a	Is attainable from past graduates whom I can contact	2	5.41%	10	27.03%	11	29.73%	7	18.92%	2	5.41%	5	13.51%	37
7-b	Is attainable from extra-curricular activities presented	0	0.00%	3	8.11%	11	29.73%	13	35.14%	9	24.32%	1	2.70%	37
7-c	Opportunities are published through the instructors	0	0.00%	2	5.41%	7	18.92%	16	43.24%	11	29.73%	1	2.70%	37
8	The program instructors:	x	x	x	x	x	x	x	x	x	x	x	x	x
8-a	Know the subject matter and occupational requirements	0	0.00%	2	5.41%	1	2.70%	19	51.35%	15	40.54%	0	0.00%	37
8-b	Are available to provide help when I need it	0	0.00%	1	2.70%	3	8.11%	14	37.84%	19	51.35%	0	0.00%	37
8-c	Provide interesting & meaningful subject matter	0	0.00%	1	2.70%	1	2.70%	20	54.05%	15	40.54%	0	0.00%	37
8-d	Are fair and equal with students in general	0	0.00%	1	2.70%	4	10.81%	15	40.54%	16	43.24%	1	2.70%	37
9	Instructional lecture and lab facilities:	x	x	x	x	x	x	x	x	x	x	x	x	x
9-a	Are up-to-date and kept that way	0	0.00%	1	2.70%	9	24.32%	16	43.24%	10	27.03%	1	2.70%	37
9-b	Provide a positive environment for learning	0	0.00%	0	0.00%	1	2.70%	18	48.65%	16	43.24%	2	5.41%	37
9-c	Are safe, functional, and well maintained	0	0.00%	0	0.00%	0	0.00%	18	48.65%	16	43.24%	3	8.11%	37
9-d	Include enough work stations for the class size	0	0.00%	0	0.00%	1	2.70%	15	40.54%	20	54.05%	1	2.70%	37
10	Instructional equipment such as:	x	x	x	x	x	x	x	x	x	x	x	x	x
10-a	Text books are good, clear and meet class needs	0	0.00%	1	2.70%	8	21.62%	11	29.73%	17	45.95%	0	0.00%	37
10-b	Sufficient lab equipment & materials for class	0	0.00%	0	0.00%	7	18.92%	11	29.73%	18	48.65%	1	2.70%	37
10-c	Lab equipment is safe, functional and maintained	1	2.70%	0	0.00%	2	5.41%	15	40.54%	18	48.65%	1	2.70%	37
11	The elective classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
11-a	Meaningful and worthwhile	3	8.11%	5	13.51%	10	27.03%	12	32.43%	4	10.81%	3	8.11%	37
11-b	Fitting choices for the overall program and degree	4	10.81%	5	13.51%	6	16.22%	12	32.43%	5	13.51%	5	13.51%	37
11-c	Taught by instructors who can relate to plastics	7	18.92%	7	18.92%	6	16.22%	5	13.51%	7	18.92%	5	13.51%	37
11-d	Are "in-step" with the core classes in the program	4	10.81%	6	16.22%	9	24.32%	7	18.92%	6	16.22%	5	13.51%	37
12	The support classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
12-a	Meaningful and worthwhile	1	2.70%	4	10.81%	9	24.32%	16	43.24%	5	13.51%	2	5.41%	37
12-b	Fitting choices for the overall program and degree	1	2.70%	3	8.11%	7	18.92%	20	54.05%	6	16.22%	0	0.00%	37
12-c	Taught by instructors who can relate to plastics	2	5.41%	8	21.62%	6	16.22%	14	37.84%	7	18.92%	0	0.00%	37
12-d	Are "in-step" with the core classes in the program	3	8.11%	5	13.51%	6	16.22%	17	45.95%	6	16.22%	0	0.00%	37
13	The "internship" requirements of the program:	x	x	x	x	x	x	x	x	x	x	x	x	x
13-a	Are meaningful and worthwhile (1st. & 2nd.)	1	2.70%	2	5.41%	3	8.11%	6	16.22%	10	27.03%	15	40.54%	37
13-b	Give insight into the expectations of the industry	0	0.00%	1	2.70%	2	5.41%	7	18.92%	11	29.73%	16	43.24%	37
13-c	Are faculty assisted and followed up by them	2	5.41%	1	2.70%	3	8.11%	5	13.51%	8	21.62%	18	48.65%	37
13-d	Are appropriate in quantity, time or requirements	1	2.70%	1	2.70%	2	5.41%	9	24.32%	7	18.92%	17	45.95%	37
14	I am given adequate individual attention:	x	x	x	x	x	x	x	x	x	x	x	x	x
14-a	By my instructor in the lab (student ratio)	1	2.70%	0	0.00%	1	2.70%	16	43.24%	19	51.35%	0	0.00%	37
14-b	By my instructor in the class room (student ratio)	1	2.70%	1	2.70%	3	8.11%	16	43.24%	16	43.24%	0	0.00%	37
15	My classroom experiences include:	x	x	x	x	x	x	x	x	x	x	x	x	x
15-a	Adequate "challenges" given by professor	0	0.00%	0	0.00%	6	16.22%	15	40.54%	15	40.54%	1	2.70%	37
15-b	Adequate availability of computers	0	0.00%	1	2.70%	8	21.62%	10	27.03%	18	48.65%	0	0.00%	37
15-c	Adequate reference materials available	0	0.00%	1	2.70%	4	10.81%	15	40.54%	17	45.95%	0	0.00%	37
16	I receive proper advising:	x	x	x	x	x	x	x	x	x	x	x	x	x
16-a	Within the program classes	1	2.70%	0	0.00%	6	16.22%	12	32.43%	18	48.65%	0	0.00%	37
16-b	From my professor "advisor"	1	2.70%	2	5.41%	6	16.22%	10	27.03%	18	48.65%	0	0.00%	37

PLTS – 121, Winter, 2002
Homework #14 – Rotational Molding #2 – Pages 543 - 566

Name: _____ Lab. No.: _____

11. List 6 advantages of rotational molding.

12. List 4 disadvantages of rotational molding.

13. Explain "jacketed rotational molding".

14. What fuel is usually used to heat the ovens for rotational molding?

15. What are most rotational molds made of?

16. List two other materials that rotational mold can be made of.

17. What draft angle is recommended for rotational molds?

18. What is added to polyethylene when a rotational molder wants to cross-link the polymer?

19. What additive is routinely added to rotational molding resins?

20. What is the recommended wall thickness range for rotational mold parts?

		1-Poor	1-Poor	2-Fair	2-Fair	3-Ave.	3-Ave.	4-Pretty	4-Pretty	5-Good	5-Good	6-Don't	6-Don't	Base
		Data	%	Data	%	Data	%	Data	Good-%	Data	%	Data	Know-%	
17-a	Choose this program again as I first did	1	2.70%	0	0.00%	3	8.11%	3	8.11%	30	81.08%	0	0.00%	37
17-b	Recommend the program to another	1	2.70%	1	2.70%	1	2.70%	4	10.81%	30	81.08%	0	0.00%	37
17-c	Rate the program	0	0.00%	1	2.70%	1	2.70%	7	18.92%	28	75.68%	0	0.00%	37
18	When you entered the program, how did you view your	x	x	x	x	x	x	x	x	x	x	x	x	x
	career potential?	0	0.00%	0	0.00%	4	10.81%	5	13.51%	27	72.97%	1	2.70%	37
19	How do you view your career potential now?	1	2.70%	0	0.00%	2	5.41%	15	40.54%	19	51.35%	0	0.00%	37
		Check	Check											
		Data	%											
V	Why did you originally select the Plastics Program?	x	x											
V-a	Hands-on Education	22	59.46%											
V-b	Want to work in Plastics industry	19	51.35%											
V-c	Other students excited about the program	9	24.32%											
V-d	Recommendations from others	23	62.16%											
V-e	Other students	4	10.81%											
V-f	Relative or friend	16	43.24%											
V-g	High school counselor/teacher	4	10.81%											
V-h	FSU faculty/administration	4	10.81%											
V-i	Someone in industry	10	27.03%											
V-j	Relative or friend	8	21.62%											
V-k	Other - see notes	6	16.22%											

PLTS – 121, Winter, 2002
Homework #14 – Rotational Molding #2 – Pages 543 - 566
Name: _____ Lab. No.: _____

11. List 6 advantages of rotational molding.

12. List 4 disadvantages of rotational molding.

13. Explain "jacketed rotational molding".

14. What fuel is usually used to heat the ovens for rotational molding?

15. What are most rotational molds made of?

16. List two other materials that rotational mold can be made of.

17. What draft angle is recommended for rotational molds?

18. What is added to polyethylene when a rotational molder wants to cross-link the polymer?

19. What additive is routinely added to rotational molding resins?

20. What is the recommended wall thickness range for rotational mold parts?

Winter Term, 2002
Student Survey
Combined Comments
PLTS – 212, All Sections

III. Check the statement that best describes why you picked the Ferris Plastics Program for a curriculum:
A. "Internship Plastics."
B. "High school teacher recommended."
C. "High school teacher."

3-a. The course content taught is: In line with my needs and interests:
a. "More design classes using CAD should be offered."

5-c. When lab activities accompany lecture: Hands-on experiences are paced well:
a. "Sometimes rushed."

10-a. Instructional equipment such as: Textbooks are good, clear and meet class needs:
a. "Text is behind current technology."

11-a. The elective classes required are: Meaningful and worthwhile:
a. "Chem. 211 is not worthwhile. Get rid of Chem. 211 or require pre-recs. The class sucks and I cannot relate it to my PLTS classes at all."

12-a. The support classes are: Meaningful and worthwhile:
a. "Very little data for tooling."

12-c. The support classes are: Taught by instructors that can relate to plastics:
a. "Not always."

13-a. The "internship" requirements of the program: Are meaningful and worthwhile:
a. "Haven't interned yet."

15-b. My classroom experiences included: Adequate availability of computers:
a. "Need faster computers."

V-k. Why did you originally select the Plastics Program: Other:

a. "Job placement, salary."
b. "Great job placement."
c. "Work paid for it."
d. "$"
e. "Transferred from other plastics school. Ferris has good reputation in industry."
f. "Heard it was cool."
g. "What I want to do for a job."
h. "Read summary and it looked good."
i. "Retired FSU professor recommended/father of plastics grad."

Question	Wording	Check Data	Check %											
I	Have you completed your	x	x											
	First internship	34	73.91%											
	Second internship	0	0.00%											
II	Check the statement that best describes	x	x											
	your objective for attending college:	x	x											
II-a	Prepare to get a job	40	86.96%											
II-b	Improve job skills for present occupation	4	8.70%											
II-c	Prepare for transfer to another college	0	0.00%											
II-d	Personal interest	4	8.70%											
II-e	Other - see notes	1	2.17%											
III	Check the statement that best describes	x	x											
	why you picked the Ferris Plastics Program	x	x											
	for a curriculum:	x	x											
III-a	Availability of a job at graduation	15	32.61%											
III-b	Existing reputation of program	20	43.48%											
III-c	Did not like program I was in	2	4.35%											
III-d	Published pay rates of industry/career	66	143.48%											
III-e	Other - see notes	x	x											
IV	Check your current student status in the	x	x											
	Plastics Program:	x	x											
IV-a	Freshman	0	0.00%											
IV-b	Sophomore	39	84.78%											
IV-c	Junior	7	15.22%											
IV-d	Senior	0	0.00%											
		1-Poor Data	1-Poor %	2-Fair Data	2-Fair %	3-Ave. Data	3-Ave. %	4-Pretty Data	4-Pretty Good-%	5-Good Data	5-Good %	6-Don't Data	6-Don't Know-%	Base
	Start Ranking Questions	x	x	x	x	x	x	x	x	x	x	x	x	x
1	Course in the Plastics Program are:	x	x	x	x	x	x	x	x	x	x	x	x	x
1-a	Based on realistic industry requirements	0	0.00%	1	2.17%	5	10.87%	18	39.13%	21	45.65%	1	2.17%	46
1-b	Up-to-date in their content	0	0.00%	3	6.52%	1	2.17%	15	32.61%	26	56.52%	1	2.17%	46
1-c	A "value" to me at their current tuition cost	2	4.35%	0	0.00%	21	45.65%	15	32.61%	8	17.39%	0	0.00%	46
2	The courses taught in Plastics have:	x	x	x	x	x	x	x	x	x	x	x	x	x
2-a	Written objectives which are available to me	0	0.00%	3	6.52%	8	17.39%	16	34.78%	17	36.96%	2	4.35%	46
2-b	Syllabi which tell me what I will learn	0	0.00%	2	4.35%	5	10.87%	12	26.09%	26	56.52%	1	2.17%	46
2-c	Resources built in to utilize for information	0	0.00%	1	2.17%	3	6.52%	17	36.96%	25	54.35%	0	0.00%	46
3	The course content taught is:	x	x	x	x	x	x	x	x	x	x	x	x	x
3-a	In line with my needs and interests	0	0.00%	2	4.35%	6	13.04%	22	47.83%	16	34.78%	0	0.00%	46
3-b	Understood by the professors teaching	0	0.00%	1	2.17%	6	13.04%	8	17.39%	31	67.39%	0	0.00%	46
4	The teaching methods used in the course:	x	x	x	x	x	x	x	x	x	x	x	x	x
4-a	Utilize the latest technology	0	0.00%	0	0.00%	5	10.87%	20	43.48%	19	41.30%	2	4.35%	46
4-b	Utilize technologies which help me understand	0	0.00%	0	0.00%	5	12.50%	14	35.00%	21	52.50%	0	0.00%	40
4-c	Apply knowledge from instructor experience	0	0.00%	1	2.17%	4	8.70%	10	21.74%	31	67.39%	0	0.00%	46
5	When laboratory activities acccompany lecture:	x	x	x	x	x	x	x	x	x	x	x	x	x
5-a	State-of-the-art equipment is utilized	0	0.00%	4	8.70%	10	21.74%	18	39.13%	13	28.26%	1	2.17%	46
5-b	Experiences parallel the lecture topics	0	0.00%	1	2.17%	6	13.04%	22	47.83%	16	34.78%	1	2.17%	46
5-c	Hands-on experiences are "paced" well	0	0.00%	1	2.17%	6	13.04%	13	28.26%	26	56.52%	0	0.00%	46
6	Aside from the structured class topics/sessions:	x	x	x	x	x	x	x	x	x	x	x	x	x
6-a	I find the instructor's experience meaningful	0	0.00%	1	2.17%	5	10.87%	17	36.96%	23	50.00%	0	0.00%	46
6-b	I can gain insight into future positions	0	0.00%	0	0.00%	5	10.87%	22	47.83%	19	41.30%	0	0.00%	46
6-c	I am given consistent information	0	0.00%	0	0.00%	3	6.52%	24	52.17%	19	41.30%	0	0.00%	46
7	Other Plastics industry information:	x	x	x	x	x	x	x	x	x	x	x	x	x
7-a	Is attainable from past graduates whom I can contact	4	8.70%	7	15.22%	11	23.91%	13	28.26%	7	15.22%	4	8.70%	46
7-b	Is attainable from extra-curricular activities presented	0	0.00%	6	13.04%	12	26.09%	15	32.61%	13	28.26%	0	0.00%	46
7-c	Opportunities are published through the instructors	1	2.17%	2	4.35%	9	19.57%	16	34.78%	15	32.61%	3	6.52%	46
8	The program instructors:	x	x	x	x	x	x	x	x	x	x	x	x	x
8-a	Know the subject matter and occupational requirements	0	0.00%	0	0.00%	1	2.17%	17	36.96%	28	60.87%	0	0.00%	46
8-b	Are available to provide help when I need it	0	0.00%	0	0.00%	8	17.39%	12	26.09%	26	56.52%	0	0.00%	46
8-c	Provide interesting & meaningful subject matter	0	0.00%	0	0.00%	3	6.52%	19	41.30%	24	52.17%	0	0.00%	46
8-d	Are fair and equal with students in general	0	0.00%	2	4.35%	4	8.70%	20	43.48%	20	43.48%	0	0.00%	46
9	Instructional lecture and lab facilities:	x	x	x	x	x	x	x	x	x	x	x	x	x
9-a	Are up-to-date and kept that way	0	0.00%	1	2.17%	9	19.57%	20	43.48%	15	32.61%	1	2.17%	46
9-b	Provide a positive environment for learning	0	0.00%	0	0.00%	4	8.70%	21	45.65%	21	45.65%	0	0.00%	46
9-c	Are safe, functional, and well maintained	0	0.00%	0	0.00%	2	4.35%	15	32.61%	28	60.87%	1	2.17%	46
9-d	Include enough work stations for the class size	0	0.00%	0	0.00%	7	15.22%	15	32.61%	22	47.83%	2	4.35%	46
10	Instructional equipment such as:	x	x	x	x	x	x	x	x	x	x	x	x	x
10-a	Text books are good, clear and meet class needs	0	0.00%	9	19.57%	5	10.87%	22	47.83%	10	21.74%	0	0.00%	46
10-b	Sufficient lab equipment & materials for class	0	0.00%	2	4.35%	7	15.22%	20	43.48%	16	34.78%	1	2.17%	46
10-c	Lab equipment is safe, functional and maintained	0	0.00%	0	0.00%	7	15.22%	15	32.61%	23	50.00%	1	2.17%	46
11	The elective classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
11-a	Meaningful and worthwhile	4	8.70%	12	26.09%	15	32.61%	11	23.91%	4	8.70%	0	0.00%	46
11-b	Fitting choices for the overall program and degree	1	2.17%	12	26.09%	12	26.09%	14	30.43%	6	13.04%	1	2.17%	46
11-c	Taught by instructors who can relate to plastics	13	28.26%	6	13.04%	14	30.43%	7	15.22%	6	13.04%	0	0.00%	46
11-d	Are "in-step" with the core classes in the program	8	17.39%	8	17.39%	16	34.78%	9	19.57%	5	10.87%	0	0.00%	46
12	The support classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
12-a	Meaningful and worthwhile	2	4.35%	5	10.87%	15	32.61%	14	30.43%	8	17.39%	2	4.35%	46
12-b	Fitting choices for the overall program and degree	1	2.17%	4	8.70%	13	28.26%	18	39.13%	9	19.57%	1	2.17%	46
12-c	Taught by instructors who can relate to plastics	4	8.70%	5	10.87%	13	28.26%	15	32.61%	8	17.39%	1	2.17%	46
12-d	Are "in-step" with the core classes in the program	2	4.35%	5	10.87%	17	36.96%	13	28.26%	8	17.39%	1	2.17%	46
13	The "intership" requirements of the program:	x	x	x	x	x	x	x	x	x	x	x	x	x
13-a	Are meaningful and worthwhile (1st. & 2nd.)	0	0.00%	1	2.17%	8	17.39%	11	23.91%	24	52.17%	2	4.35%	46
13-b	Give insight into the expectations of the industry	1	2.17%	1	2.17%	2	4.35%	11	23.91%	24	52.17%	7	15.22%	46
13-c	Are faculty assisted and followed up by them	0	0.00%	3	6.52%	7	15.22%	10	21.74%	19	41.30%	7	15.22%	46
13-d	Are appropriate in quantity, time or requirements	1	2.17%	1	2.17%	7	15.22%	8	17.39%	22	47.83%	7	15.22%	46
14	I am given adequate individual attention:	x	x	x	x	x	x	x	x	x	x	x	x	x
14-a	By my instructor in the lab (student ratio)	0	0.00%	2	4.35%	1	2.17%	18	39.13%	24	52.17%	1	2.17%	46
14-b	By my instructor in the class room (student ratio)	0	0.00%	1	2.17%	6	13.04%	22	47.83%	17	36.96%	0	0.00%	46
15	My classroom experiences include:	x	x	x	x	x	x	x	x	x	x	x	x	x
15-a	Adequate "challenges" given by professor	0	0.00%	2	4.35%	3	6.52%	20	43.48%	21	45.65%	0	0.00%	46
15-b	Adequate availability of computers	0	0.00%	2	4.35%	10	21.74%	15	32.61%	19	41.30%	0	0.00%	46
15-c	Adequate reference materials available	0	0.00%	1	2.17%	11	23.91%	17	36.96%	17	36.96%	0	0.00%	46
16	I receive proper advising:	x	x	x	x	x	x	x	x	x	x	x	x	x
16-a	Within the program classes	1	2.17%	2	4.35%	4	8.70%	14	30.43%	25	54.35%	0	0.00%	46
16-b	From my professor "advisor"	2	4.35%	3	6.52%	5	10.87%	9	19.57%	27	58.70%	0	0.00%	46

PLTS – 121, Winter, 2002
Homework #14 – Rotational Molding #2 – Pages 543 - 566
Name: _____ Lab. No.: _____

11. List 6 advantages of rotational molding.

12. List 4 disadvantages of rotational molding.

13. Explain "jacketed rotational molding".

14. What fuel is usually used to heat the ovens for rotational molding?

15. What are most rotational molds made of?

16. List two other materials that rotational mold can be made of.

17. What draft angle is recommended for rotational molds?

18. What is added to polyethylene when a rotational molder wants to cross-link the polymer?

19. What additive is routinely added to rotational molding resins?

20. What is the recommended wall thickness range for rotational mold parts?

		1-Poor	1-Poor	2-Fair	2-Fair	3-Ave.	3-Ave.	4-Pretty	4-Pretty	5-Good	5-Good	6-Don't	6-Don't	Base
		Data	%	Data	%	Data	%	Data	Good-%	Data	%	Data	Know-%	
17-a	Choose this program again as I first did	2	4.35%	1	2.17%	4	8.70%	14	30.43%	24	52.17%	1	2.17%	46
17-b	Recommend the program to another	0	0.00%	0	0.00%	6	13.04%	14	30.43%	25	54.35%	1	2.17%	46
17-c	Rate the program	0	0.00%	0	0.00%	1	2.17%	24	52.17%	21	45.65%	0	0.00%	46
18	When you entered the program, how did you view your	x	x	x	x	x	x	x	x	x	x	x	x	x
	career potential?	0	0.00%	0	0.00%	5	10.87%	18	39.13%	22	47.83%	1	2.17%	46
19	How do you view your career potential now?	0	0.00%	1	2.17%	4	8.70%	22	47.83%	19	41.30%	0	0.00%	46
		Check	Check											
		Date	%											
V	Why did you originally select the Plastics Program?	x	x											
V-a	Hands-on Education	27	58.70%											
V-b	Want to work in Plastics Industry	22	47.83%											
V-c	Other students excited about the program	2	4.35%											
V-d	Recommendations from others	28	60.87%											
V-e	Other students	3	6.52%											
V-f	Relative or friend	15	32.61%											
V-g	High school counselor/teacher	11	23.91%											
V-h	FSU faculty/administration	8	17.39%											
V-i	Someone in industry	7	15.22%											
V-j	Relative or friend	15	32.61%											
V-k	Other - see notes	2	4.35%											

PLTS – 121, Winter, 2002

Homework #14 – Rotational Molding #2 – Pages 543 - 566

Name: _____ Lab. No.: _____

11. List 6 advantages of rotational molding.

12. List 4 disadvantages of rotational molding.

13. Explain "jacketed rotational molding".

14. What fuel is usually used to heat the ovens for rotational molding?

15. What are most rotational molds made of?

16. List two other materials that rotational mold can be made of.

17. What draft angle is recommended for rotational molds?

18. What is added to polyethylene when a rotational molder wants to cross-link the polymer?

19. What additive is routinely added to rotational molding resins?

20. What is the recommended wall thickness range for rotational mold parts?

Winter Term, 2002
Student Survey
Comments
PLTS – 300

III. Check the statement that best describes why you picked the Ferris Plastics Program for a curriculum: Other (Describe):
   a. "Wanted to be in engineering."
   b. "I've been very happy with the Plastics Program here and I feel I will be very prepared when I enter the work environment. I would recommend this program to anyone with interest."
   c. "Community College (GRCC)."
   d. "$ and availability of jobs."
   e. "Wanted to work in a field little known about, but had potential to make a good living."

1-c. Course in Plastics Program are: A value to me at their current tuition cost:
   a. "Tuition is always "too high".

2-a. The courses taught in Plastics have: Written objectives which are available to me:
   a. "Some times unavailable."

4-c. The teaching methods used in the course: Apply knowledge from instructor experience:
   a. "Especially Schult & Muccio."

5-a. When laboratory activities accompany lecture: State-of-the-art equipment is utilized:
   a. "Needs up-dating -> some."
   b. "I wouldn't call the Cinci "State–of-the-art".
   c. "All labs do a great job in directly implementing the lectures used and aids in understanding."
   d. "Lab needs robots, what shop today does not have them?"

6-c. Aside from the structured class topics/sessions: I am given consistent information:
   a. "Except Speirs @ times."

7-a. Other Plastics Industry information: Is attainable from past graduates whom I can contact:
   a. "Needs work, build database of alumni."

7-c. Opportunities are published through the instructors:
   a. "Announcements are great."

8-d. The program instructors: Are fair and equal with students in general:
   a. "Speirs -> unfair tests."

9-a. Instructional lecture and laboratory facilities: Are up-to-date and kept that way:
   a. "It is difficult to keep machinery up-to-date due to cost, but this program does a great job."

10-a. Instructional equipment such as: Textbooks are good, clear, and meet class needs:
   a. "Some textbooks are useless, but most are right-on."
   b. "Mostly yes, but some <$100.00 unused."
   c. "Some textbooks aren't used enough for what we pay."
   d. "When used ?"

10-c. Lab equipment is safe, functional, and maintained:
   a. "Except DIMA."
11-a. The elective classes required are: Meaningful and worthwhile:
   a. "Thanks Mr. Muccio!"
   b. "University sucking the money out of me! As if the fees aren't bad enough."
11-c. Are "in-step" with the core classes in the program:
   a. "He is the only Prof. who ventures into new territory in our program, thank God."
12-a. The support classes required are: Meaningful and worthwhile:
   a. "Chem. 211 a joke."
   b. "I think we need a chem. class between 121 and organic."
   c. "Some support classes are jokes that do not challenge me."
12-c. Are "in-step" with the core classes in the program:
   a. "Balanda. ☹"
13-a. The "internship" requirements of the program: Are meaningful and worthwhile (1^{st}. & 2^{nd}.)
   a. "I think the internship program here is excellent and very useful."
   b. "Only done 1^{st}. @ CC."
   c. "I think its outrageous we have to pay for it and the instructor does nothing."
14-a. I am given adequate individual attention: By my instructor in laboratory (student ratio)
   a. "Need more lab assistants."
15-b. My classroom experiences include: Adequate "challenges" given by professor:
   a. "Labs & limited comp. plus all the MFG & MECH people that use it ... makes me mad!"
16-b. I received proper advising: Within the program classes:
   a. "I'm very happy with the advising I've received (Muccio)."
17-c. Overall, I would: Choose this program again as I first did:
   a. "Marsh needs to find a new job! Bring Schult back as director ... soon, before program dies."
   b. "Excellent all around program."
.19-a. How do you view your career potential now?
   a. "Excited about my future, because of this program."
   b. "Excellent."

Additional Comments:

-"A lot of the classes seemed old (?), outdated, too much survey, not enough in depth. (Industrial Eng., PLTS - 300) Based on 8 years in industry experience I feel that I did not learn stuff that was relevant. It seem that terminology was the thing that was most prevalent. Don't perceive this badly, 25% of the classes were excellent, others seemed to be a waste. The reason I would not choose this program again is because of the technology degree, not engineering, as schools such as Mich. Tech. And U of M become

more plastics oriented with an engineering degree I think Ferris will struggle with attendance down the road. Any questions feel free to call me @ (616) 772-3033."

-"Everything I need to learn about organic chemistry & plastics I learned from PLTS – 320, Speirs. Mr. Balanda & Chem. 211 are both a joke to this program! He has no clue … STILL! I know this has been a problem in the past & Marsh continues to ignore or sweep this issue under the rug … and waits for next year's students to come and complain. Mr. Balanda is the root cause of the problem and he is a terrible professor who has no clue about plastics and needs to be informed -> Once Again!"

Question	Wording	Check Data	Check %											
I	Have you completed your	x	x											
	First Internship	31	93.94%											
	Second Internship	7	21.21%											
II	Check the statement that best describes	x	x											
	your objective for attending college:	x	x											
II-a	Prepare to get a job	28	84.85%											
II-b	Improve job skills for present occupation	5	15.15%											
II-c	Prepare for transfer to another college	0	0.00%											
II-d	Personal interest	5	15.15%											
II-e	Other - see notes	0	0.00%											
III	Check the statement that best describes	x	x											
	why you picked the Ferris Plastics Program	x	x											
	for a curriculum:	x	x											
III-a	Availability of a job at graduation	12	36.36%											
III-b	Existing reputation of program	14	42.42%											
III-c	Did not like program I was in	3	9.09%											
III-d	Published pay rates of industry/career	5	15.15%											
III-e	Other - see notes	5	15.15%											
IV	Check your current student status in the	x	x											
	Plastics Program:	x	x											
IV-a	Freshman	0	0.00%											
IV-b	Sophomore	1	3.03%											
IV-c	Junior	20	60.61%											
IV-d	Senior	12	36.36%											
		1-Poor Data	1-Poor %	2-Fair Data	2-Fair %	3-Ave. Data	3-Ave. %	4-Pretty Data	4-Pretty Good-%	5-Good Data	5-Good %	6-Don't Data	6-Don't Know-%	Base
	Start Ranking Questions	x	x	x	x	x	x	x	x	x	x	x	x	x
1	Course in the Plastics Program are:	x	x	x	x	x	x	x	x	x	x	x	x	x
1-a	Based on realistic industry requirements	0	0.00%	0	0.00%	3	9.09%	19	57.58%	9	27.27%	2	6.06%	33
1-b	Up-to-date in their content	0	0.00%	0	0.00%	4	12.12%	18	54.55%	11	33.33%	0	0.00%	33
1-c	A "value" to me at their current tuition cost	0	0.00%	5	15.15%	9	27.27%	15	45.45%	4	12.12%	0	0.00%	33
2	The courses taught in Plastics have:	x	x	x	x	x	x	x	x	x	x	x	x	x
2-a	Written objectives which are available to me	0	0.00%	0	0.00%	4	12.12%	21	63.64%	8	24.24%	0	0.00%	33
2-b	Syllabi which tell me what I will learn	0	0.00%	0	0.00%	4	12.12%	14	42.42%	15	45.45%	0	0.00%	33
2-c	Resources built in to utilize for information	0	0.00%	1	3.03%	4	12.12%	14	42.42%	12	36.36%	2	6.06%	33
3	The course content taught is:	x	x	x	x	x	x	x	x	x	x	x	x	x
3-a	In line with my needs and interests	1	3.03%	0	0.00%	4	12.12%	18	54.55%	10	30.30%	0	0.00%	33
3-b	Understood by the professors teaching	0	0.00%	1	3.03%	0	0.00%	11	33.33%	21	63.64%	0	0.00%	33
4	The teaching methods used in the course:	x	x	x	x	x	x	x	x	x	x	x	x	x
4-a	Utilize the latest technology	0	0.00%	1	3.03%	8	24.24%	11	33.33%	13	39.39%	0	0.00%	33
4-b	Utilize technologies which help me understand	0	0.00%	0	0.00%	5	15.15%	11	33.33%	17	51.52%	0	0.00%	33
4-c	Apply knowledge from instructor experience	0	0.00%	0	0.00%	1	3.03%	14	42.42%	18	54.55%	0	0.00%	33
5	When laboratory activities acccompany lecture:	x	x	x	x	x	x	x	x	x	x	x	x	x
5-a	State-of-the-art equipment is utilized	1	3.03%	4	12.12%	12	36.36%	11	33.33%	5	15.15%	0	0.00%	33
5-b	Experiences parallel the lecture topics	0	0.00%	0	0.00%	6	18.18%	15	45.45%	12	36.36%	0	0.00%	33
5-c	Hands-on experiences are "paced" well	0	0.00%	0	0.00%	7	21.21%	15	45.45%	11	33.33%	0	0.00%	33
6	Aside from the structured class topics/sessions:	x	x	x	x	x	x	x	x	x	x	x	x	x
6-a	I find the instructor's experience meaningful	0	0.00%	0	0.00%	6	18.18%	13	39.39%	14	42.42%	0	0.00%	33
6-b	I can gain insight into future positions	0	0.00%	2	6.06%	5	15.15%	15	45.45%	10	30.30%	1	3.03%	33
6-c	I am given consistent information	0	0.00%	1	3.03%	7	21.21%	19	57.58%	6	18.18%	0	0.00%	33
7	Other Plastics industry information:	x	x	x	x	x	x	x	x	x	x	x	x	x
7-a	Is attainable from past graduates whom I can contact	5	15.15%	6	18.18%	11	33.33%	4	12.12%	5	15.15%	2	6.06%	33
7-b	Is attainable from extra-curricular activities presented	1	3.03%	6	18.18%	10	30.30%	11	33.33%	4	12.12%	1	3.03%	33
7-c	Opportunities are published through the instructors	1	3.03%	3	9.09%	7	21.21%	10	30.30%	10	30.30%	2	6.06%	33
8	The program instructors:	x	x	x	x	x	x	x	x	x	x	x	x	x
8-a	Know the subject matter and occupational requirements	0	0.00%	0	0.00%	3	9.09%	12	36.36%	17	51.52%	1	3.03%	33
8-b	Are available to provide help when I need it	0	0.00%	0	0.00%	2	6.06%	7	21.21%	23	69.70%	1	3.03%	33
8-c	Provide interesting & meaningful subject matter	0	0.00%	0	0.00%	1	3.13%	11	34.38%	19	59.38%	1	3.13%	32
8-d	Are fair and equal with students in general	1	3.03%	2	6.06%	4	12.12%	15	45.45%	11	33.33%	0	0.00%	33
9	Instructional lecture and lab facilities:	x	x	x	x	x	x	x	x	x	x	x	x	x
9-a	Are up-to-date and kept that way	0	0.00%	0	0.00%	12	36.36%	15	45.45%	6	18.18%	0	0.00%	33
9-b	Provide a positive environment for learning	0	0.00%	1	3.03%	2	6.06%	15	45.45%	15	45.45%	0	0.00%	33
9-c	Are safe, functional, and well maintained	0	0.00%	0	0.00%	2	6.06%	16	48.48%	15	45.45%	0	0.00%	33
9-d	Include enough work stations for the class size	0	0.00%	1	3.03%	3	9.09%	11	33.33%	18	54.55%	0	0.00%	33
10	Instructional equipment such as:	x	x	x	x	x	x	x	x	x	x	x	x	x
10-a	Text books are good, clear and meet class needs	1	3.03%	6	18.18%	7	21.21%	16	48.48%	3	9.09%	0	0.00%	33
10-b	Sufficient lab equipment & materials for class	0	0.00%	3	9.09%	2	6.06%	19	57.58%	8	24.24%	1	3.03%	33
10-c	Lab equipment is safe, functional and maintained	0	0.00%	2	6.06%	5	15.15%	15	45.45%	11	33.33%	0	0.00%	33
11	The elective classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
11-a	Meaningful and worthwhile	7	21.21%	5	15.15%	10	30.30%	8	24.24%	3	9.09%	0	0.00%	33
11-b	Fitting choices for the overall program and degree	6	18.18%	3	9.09%	8	24.24%	11	33.33%	2	6.06%	3	9.09%	33
11-c	Taught by instructors who can relate to plastics	11	33.33%	7	21.21%	7	21.21%	4	12.12%	2	6.06%	2	6.06%	33
11-d	Are "in-step" with the core classes in the program	9	27.27%	3	9.09%	14	42.42%	4	12.12%	2	6.06%	1	3.03%	33
12	The support classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
12-a	Meaningful and worthwhile	1	3.03%	7	21.21%	8	24.24%	12	36.36%	5	15.15%	0	0.00%	33
12-b	Fitting choices for the overall program and degree	0	0.00%	7	21.21%	6	18.18%	15	45.45%	5	15.15%	0	0.00%	33
12-c	Taught by instructors who can relate to plastics	5	15.15%	2	6.06%	14	42.42%	7	21.21%	4	12.12%	1	3.03%	33
12-d	Are "in-step" with the core classes in the program	2	6.06%	4	12.12%	9	27.27%	11	33.33%	6	18.18%	1	3.03%	33
13	The "intership" requirements of the program:	x	x	x	x	x	x	x	x	x	x	x	x	x
13-a	Are meaningful and worthwhile (1st. & 2nd.)	0	0.00%	0	0.00%	2	6.06%	8	24.24%	21	63.64%	2	6.06%	33
13-b	Give insight into the expectations of the industry	0	0.00%	0	0.00%	2	6.06%	9	27.27%	20	60.61%	2	6.06%	33
13-c	Are faculty assisted and followed up by them	0	0.00%	2	6.06%	5	15.15%	13	39.39%	11	33.33%	2	6.06%	33
13-d	Are appropriate in quantity, time or requirements	0	0.00%	1	3.13%	4	12.50%	9	28.13%	16	50.00%	2	6.25%	32
14	I am given adequate individual attention:	x	x	x	x	x	x	x	x	x	x	x	x	x
14-a	By my instructor in the lab (student ratio)	0	0.00%	2	6.06%	6	18.18%	8	24.24%	17	51.52%	0	0.00%	33
14-b	By my instructor in the class room (student ratio)	0	0.00%	1	3.03%	6	18.18%	9	27.27%	17	51.52%	0	0.00%	33
15	My classroom experiences include:	x	x	x	x	x	x	x	x	x	x	x	x	x
15-a	Adequate "challenges" given by professor	0	0.00%	0	0.00%	2	6.06%	18	54.55%	13	39.39%	0	0.00%	33
15-b	Adequate availability of computers	0	0.00%	1	3.03%	2	6.06%	9	27.27%	21	63.64%	0	0.00%	33
15-c	Adequate reference materials available	0	0.00%	1	3.03%	6	18.18%	12	36.36%	13	39.39%	1	3.03%	33
16	I receive proper advising:	x	x	x	x	x	x	x	x	x	x	x	x	x
16-a	Within the program classes	0	0.00%	1	3.03%	6	18.18%	14	42.42%	12	36.36%	0	0.00%	33
16-b	From my professor "advisor"	1	3.03%	4	12.12%	5	15.15%	6	18.18%	17	51.52%	0	0.00%	33

		1-Poor	1-Poor	2-Fair	2-Fair	3-Ave.	3-Ave.	4-Pretty	4-Pretty	5-Good	5-Good	6-Don't	6-Don't	Base
		Data	%	Data	%	Data	%	Data	Good-%	Data	%	Data	Know-%	
17-a	Choose this program again as I first did	1	3.03%	0	0.00%	5	15.15%	6	18.18%	19	57.58%	2	6.06%	33
17-b	Recommend the program to another	1	3.03%	0	0.00%	2	6.06%	9	27.27%	19	57.58%	2	6.06%	33
17-c	Rate the program	1	3.03%	0	0.00%	2	6.06%	12	36.36%	18	54.55%	0	0.00%	33
18	When you entered the program, how did you view your	x	x	x	x	x	x	x	x	x	x	x	x	x
	career potential?	0	0.00%	0	0.00%	2	6.06%	10	30.30%	21	63.64%	0	0.00%	33
19	How do you view your career potential now?	0	0.00%	1	3.03%	3	9.09%	6	18.18%	23	69.70%	0	0.00%	33
		Check	Check											
		Data	%											
V	Why did you originally select the Plastics Program?	x	x											
V-a	Hands-on Education	15	45.45%											
V-b	Want to work in Plastics industry	19	57.58%											
V-c	Other students excited about the program	4	12.12%											
V-d	Recommendations from others	18	54.55%											
V-e	Other students	5	15.15%											
V-f	Relative or friend	14	42.42%											
V-g	High school counselor/teacher	5	15.15%											
V-h	FSU faculty/administration	18	54.55%											
V-I	Someone in industry	4	12.12%											
V-j	Relative or friend	14	42.42%											
V-k	Other - see notes	5	15.15%											

Current Student Survey
Comments
Winter Term, 2002
PLTS – 499

III. Check the statements that best describe why you picked the Ferris Plastics Program for a curriculum: Other:
   a. "High school advisor"
   b. "Random"

4-c. The teaching methods used in the course: Apply knowledge from instructor experience:
   a. "More is better."

5-a. When lab activities accompany lecture: State-of-the-art equipment is utilized:
   a. "Cavity pressure."

5-b. When lab activities accompany lecture: Experience Parallel the lecture topics:
   a. "In processing."

5-c. When lab activities accompany lecture: Hands-on experiences are "paced" well:
   a. "Too fast for me."

6-a. Aside from the structured class topics/sessions: I find the instructor's experiences meaningful:
   a. "I remember better."

10-a. Instructional equipment such as: Text books are good, clear, and meet class needs:
   a. "Text not used."

11-a. The elective classes required are: Meaningful and worth while:
   a. "Need options."

11-b. The elective classes required are: Fitting choices for the overall program and degree:
   a. "More projects."

13-a. The "internship" requirements of the program: Are meaningful and worthwhile:
   a. "Excellent."

14-a. I am given adequate individual attention: By my instructor in lab:
   a. "Not very good in 211 and 321."

16-b. I received proper advising: From my professor "advisor":
   a. "Langell has been great."

17-a. Overall, I would: Choose this program again as I first did:
   a. "Maybe."

17-b. Overall, I would: Recommend the program to another:
   a. "Yes."

18-a. When you entered the program, how did you view your career options:
   a. "Hugh."

IV. Why did you originally select the Plastics Program: Other:
   a. "Junior college councilor"
   b. "Mostly random"

Additional Comments:
"Some students allowed to progress based on race/gender. Not fair. Bad for the reputation of the program. I feel the FSU Plastics Program should have more classes that teach PPAP, control plan, etc. More closely containing information about quality control.

Current Student Survey
Winter Term, 2002
PLTS - 499

Question	Wording	Check Data	Check %											
I	Have you completed your	x	x											
	First Internship	17	100.00%											
	Second Internship	17	100.00%											
II	Check the statement that best describes	x	x											
	your objective for attending college:	x	x											
II-a	Prepare to get a job	13	76.47%											
II-b	Improve job skills for present occupation	1	5.88%											
II-c	Prepare for transfer to another college	0	0.00%											
II-d	Personal interest	1	5.88%											
II-e	Other - see notes	0	0.00%											
III	Check the statement that best describes	x	x											
	why you picked the Ferris Plastics Program	x	x											
	for a curriculum:	x	x											
III-a	Availability of a job at graduation	4	23.53%											
III-b	Existing reputation of program	6	35.29%											
III-c	Did not like program I was in	0	0.00%											
III-d	Published pay rates of industry/career	3	17.65%											
III-e	Other - see notes	3	17.65%											
IV	Check your current student status in the	x	x											
	Plastics Program:	x	x											
IV-a	Freshman													
IV-b	Sophomore													
IV-c	Junior													
IV-d	Senior													
		1-Poor Data	1-Poor %	2-Fair Data	2-Fair %	3-Ave. Data	3-Ave. %	4-Pretty Data	4-Pretty Good-%	5-Good Data	5-Good %	6-Don't Data	6-Don't Know-%	Base
	Start Ranking Questions	x	x	x	x	x	x	x	x	x	x	x	x	x
1	Course in the Plastics Program are:	x	x	x	x	x	x	x	x	x	x	x	x	x
1-a	Based on realistic industry requirements	0	0.00%	1	5.88%	2	11.76%	7	41.18%	7	41.18%	0	0.00%	17
1-b	Up-to-date in their content	0	0.00%	0	0.00%	3	17.65%	5	29.41%	9	52.94%	0	0.00%	17
1-c	A "value" to me at their current tuition cost	0	0.00%	1	5.88%	7	41.18%	7	41.18%	2	11.76%	0	0.00%	17
2	The courses taught in Plastics have:	x	x	x	x	x	x	x	x	x	x	x	x	x
2-a	Written objectives which are available to me	0	0.00%	0	0.00%	4	23.53%	8	47.06%	5	29.41%	0	0.00%	17
2-b	Syllabi which tell me what I will learn	0	0.00%	0	0.00%	2	11.76%	5	29.41%	10	58.82%	0	0.00%	17
2-c	Resources built in to utilize for information	0	0.00%	0	0.00%	6	35.29%	6	35.29%	4	23.53%	1	5.88%	17
3	The course content taught is:	x	x	x	x	x	x	x	x	x	x	x	x	x
3-a	In line with my needs and interests	1	5.88%	0	0.00%	2	11.76%	11	64.71%	3	17.65%	0	0.00%	17
3-b	Understood by the professors teaching	0	0.00%	0	0.00%	2	11.76%	6	35.29%	9	52.94%	0	0.00%	17
4	The teaching methods used in the course:	x	x	x	x	x	x	x	x	x	x	x	x	x
4-a	Utilize the latest technology	0	0.00%	0	0.00%	4	23.53%	2	11.76%	10	58.82%	1	5.88%	17
4-b	Utilize technologies which help me understand	0	0.00%	0	0.00%	2	11.76%	7	41.18%	8	47.06%	0	0.00%	17
4-c	Apply knowledge from instructor experience	0	0.00%	0	0.00%	1	5.88%	6	35.29%	10	58.82%	0	0.00%	17
5	When laboratory activities acccompany lecture:	x	x	x	x	x	x	x	x	x	x	x	x	x
5-a	State-of-the-art equipment is utilized	0	0.00%	0	0.00%	3	17.65%	11	64.71%	3	17.65%	0	0.00%	17
5-b	Experiences parallel the lecture topics	0	0.00%	0	0.00%	3	17.65%	7	41.18%	7	41.18%	0	0.00%	17
5-c	Hands-on experiences are "paced" well	0	0.00%	0	0.00%	3	17.65%	7	41.18%	7	41.18%	0	0.00%	17
6	Aside from the structured class topics/sessions:	x	x	x	x	x	x	x	x	x	x	x	x	x
6-a	I find the instructor's experience meaningfull	0	0.00%	1	5.88%	0	0.00%	5	29.41%	11	64.71%	0	0.00%	17
6-b	I can gain insight into future positions	0	0.00%	0	0.00%	3	17.65%	7	41.18%	7	41.18%	0	0.00%	17
6-c	I am given consistent information	0	0.00%	1	5.88%	4	23.53%	7	41.18%	5	29.41%	0	0.00%	17
7	Other Plastics Industry information:	x	x	x	x	x	x	x	x	x	x	x	x	x
7-a	Is attainable from past graduates whom I can contact	0	0.00%	4	23.53%	9	52.94%	3	17.65%	1	5.88%	0	0.00%	17
7-b	Is attainable from extra-curricular activities presented	0	0.00%	3	17.65%	4	23.53%	6	35.29%	2	11.76%	2	11.76%	17
7-c	Opportunities are published through the instructors	0	0.00%	1	5.88%	9	52.94%	4	23.53%	2	11.76%	1	5.88%	17
8	The program instructors:	x	x	x	x	x	x	x	x	x	x	x	x	x
8-a	Know the subject matter and occupational requirements	0	0.00%	0	0.00%	1	5.88%	8	47.06%	8	47.06%	0	0.00%	17
8-b	Are available to provide help when I need it	0	0.00%	0	0.00%	3	17.65%	6	35.29%	8	47.06%	0	0.00%	17
8-c	Provide interesting & meaningful subject matter	0	0.00%	0	0.00%	2	11.76%	8	47.06%	7	41.18%	0	0.00%	17
8-d	Are fair and equal with students in general	0	0.00%	0	0.00%	4	23.53%	6	35.29%	7	41.18%	0	0.00%	17
9	Instructional lecture and lab facilities:	x	x	x	x	x	x	x	x	x	x	x	x	x
9-a	Are up-to-date and kept that way	0	0.00%	0	0.00%	3	17.65%	10	58.82%	4	23.53%	0	0.00%	17
9-b	Provide a positive environment for learning	0	0.00%	0	0.00%	2	11.76%	11	64.71%	4	23.53%	0	0.00%	17
9-c	Are safe, functional, and well maintained	0	0.00%	0	0.00%	1	5.88%	9	52.94%	7	41.18%	0	0.00%	17
9-d	Include enough work stations for the class size	0	0.00%	3	17.65%	3	17.65%	4	23.53%	7	41.18%	0	0.00%	17
10	Instructional equipment such as:	x	x	x	x	x	x	x	x	x	x	x	x	x
10-a	Text books are good, clear and meet class needs	1	5.88%	2	11.76%	5	29.41%	6	35.29%	3	17.65%	0	0.00%	17
10-b	Sufficient lab equipment & materials for class	0	0.00%	2	11.76%	4	23.53%	9	52.94%	2	11.76%	0	0.00%	17
10-c	Lab equipment is safe, functional and maintained	0	0.00%	0	0.00%	2	11.76%	7	41.18%	8	47.06%	0	0.00%	17
11	The elective classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
11-a	Meaningful and worthwhile	0	0.00%	5	29.41%	6	35.29%	3	17.65%	2	11.76%	1	5.88%	17
11-b	Fitting choices for the overall program and degree	2	11.76%	5	29.41%	6	35.29%	2	11.76%	2	11.76%	0	0.00%	17
11-c	Taught by instructors who can relate to plastics	2	11.76%	5	29.41%	3	17.65%	5	29.41%	2	11.76%	0	0.00%	17
11-d	Are "in-step" with the core classes in the program	1	5.88%	6	35.29%	3	17.65%	6	35.29%	1	5.88%	0	0.00%	17
12	The support classes required are:	x	x	x	x	x	x	x	x	x	x	x	x	x
12-a	Meaningful and worthwhile	0	0.00%	4	23.53%	4	23.53%	7	41.18%	2	11.76%	0	0.00%	17
12-b	Fitting choices for the overall program and degree	1	5.88%	3	17.65%	4	23.53%	7	41.18%	2	11.76%	0	0.00%	17
12-c	Taught by instructors who can relate to plastics	1	5.88%	5	29.41%	3	17.65%	6	35.29%	2	11.76%	0	0.00%	17
12-d	Are "in-step" with the core classes in the program	1	5.88%	1	5.88%	7	41.18%	5	29.41%	3	17.65%	0	0.00%	17
13	The "intership" requirements of the program:	x	x	x	x	x	x	x	x	x	x	x	x	x
13-a	Are meaningful and worthwhile (1st. & 2nd.)	0	0.00%	1	5.88%	0	0.00%	2	11.76%	14	82.35%	0	0.00%	17
13-b	Give insight into the expectations of the industry	0	0.00%	2	11.76%	0	0.00%	5	29.41%	10	58.82%	0	0.00%	17
13-c	Are faculty assisted and followed up by them	0	0.00%	0	0.00%	3	17.65%	10	58.82%	4	23.53%	0	0.00%	17
13-d	Are appropriate in quantity, time or requirements	0	0.00%	1	5.88%	1	5.88%	8	47.06%	7	41.18%	0	0.00%	17
14	I am given adequate individual attention:	x	x	x	x	x	x	x	x	x	x	x	x	x
14-a	By my instructor in the lab (student ratio)	0	0.00%	1	5.88%	4	23.53%	6	35.29%	6	35.29%	0	0.00%	17
14-b	By my instructor in the class room (student ratio)	0	0.00%	0	0.00%	3	17.65%	9	52.94%	5	29.41%	0	0.00%	17
15	My classroom experiences include:	x	x	x	x	x	x	x	x	x	x	x	x	x
15-a	Adequate "challenges" given by professor	0	0.00%	0	0.00%	1	5.88%	8	47.06%	8	47.06%	0	0.00%	17
15-b	Adequate availability of computers	0	0.00%	1	5.88%	3	17.65%	5	29.41%	8	47.06%	0	0.00%	17
15-c	Adequate reference materials available	0	0.00%	1	5.88%	4	23.53%	6	35.29%	6	35.29%	0	0.00%	17
16	I receive proper advising:	x	x	x	x	x	x	x	x	x	x	x	x	x
16-a	Within the program classes	0	0.00%	1	5.88%	3	17.65%	6	35.29%	7	41.18%	0	0.00%	17
16-b	From my professor "advisor"	2	11.76%	1	5.88%	1	5.88%	3	17.65%	10	58.82%	0	0.00%	17

		1-Poor	1-Poor	2-Fair	2-Fair	3-Ave.	3-Ave.	4-Pretty	4-Pretty	5-Good	5-Good	6-Don't	6-Don't	Base
		Data	%	Data	%	Data	%	Data	Good-%	Data	%	Data	Know-%	
17-a	Choose this program again as I first did	1	5.88%	2	11.76%	3	17.65%	3	17.65%	7	41.18%	1	5.88%	17
17-b	Recommend the program to another	0	0.00%	0	0.00%	1	5.88%	7	41.18%	9	52.94%	0	0.00%	17
17-c	Rate the program	0	0.00%	0	0.00%	1	5.88%	8	47.06%	8	47.06%	0	0.00%	17
18	When you entered the program, how did you view your	x	x	x	x	x	x	x	x	x	x	x	x	x
	career potential?	0	0.00%	0	0.00%	2	11.76%	5	29.41%	10	58.82%	0	0.00%	17
19	How do you view your career potential now?	1	5.88%	2	11.76%	2	11.76%	7	41.18%	5	29.41%	0	0.00%	17
		Check	Check											
		Data	%											
V	Why did you originally select the Plastics Program?	x	x											
V-a	Hands-on Education	10	58.82%											
V-b	Want to work in Plastics Industry	8	47.06%											
V-c	Other students excited about the program	1	5.88%											
V-d	Recommendations from others	12	70.59%											
V-e	Other students	0	0.00%											
V-f	Relative or friend	7	41.18%											
V-g	High school counselor/teacher	4	23.53%											
V-h	FSU faculty/administration	2	11.76%											
V-i	Someone in Industry	3	17.65%											
V-j	Relative or friend	1	5.88%											
V-k	Other - see notes	2	11.76%											

SECTION IX

Facilities and equipment review

FACILTIES AND EQUIPMENT

Facilities:

In 1995, the rubber industry approached FSU to develop "Rubber" degree programs based on the model established by the plastics programs. In their proposal, rubber industry supporters committed funding to put an addition on the existing facility in order to support the new rubber program. In fall 1999 the new National Elastomer Center was dedicated.

The new facility almost doubled the original building in size, adding laboratory space for both programs and upgrading lecture facilities. Included in the addition was a large (12000 ft. sq.) open laboratory space, which now houses the primary plastics processing laboratory. Three smaller labs (est. 1600 ft. sq. each) are used for plastics finishing/decoration, assembly and tooling respectively. An expanded, environmentally controlled plastics testing lab was also added to the facility. Two small "staging" labs, where faculty can meet with students during lab sessions were also included in the design. In addition to the laboratory space, the NEC has 4 lecture rooms varying in size from 16 students to 65 students. Three of these classrooms have multimedia capability. Also, 8 faculty offices and a department office with a small conference room were added to the building. The rubber and plastics faculty as well as administration to have offices in the facility to improved student access.

The National Elastomer Center (NEC) is one of the premier education facilities in the country. The combination of laboratories and lecture rooms develops the building into an impressive educational facility.

Equipment:

The focus of the hands-on plastics education at FSU revolves around primary processing. Primary processing is the conversion of plastics pellets into a finished article. The most used primary process equipment is (in order of significance):

Process	Number at FSU
Injection molding	10
Extrusion	3
Thermoforming	2
Blow molding	2
Rotational molding	2
Compression/Transfer molding	2
Casting	N/A

As part of the hands-on approach to education, the plastics program has organized laboratories to assure each student a safe, positive individual experience. This is partially achieved by controlling the number of students per machine. All the plastics laboratories limit to 2 students per machine.

As described by the alumni the vast majority of them are involved in injection molding. The primary processing laboratory at FSU has many injection molding machines. The weakness stems from the age of these machines. There are three machines that are three years (two of these machines are consigned from their manufacturers and could leave any time) or younger, and 5 machines that were manufactured in 1980 or later. The "well worn" machinery is representative of the industry but does not allow the student to experience modern technology. It is very important for the program to have a budget to purchase modern equipment.

The alumni identified extrusion as another process that their companies use. Extrusion is the most significant process, terms of volume of plastics used, in the industry and plays an important part in plastics manufacturing. At FSU we have three extruders, two which are laboratory level equipment and not representative of industry. Over the past five years the faculty have attempted many different ways to receive donations to purchase a new extruded without success. The program needs a new extruder!

The alumni also identified blow molding as a significant process and one they are involved with. In addition, blow molding is becoming a significant process in the automotive market as companies develop hollow structural parts. At FSU, we have two blow molders. One uses technology that has been out of date for 10 years, the other is consigned from the manufacturer. The program needs an upgrade in blow molding equipment.

The other primary processes are represented fairly well in the FSU labs.

New Equipment:

Meiki (1990) 100 ton injection molding machine	(donated)
Van Dorn (1976) 75 ton injection molding machine	(donated)
Ferromatic (1997) 50 ton electric molding machine	(purchased*)
Indigo (2001) 275 ton injection molding machine	(purchased*)
DIMA (2000) 175 ton injection molding machine	(consigned)
Tosh Logica pad printer	(donated)
(2) Rotational molding machines	(purchased)
16 Dell Computers	(purchased)
(50) Moldflow licensees	(consigned)

*Perkins Grant allocated by FSU

PLASTICS EQUIPMENT LIST
(9/2002)

36. Franklin		Hot Stamping Machine
37. United Silicone	UP-303	Pad Printer
38. Tampo Print	TT/80/31	Pad Printer
39. Tampo Print	BM 1080	Cliché Printer
40. Nickelderm		Thickness Tester
41. Corotec	Plasma Jet	Surface Treater
42. Neuman Engingeering (2)		Hot Stakers
43. Loctite		UV Cure System
44. Bryant	TAS2010	Thermal Assy System
45. Vertrod		Thermal Impulse Sealer
46. Dukane	Model 2000	Sonic Welder
47. Dukane	Model 5111	Sonic Welder
48. Branson	Model 490	Sonic Welder
49. Matsui	Jet Loader	Loader/Dryer
50. Conair Franklin	SC30	Loader/Dryer
51. Conair Franklin	CD30	Loader/Dryer
52. Conair Franklin	CD100	Dryer
53. Whitlock (2)	WD-25	Dryer
54. Bry-Air	DH-2	Dryer
55.Una-Dyn	50	Dryer
56. Matsui	MC-III	Conditioner
57. Sterlco	M-2	Conditioner
58. Sterlco	6424 Dual Zone	Conditioner
59. Budzar	MTC	Conditioner
60. Sterling	SMC300	Chiller
61. Killion		Material Pelletizer
62. IMS	2144	Material Grinder
63. LR Systems	SG-100	Material Grinder
64. Nelmor	66-M1	Material Grinder
65. Band Saw		
62. Drill Press (2)		
63. Belt/Disc Sander		
64. Tennsmith	Shear	Material Cutter
65. Allis-Chalmers	3000lbs	Forklift
66. Allis-Chalmers	7000 lbs	Forklift

PLASTICS EQUIPMENT LIST
(9/2002)

1. Ferramatik Milacron	275 ton	Inj. Molding Machine
2. Ferramatik Milacron	50 ton	Inj. Molding Machine
3. Cincinati Milacron	75 ton	Inj. Molding Machine
4. Van Dorn	75 ton	Inj. Molding Machine
5. Meiki	100 ton	Inj. Molding Machine
6. Dima (not working)		Inj. Molding Machine
7. Engel 2 shot (not working)		Inj. Molding Machine
8. Boy	50 ton	Inj. Molding Machine
9. Newbury	30 ton	Inj. Molding Machine
10. Mitsubishi	120 ton	Inj. Molding Machine
11. Bekum	H121-S	Blow molder
12. Rosade	R-2	Blow Molder
13. Lyle Hydrotrim		Thermoformer
14. Comet		Thermoformer
15. Al-BE	1 inch	Extruder
15. Rainville	2 inch	Extruder
16. Lung Meng		Blown Film Extruder
17. Wabash	30 ton	Compression Molder
18. Dake	50 Ton	Compression Molder
19. Powerlab (2)	654	Rotational Molder
20. Lindberg	BTE6	Oven
21. Despatch	NA-23	Oven
22. Grieve	LR-271C	Oven
23. Labline	LC	Oven
24. Grieve	LR	Oven
25. Instron	4301	Tensile Tester
26. Kayeness (2)		Melt Flow Indexer
27. Tinius Olsen (2)		VICAT Tester
28. Gardner (3)		Drop Weight Impact Tester
29. TMI (2)		Pendulum Impact Tester
30. TMI (2)		Notcher for Impact Tests
31. Tinius Olsen (2)		Dilatometer
32. Arizona Instruments	MK-II	Moisture Analyzer
33. Computrac	Max-50	Moisture Analyzer
34. QUV		Weather Tester
35. USI		Hot Stamping Machine

FERRIS STATE UNIVERSITY
PLASTICS PROGRAM NEEDS

PRIORITY	ITEM	QTY	COST EACH, $K
high	**Complete extrusion line for sheet, profiles**	**1**	**125**
high	**New injection molding machine, 50 to 250 ton**	**2**	**100**
high	**Mold with slides & core pulls (FSU to fund?)**	**1**	**50**
high	**Gaylords of blow-molding grade HDPE**	**6**	**0.5**
high	Gaylords of HIPS (no GP-PS)	6	0.5
high	Gaylords of HDPE	6	0.5
high	Gaylords of unfilled PA 6 or 6/6	4	1.5
high	Gaylords of Acetal copolymer	4	1.5
high	Gaylords of PE for blown film	4	0.5
medium	Grants for supplies & expenses		5
medium	Grants for faculty development		5
medium	Transfer molding press and tooling	1	
medium	Thermoset injection molder	1	100
medium	Vented-barrel injection molder	1	100
medium	Complete gas-assist system	1	
medium	Spin welder & mold for associated parts	1	
medium	Molds that can run in presses under 250-ton	1	
medium	Hot-runner molds	1	
medium	Molds that produce "give aways"	1	
medium	Molds that produce parts for assembly	1	
medium	Molds containing valve-gating	1	
medium	Small 2-shot mold	1	
medium	Abrasion Tester	1	6
medium	Capillary Rheometer	1	45
medium	Instrumented Impact (Drop and Pendulum)	1	14
medium	Additional Dilatometer	1	1.5
medium	Mold conditioners		
medium	Chillers		
medium	Equipment for cavity pressure monitoring		

Curriculum review

The plastics curriculum is based on the Ferris model of 2+2 where AAS graduates transfer into the BS program. Students who receive their AAS in Plastics technology must satisfy the academic entrance requirements to be accepted into the BS Plastics Engineering Technology degree program.

The AAS degree is designed to offer a sufficient knowledge for a plastics technologist or technician. The majority of the AAS graduates (90%) continue their education in the Bachelors program. Those students who do not continue are either academically ineligible or for financial reasons go into industry to gain stability. Interestingly, many ineligible students "recycle" back though the program courses to improve their grades to become eligible for the Bachelor degree.

Curriculum Change

In the spring of 1998 a "curriculum clean-up" to reflect necessary changes to the program after the 1992 major curriculum revision had gone though a complete academic cycle. Courses were modified to reflect additional technology obtained by the university and renumbered to make more sense on the check sheet. Extensive effort was focused on sequencing the courses in a logical manner to keep the semesters somewhat balanced to allow for ease of scheduling. Attached is a spreadsheet demonstrating how the curriculum flow was analyzed.

Changes submitted in 1998 and implemented in fall 1999.

Modified/changed courses*:
PLTS 110 Introduction to plastics technology
PLTS 121 Plastics Processing I
PLTS 211 Plastics processing II
PLTS 212 Plastics Product and tool design I
PLTS 223 Plastics Testing and Properties
PLST 300 Plastics project management
PLTS 320 Plastics & Elastomer systems
PLTS 321 Plastics Processing III
PLTS 499 Plastics career skills

PLTS 110 Introduction to plastics technology, 3 credits (2+3)
This course was modified to reflect additional laboratory experiences for the students

PLTS 121 Plastics Processing I, 4 credit (3 +3)
This course was modified to add a lecture hour and remove all injection molding information. This change reflects an effort to eliminate repetition that occurred in previous course sequence and allows more depth for coverage of processes other than injection molding.

PLTS 211 Plastics processing II, 5credit (2+8)
This course was modified to add laboratory hours to allow students enough time to complete necessary mold changes. In addition, the course was rewritten to focus on Injection molding

PLTS 212 Plastics Product and tool design I, 5 credit (3+3bench lab, 2 computer lab)
This design course was modified to reflect a change in the design sequence and elimination of CADD 322. A computer lab was added to introduce students to computer aided engineering concepts in the plastics industry. Additionally, plastics product design concepts were added to the course to prepare AAS students for industry.

PLTS 223 Plastics Testing and Properties, 5 credits (4+3)
Modifications to this course included reducing the laboratory hours because it became repetitive and the limited number of "testing stations" available in the laboratory. A lecture hour was added to include basic materials information for AAS students due to the moving to the BS and renaming of the Plastics & Elastomer materials course.

PLTS 300 Plastics engineering management systems, 4 credits (3+3)
"Plastics projects, PLTS 300 and PLTS 400 were dropped from the curriculum and a modified course was written to contain project management concepts and introduce computer software used in the manufacturing industries.

PLTS 320 Plastics & Elastomer systems, 3 credits (3+0)
Moved to the junior year this course was reduced to 3 credit reflecting the addition of "materials" credits to PLTS223

PLTS 321 Advanced injection molding, 4 credits (2+6)
No format change but the course content was modified to focus on injection molding and ancillary equipment.

PLTS 499 Plastics career skills, 1 credit (1+0)
Format was changed from a 3-hour lab format to 1 hour of lecture to reflect the way the course had changed.

Additional changes made since 1998*
PLTS 410 Costing, Packaging and Economic issues (*added*)
PLTS 100 Survey o plastics and elastomer systems (*added*)
PLTS 290 Plastics Composites (*elective*)
PLTS 290 Technical and project presentation (*elective*)
CADD 322 Computer aided engineering for Plastics (*dropped*)
Directed Elective (*added*)
Prerequisite changes
CHEM 311 (*dropped*)

PLTS 410 Plastics Industrial Finance Practices
After offering this course experimentally for three semesters, the faculty agreed to include this course as part of the plastics engineering technology curriculum in fall 2000.

PLTS 100 Introduction to plastics
Initially offered as an experimental course, this course has been offered as an introduction to plastic and a recruiting tool for undecided students.

PLTS 290 Plastics Composite structures
Initially offered as an experimental course this course is offered, on average once a year as an elective for plastics students.

PLTS 290 Plastics projects
Initially offered as an experimental course to assist students in developing and writing professional quality research papers and present findings at a national conference.

CADD 322 Computer aided engineering for Plastics
Course dropped to reflect addition of content in PLTS 212.

Directed Elective
This course was added to the Plastics engineering technology (BS) check sheet to allow student a modicum of flexibility in the curriculum. This course allows (motivates) faculty to develop courses and allows the student to focus on an area of interest that could include courses outside of the plastics department.

Prerequisite Changes
After a review of the baccalaureate courses and their content, it became apparent that many of the required courses did not necessarily rely on a course, which had been identified as a prerequisite. These prerequisites were removed which help student more easily register for courses.

CHEM 311 Polymer Chemistry
This course did not completely satisfy the needs of our students and was eliminated to make more room in the program.

MFGE 423 Engineering Economics
This course was dropped when course content was absorbed into PLTS 410

On going discussions:
CHEM 211 Organic Chemistry for plastics
Current students and alumni have expressed frustration with CHEM 211. The plastics faculty has had on going discussions with the Chemistry faculty to improve this situation.

Conclusion:

The plastics faculty is committed to change as demonstrated by the considerable their effort. They are committed to developing, improving and modifying the plastics curriculum to reflect industry changes and offer the student to focus his or her education in their area of interest.

* Outlines or syllabus attached

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

PLASTICS CURRICULUM GUIDE SHEET
ASSOCIATE IN APPLIED SCIENCE
PLASTICS TECHNOLOGY
FALL SEMESTER

First Year Fall Semester (15 credits)			Credits
PLTS	110	Introduction to Plastics Technology	3
MFGT	150	Manufacturing Processes	2
ENGL	150	English 1	3
MATH	116	Algebra & Numerical Trigonometry	4
____	____	Social Awareness Elective	3

First Year Winter Semester (15 credits)			Credits
PLTS	121	Plastics Processing 1	4
PHYS	211	Introductory Physics	4
MATH	126	Algebra & Analytical Trigonometry	4
ETEC	140	Engineering Graphics	3

Summer Semester - Freshman/Sophomore			
PLTS	193	Industrial Internship	4

Second Year Fall Semester (18 credits)			
PLTS	211	Plastics Processing 2	5
CHEM	121	General Chemistry 1	5
EEET	227	Electronics for Plastics & Rubber	2
ENGL	250	English 2	3
____	____	Cultural Enrichment Elective	3

Second Year Winter Semester (16 credits)			
PLTS	223	Plastics Testing & Propertie	5
PLTS	212	Plastics Product & Tool Design 1	5
MECH	250	Fluid Power w/Controls	2
CHEM	211	Fund. of Organic/Polymer Chemistry	4

Total semester hours required for AAS graduates: 64 (68 with internship)
Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. The student is also responsible for meeting all FSU General Education requirements as outlined in the university catalog. Your advisor is available to assist you.

BACHELOR OF SCIENCE (B.S.)
PLASTICS ENGINEERING TECHNOLOGY
FALL SEMESTER

Third Year Fall Semester (15 credits)			
PLTS	312	Plastics Product & Tool Design 2	4
PLTS	320	Plastics & Elastomeric Systems	4
MECH	340	Statics & Strengths of Materials	4
COMM	121	Fundamentals of Public Speaking	3

Third Year Winter Semester (15 credits)			
PLTS	321	Advanced Injection Molding	4
PLTS	300	Plastics Engineer Management Systems	4
EEET	317	Automation for Plastics	4
ENGL	311	Advanced Technical Writing	3

Summer Semester - Junior/Senior			
PLTS	393	Industrial Internship	4

Fourth Year Fall Semester (15 credits)			
PLTS	411	Plastics Decorating & Assembly	3
MFGE	351	Intro Industrial Engineering	3
MFGE	353	Statistical Quality Control	3
____	____	Social Awareness	3
____	____	Cultural Enrichment	3

Fourth Year Winter Semester (16 credits)			
PLTS	____	Technical Elective	3
PLTS	499	Plastics Career Skills	1
PLTS	410	Plts Industry Finance Practice	3
MFGE	451	Intro to Plant Engineering	3
____	____	Social Awareness (300)	3
____	____	Cultural Enrichment (200)	3

Total Semester hours required for BS graduate: 125 (133 with internships)
Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. The student is also responsible for meeting all FSU General Education requirements as outlined in the university catalog. Your advisor is available to assist you.

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

CURRICULUM REQUIREMENTS
Plastics Technology (PT)
Associate in Applied Science (AAS)
FALL SEMESTER

ENTRY CRITERIA:

1. 2.0 GPA (High School or College Transfer GPA)
2. High School Algebra (or MATH 110 or equivalent) and MATH ACT = 19: MATH 116 placement
3. High School Chemistry (or CHEM 103)

TECHNICAL			CREDIT HOURS
PLTS	110	Introduction to Plastics Technology	3
PLTS	121	Plastics Processing 1	4
PLTS	193	Plastics Industrial Internship 1	4
PLTS	211	Plastics Processing 2	5
PLTS	212	Plastics Products & Tool Design I	5
PLTS	223	Plastics Testing & Properties	5
Technical Related			
EEET	227	Electronics Technology for Plastics/Rubber	2
ETEC	140	Engineering Graphics Comprehensive	3
MECH	250	Fluid Power with Controls	2
MFGT	150	Manufacturing Processes	2

GENERAL EDUCATION			CREDIT HOURS
Communication Competence			
ENGL	150	English 1	3
ENGL	250	English 2	3
Scientific Understanding			
CHEM	121	General Chemistry I	5
CHEM	211	Fund. of Organic/Polymer Chemistry*	4
PHYS	211	Introductory Physics	4
Quantitative Skills			
MATH	116	Intermediate Algebra & Num. Trig.	4
MATH	126	Algebra & Analytical Trigonometry	4
Cultural Enrichment			
Elective			3
Social Awareness			
Elective			3

Bachelor of Science (BS)
Plastics Engineering Technology (PET)
Fall Semester

ENTRY CRITERIA:

1. Application by March 1 prior to *Fall* term requested.
2. AAS in Plastics Technology.
3. 2.70 GPA in Plastics (PLTS) classes.
4. 2.50 GPA in MATH classes including MATH 116 and 126.
5. 2.50 GPA overall.

TECHNICAL			CREDIT HOURS
PLTS	300	Plastics Engineer Management System	4
PLTS	312	Plastics Product & Tool Design II	4
PLTS	320	Plastics & Elastomeric Systems	4
PLTS	321	Advanced Injection Molding	4
PLTS	393	Plastics Industrial Internship 2	4
PLTS	410	Plastics Industry Finance Practice	3
PLTS	411	Plastics Decorating & Assembly	3
PLTS	499	Plastics Career Skills	1
PLTS	---	Technical Elective	3
Technical Related			
EEET	317	Automation for Plastics	4
MECH	340	Statics and Strengths of Materials	4
MFGE	351	Intro. to Industrial Engineering	3
MFGE	353	Statistical Quality Control	3
MFGE	451	Intro to Plant Engineering	3

GENERAL EDUCATION			CREDIT HOURS
Communication Competence			
COMM	121	Fundamentals of Public Speaking	3
ENGL	311	Advanced Technical Writing	3
Scientific Understanding			
CHEM	211	Fund. of Organic/Polymer Chemistry (Taken in AAS Degree)	
Quantitative Skills			
MATH	126	Algebra & Analytic Trigonometry (taken in AAS)	
Cultural Enrichment			
Elective (3 cr. must be at 200 level or above)			6
Social Awareness			
Elective (3 cr, must be at 300 level or above)			6

Ed Muccio
REV 2/01

Fall, 2000

Ferris State University
College of Technology
Plastics and Rubber Engineering Technology

COURSE OUTLINE

COURSE TITLE: PLTS-100 Survey of Plastics and Elastomer Technology

COURSE DESCRIPTION:

This is a survey course designed to acquaint *potential* Plastics Majors and NON Plastics Majors with basic concepts of Plastics and Elastomer Technology. Students will become familiar with history, basic materials, application/design, processing, markets, and future of Plastics and Elastomer Technology. Students require no previous background in the subject.

COURSE TOPICS:

	Lecture Time (hours)
• History of the plastics industry	2
• Plastics Industry demographics	3
• Plastic Materials (including chemistry (overview), properties, end-use markets, and nomenclature)	4
• Elastomeric Materials	3
• Plastics and Elastomer Processing, including	
◦ Injection Molding	3
◦ Extrusion	2
◦ Casting	1
◦ Composites	1
◦ Thermoforming	1
◦ Blow Molding	1
◦ Compression/Transfer Molding	1
◦ Unique Processes (rotational, LIM)	1
• Product Design Basics	3
• Decorating and Assembly Basics	2
• Recycling	2
TOTAL	**30**

Credit Hours: **2 Hours**

Contact Hours: **2 lectures/week**

Prerequisites: **NONE**

Textbook: **NONE**

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
Plastics and Rubber Engineering Technology Department

COURSE SYLLABUS

COURSE TITLE: PLTS 290: *Plastics Composites*

COURSE DESCRIPTION:
Composite Plastics Materials are used in all major product markets. The use of advanced composite materials is increasing at a rate greater then that of all other plastics materials. The student will be introduced to all aspects of composite materials including:

1. History of Composites/Future of Composites
2. Composite Materials
3. Composite Processing
4. Use and Applications of Composites
5. Composite Issues (Design, Cost, Environmental)

This course provides the student with an understanding of the effects of combining other materials with plastics to produce composite materials. The practical applications of plastics composite materials are stressed to emphasize the value of plastics composite products.

CREDIT HOURS: 2 semester hours

CONTACT HOURS: Lecture: 2 hours/week Lab None
PREREQUISITE: None
TEXTBOOKS None

Grading

Activity	**%**	**Due**
Daily Quizzes	75	Each Lecture
Final Exam	25	As Scheduled

A 95-100	C+ 77-79	D+ 67-69
A- 90-94	C 74-76	D 64-66
B+ 87-89	C- 70-73	D- 60-63
B 84-86		F Below 60
B- 80-83		

All work to be typed and correct in format. Late work -20% each calendar day late.
All work to be done on an individual basis unless otherwise stated
Office:

Prof. Ed Muccio **email: muccioe@ferris.edu**
NEC – 223 **Phone: 231 591-2965 (including phone mail)**
FAX: 231 591 2642

Office Hours as posted on bulletin board

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
PLASTICS AND RUBBER ENGINEERING TECHNOLOGY
COURSE OUTLINE

COURSE TITLE: PLTS410 - *PLASTICS COSTING, PACKAGING & ECONOMIC ISSUES*

COURSE DESCRIPTION: This class covers the current topics relative to the business and operational aspects of a plastics company. It focuses on the economic aspects relative to profitability and to making sound financial decisions. It also includes topics relative to modern part packaging technology. Discussions include concepts related to company ownership, financial risks, fiscal responsibility, capital purchases, quoting, cost structures, and the principle cost and practical implementation issues of packaging.

NOTE: It is the intent of this outline to structure the course in a consistent and logical manner. However, each faculty teaching this course reserves the right to make necessary modifications to reflect issues such as changes in the technology, new techniques and systems developed, and the needs of the student.

CREDIT HOURS:	3 semester hours
CONTACT HOURS:	Lecture-3 hours/week
PREREQUISITES:	"Junior" status
TESTBOOK:	Supplemental packet obtained from the bookstore
CLASS SIZE:	30 Students Per Lecture Section Maximum

COURSE OBJECTIVES:

UPON COMPLETION OF THE COURSE THE STUDENT WILL KNOW:

- THE MANAGEMENT AND FINANCIAL STRUCTURES OF PLASTICS COMPANIES
- HOW COMPANY BUSINESS IS OBTAINED
- HOW A MANUFACTURING QUOTATION IS DEVELOPED
- THE COST BREAKDOWN OF ITEMS RELATIVE TO MANUFACTURING
- HOW MONEY IS SECURED TO DO BUSINESS
- HOW A COMPANY STAYS PROFITABLE
- THE ELEMENTS OF CASH AND CASH FLOW WITHIN A PLASTICS BUSINESS
- HOW TO PROPERLY PACKAGE A PLASTICS PRODUCT
- HOW PACKAGING SPECIFICATIONS ARE DEVELOPED
- THE ROLE OF THE PACKAGING INDUSTRY IN THE PLASTICS INDUSTRY
- KEY ECONOMIC ISSUES WITH MANUFACTURING AND ENGINEERING
- HOW TYPICAL JOB CLASSIFICATIONS WITHIN THE PLASTICS INDUSTRY CAN INFLUENCE COSTS AND PROFITABILITY

SECTION VIII

CONCLUSIONS

Plastics (Engineering) Technology Conclusions

Advisory Board

The advisory board member's average tenure on the board is 8.5 years.
Members expressed concern about the board membership, there is a concern that there are too many FSU "Plastics' graduates on the board.
There is a concern that the University is not adequately funding the program.
There is a perception that the program is not as powerful with the University as it once was.

Employer perception

The program is developing technically competent plastics technicians who understand the technologies required to contribute to a company. They stated that the graduates have good technical expertise and understand the terminology of the industry. The employer does however think there could be improvement in overall communication skills of our graduates. They cited a need for better technical writing and presentation skills. In addition, it was suggested, problem-solving skills should be developed within the curriculum.

Labor market

The labor market is strong; there are many more positions available than there are plastics graduates (nationally) to fill. Some of the companies and alumni contacted suggested that a degree from an accredited engineering program, which is not part of our charter, is required for advancement and suggested that FSU Plastics programs consider being accredited.

Current Students:

Students on campus felt the Plastics programs were very good and prepared them well for employment. Most students thought the lecture and laboratory sizes were very good, and should not be changed. The students felt the laboratory size afforded them time with the instructor for individual training.
The students did have some suggestions; they thought there should be more interaction with alumni. They also suggested that the faculty advising could be improved. In addition, there was a universal issue with the Plastics programs' computers. First they felt the computers were too slow and out–of-date, secondly there was a problem with "non-Plastics" majors monopolizing them and preventing "majors" access.
Finally, in regards to the curriculum many of the students had an issue with the "support" courses. Many thought that the University required too many social awareness and cultural enrichment courses. In addition, there was many negative comments made about CHEM 211; students felt they were not learning anything from the course.

should also be researched and courses offered to afford the student insight into these areas.

The Plastics programs have strong support from industry. This is evident from the materials and equipment donations and consignments. This demonstrates a strong industrial commitment to the Ferris Plastics programs. However it should be recognized that this is an on-going effort on the part of all involved including the faculty, program administration, alumni, and the advisory board. Emphasis should be placed on nurturing industrial contacts and funding should be made available to continue this endeavor.

The advisory board for the Plastics program has been a strong proponent for the program. In recent years the board has become comprised of an inordinate number of alumni and advisors who have been on the board for an extended period of time. It is recommended that the advisory board membership be reviewed and new members be recruited to reflect the direction the industry and the program are going.

The most critical issue facing the plastics programs is low enrollment. In recent years freshman enrollment has decreased. Efforts have started to improve the situation but more are necessary. A concerted effort from faculty, staff and University is recommended.

Better access to computers, as cited by the students, is necessary. The Plastics computer labs are more available than other computer labs in the SWAN building consequently COT students use them and prevent plastics students access. In addition, these students place financial burdens on the plastics S&E as they use paper and printer cartridges not budgeted.

We have been told time and again that we are one of the best in the country at what we do. We realize that in order to retain and perpetuate the reputation we must:

- Retain close ties with industry
- Continually seek feedback from a variety of source
- Instill flexibility in the curriculum to change as technology changes
- Develop a comprehensive recruiting strategy to improve enrollment

RECOMMENDATIONS

In viewing the conclusions, it is apparent the Plastics programs are a viable education choice. All those surveyed agreed that a career in plastics is still a good option. Plastics education institutions do not educate enough students to satisfy the needs of the industry. This in conjunction with the excellent starting salaries continue to make these programs attractive.

One of the cornerstones of success is the hands-on approach the programs take toward reaching saleable skills. The laboratory component of the plastics courses is vital in giving the students a practical understanding of many basic principles of plastics application and their manufacturing. This in turn also gives them a degree of confidence that allows our graduates to become productive workers much sooner than graduates of those programs that are predominately lecture based. All areas surveyed agreed that the laboratory component of the FSU Plastics programs should not be diminished or eliminated or modified in ways that would reduce the students' experience. Therefore it is recommended that to maintain the quality level of education as well as the safety of the learning environment, the laboratory component of classes and their format and size should remain intact.

The methods used in teaching are another link to the hands-on educational experience. Whenever possible, individual instructors immediately tie lecture information to laboratory experiences. This allows the student to reinforce information learned in lecture immediately in laboratory. Based on this concept the instructor becomes much less interchangeable because the laboratory experience is directly tied to a lecture instruction. Thus it is recommended, wherever possible, that the instructor teaching the lecture also instruct in the laboratory for his students.

However, it is recommended that the curriculum be reviewed to determine if the suggestions from alumni are realistic and viable for the Plastics curriculum. The curriculum underwent modifications in 1998 to reflect the 1996 program review and many of the suggested changes in this year's review have already been implemented in the curriculum. Specific areas which should be reviewed are: additional program/project management skills, tool/mold design/development and plastics chemistry and materials. In addition, due to the large number of alumni working in decoration and assembly, it is suggested that PLTS 411, *Plastics Decoration and Assembly*, be reviewed to determine if the course could be expanded to reflect the importance of these manufacturing technologies in industry. Also, based on the suggestions of employers of FSU Plastics alumni, a strong problem-solving component should be infused across the curriculum to address this need.

In 1998 a *directed elective* was added to the curriculum to allow students educational flexibility within the Plastics program. It is recommended that the faculty continue to develop experimental courses with specific emphasis on problem solving skills, project management tooling or polymer materials. Also, new plastics industry technologies

Alumni:

The alumni felt the plastics industry is a good career and that the industry is rebounding after a sluggish year.

The alumni felt strongly that the entrance requirements for both the Associates and Bachelor degrees should not be changed.

They felt that the program faculty were attentive to their individual needs.

They suggested the following modifications to the curriculum:

- Add/increase the *Tooling/Mold Design* component including additional CAD
- Increase the *Program/Project Management* course work.
- Modify the chemistry offerings to include more relevant, industry specific information including more plastics materials courses.

The alumni also suggested that FSU Plastics offer the following postgraduate training:

- Advanced mold/tool design
- Plastics materials and characterization
- Project/program management
- Advanced injection molding & troubleshooting

Faculty:

The faculty generally thought the facilities were good and that materials and supplies were adequate. They also thought the curriculum shared good information with the students and do not need to be changed. They felt strongly that the lecture and laboratories should retain current student/faculty ratios.

They also suggested that a dual entry would better utilize the facilities and allow students to "recycle" (retaking courses to improve grades) through the program faster. In addition, it was also suggested that more "Plastics" courses should be offered. Also identified was a need for more coordination of "support" courses with other departments. It was also identified that there was inadequate funding available for faculty development and for program operation.

Finally the faculty felt the plastics and rubber programs should remain separate and that intern management should not be "centralized".

Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: PLASTICS PROGRAMS - SUMMARY

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction **Average Score** 4.4

5 4 3 2 1

Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program **Average Score** 4

5 4 3 2 1

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program **Average Score** 3.8

5 4 3 2 1

Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates **Average Score** 4.8

5 4 3 2 1

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5 4 3 2 1

5. Use of Information on Labor Market **Average Score** 3.6

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop program. and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the

Program Review Panel Evaluation Form (page 2)

6. Use of Profession/Industry Standards Average Score 2.8

5 4 3 2 1

Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information Average Score 3.2

5 4 3 2 1

Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

8. Relevance of Supportive Courses Average Score 3

5 4 3 2 1

Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors Average Score 3.4

5 4 3 2 1

All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing Average Score 4.6

5 4 3 2 1

Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities Average Score 4.6

5 4 3 2 1

Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities Average Score 4

5 4 3 2 1

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment Average Score 4

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction Average Score 3.8

5 4 3 2 1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies Average Score 3.8

5 4 3 2 1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: PLASTICS.

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction **Average Score _____**

5 4 3 2 1

Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program **Average Score _____**

5 4 3 2 1

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program **Average Score _____**

5 4 3 2 1

Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates **Average Score _____**

5 4 3 2 1

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5 4 3 2 1

5. Use of Information on Labor Market **Average Score _____**

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop program. and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the

Program Review Panel Evaluation Form (page 2)

6. Use of Profession/Industry Standards **Average Score _____**

5 4 3 2 1

Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information **Average Score _____**

5 4 3 2 1

Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

8. Relevance of Supportive Courses **Average Score _____**

5 4 3 2 1

Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors **Average Score _____**

5 4 3 2 1

All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score _____**

5 4 3 2 1

Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities Average Score _____

5 4 3 2 1

Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities Average Score _____

5 4 3 2 1

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment Average Score _____

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction Average Score _____

5 4 3 2 1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies Average Score _____

5 4 3 2 1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: PLASTICS

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction Average Score _____

5 **4** 3 2 1

Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program Average Score _____

5 **4** 3 2 1

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program Average Score _____

5 **4** 3 2 1

Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates Average Score _____

5 4 3 2 1

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5 4 3 **2** 1

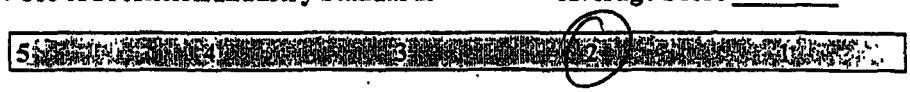
5. Use of Information on Labor Market Average Score _____

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop program. and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the

Program Review Panel Evaluation Form (page 2)

6. Use of Profession/Industry Standards **Average Score _____**



Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

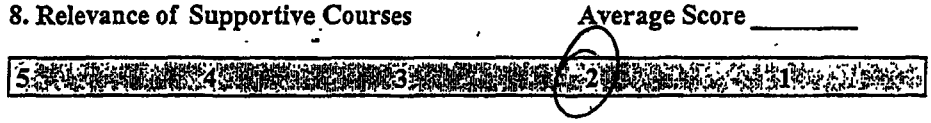
Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information **Average Score _____**

Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

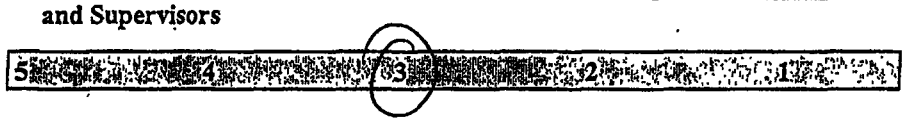
8. Relevance of Supportive Courses **Average Score _____**



Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

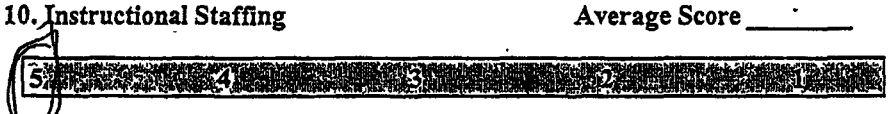
9. Qualifications of Administrators and Supervisors **Average Score _____**



All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score _____**

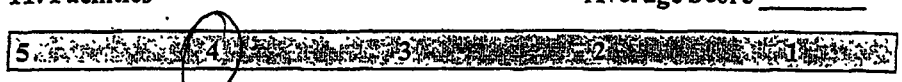


Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities Average Score _____



Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities Average Score _____

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

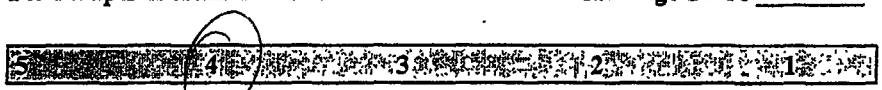
Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment Average Score _____

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

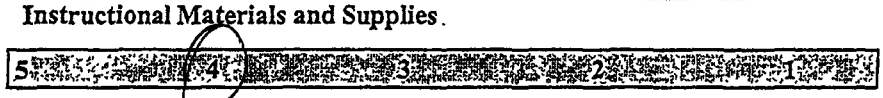
14. Adaption of Instruction Average Score _____



Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies Average Score _____



Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

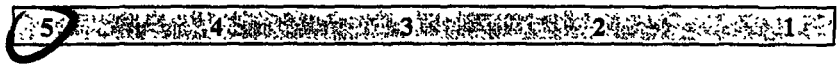
Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: PLASTICS TECH, PLASTICS ENG'G TECH

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction **Average Score _____**



Currently enrolled students rate instructional effectiveness as extremely high.

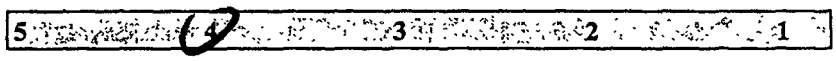
Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program **Average Score _____**

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program **Average Score _____**



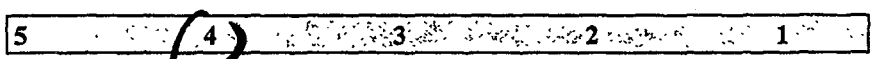
Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates **Average Score _____**

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.



5. Use of Information on Labor Market **Average Score _____**

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the program.

Program Review Panel Evaluation Form (page 2)

6. Use of Profession/Industry Standards **Average Score _____**

5 4 3 2 1

Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

7. Use of Student Follow-up Information **Average Score _____**

5 4 3 2 1

Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

8. Relevance of Supportive Courses **Average Score _____**

5 4 3 2 1

Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors **Average Score _____**

5 4 3 2 1

All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score _____**

5 4 3 2 1

Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities **Average Score _____**

5 4 3 2 1

Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities **Average Score _____**

5 4 3 2 1

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment **Average Score _____**

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction **Average Score _____**

5 4 3 2 1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies **Average Score _____**

5 4 3 2 1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: PLASTICS

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction **Average Score** _____

5 (4) 3 2 1

Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program **Average Score** _____

5 (4) 3 2 1

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program **Average Score** _____

5 (4) 3 2 1

Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates **Average Score** _____

5 (4) 3 2 1

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5 (4) 3 2 1

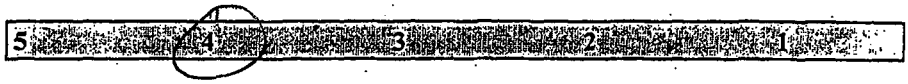
5. Use of Information on Labor Market **Average Score** _____

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop program. and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the

Program Review Panel Evaluation Form (page 2)

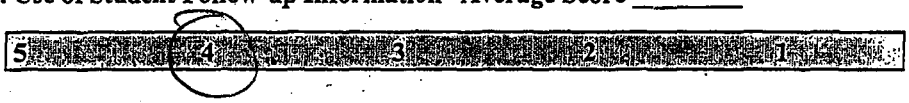
6. Use of Profession/Industry Standards **Average Score _____**



Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

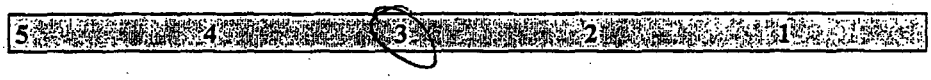
7. Use of Student Follow-up Information **Average Score _____**



Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

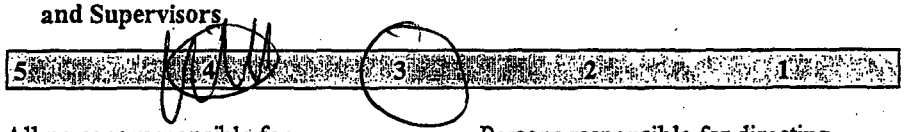
8. Relevance of Supportive Courses **Average Score _____**



Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors **Average Score _____**



All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score _____**

Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities Average Score _____

5 4 3 2 1

Present facilities are sufficient to support a high quality program.

Present facilities are a major problem for program quality.

12. Scheduling of Instructional Facilities Average Score _____

5 4 3 2 1

Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment Average Score _____

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction Average Score _____

5 4 3 2 1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies Average Score _____

5 4 3 2 1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

Program Review Panel Evaluation Form

(PRP: complete this form and include with your report)

Program: Plastics & Rubber Eng. Tech.

Instructions: Circle the number which most closely describes t he program you are evaluating.

1. Student Perception of Instruction Average Score _____

5 (4) 3 2 1

Currently enrolled students rate instructional effectiveness as extremely high.

Currently enrolled students rate the instructional effectiveness as below average.

2. Student Satisfaction with Program Average Score _____

5 (4) 3 2 1

Currently enrolled students are very satisfied with the program faculty, equipment, facilities, and curriculum.

Currently enrolled students are not satisfied with program faculty, equipment, facilities, or curriculum.

3. Advisory Committee Perceptions of Program Average Score _____

5 (4) 3 2 1

Advisory committee members perceive the program curriculum, facilities, and equipment to be of the highest quality.

Advisory committee members perceive the program curriculum, facilities, and equipment needs improvement.

4. Demand for Graduates Average Score _____

(5) 4 3 2 1

Graduates easily find employment in field.

Graduates are sometimes forced to find positions out of their field.

5 (4) 3 2 1

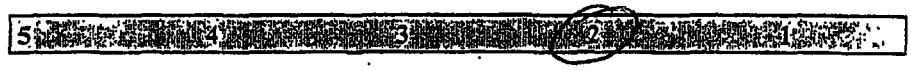
5. Use of Information on Labor Market Average Score _____

The faculty and administrators use current data on labor market needs and emerging trends in job openings to systematically develop program. and evaluate the program.

The faculty and administrators do not use labor market data in planning or evaluating the

Program Review Panel Evaluation Form (page 2)

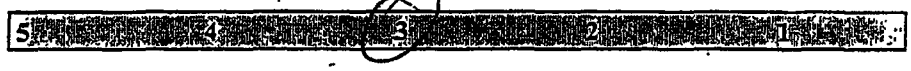
6. Use of Profession/Industry Standards **Average Score _____**



Profession/industry standards (such as licensing, certification, accreditation) are consistently used in planning and evaluating this program and content of its courses.

Little or no recognition is given to specific profession/industry standards in planning and evaluating this program.

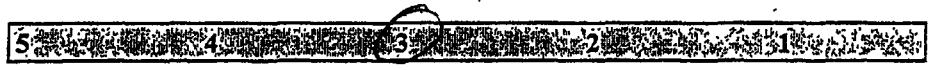
7. Use of Student Follow-up Information **Average Score _____**



Current follow-up data on completers and leavers are consistently and systematically used in evaluating this program.

Student follow-up information has not been collected for use in evaluating this program.

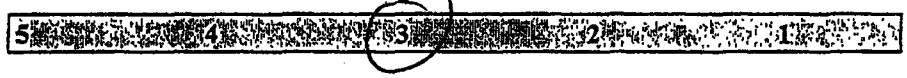
8. Relevance of Supportive Courses **Average Score _____**



Applicable supportive courses are closely coordinated with this program and are kept relevant to program goals and current to the needs of students.

Supportive course content reflects no planned approach to meeting needs of students in this program.

9. Qualifications of Administrators and Supervisors **Average Score _____**



All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

Persons responsible for directing and coordinating this program have little administrative training and experience.

10. Instructional Staffing **Average Score _____**

Instructional staffing for this program is sufficient to permit optimum program effectiveness.

Staffing is inadequate to meet the needs of this program effectively.

Program Review Panel Evaluation Form (page 3)

11. Facilities Average Score _____

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Present facilities are sufficient to support a high quality program.

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12. Scheduling of Instructional Facilities Average Score _____

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Scheduling of facilities and equipment for this program is planned to maximize use and be consistent with quality instruction.

Facilities and equipment for this are significantly under-or-over scheduled.

13. Equipment Average Score _____

5 4 3 2 1

Present equipment is sufficient to support a high quality program.

Present equipment is not adequate and represents a threat to program quality.

14. Adaption of Instruction Average Score _____

5 4 3 2 1

Instruction in all courses required for this program recognizes and responds to individual student interests, learning styles, skills, and abilities through a variety of instructional methods (such as, small group or individualized instruction, laboratory or "hands on" experiences, credit by examination).

Instructional approaches in this program do no consider individual student differences.

15. Adequate and Availability of Instructional Materials and Supplies Average Score _____

5 4 3 2 1

Faculty rate that the instructional materials and supplies as being readily available and in sufficient quantity to support quality instruction.

Faculty rate that the instructional materials are limited in amount, generally outdated, and lack relevance to program and student needs.

THIS COURSE IS COMPROSED OF THE FOLLOWING UNITS OF INSTRUCTION:

	TIME ALLOCATION (INDIVIDUAL & TOTAL HOURS)
I. Introduction	1 *LE*
A. Course goals, class requirements	
B. Instructor introduction/background	
C. The importance of knowing business practices and adding "worth" to the student	
D. Purpose of the course	
E. Syllabus review	
II. Business Overview	2 *LE*
A. Generic goals of a plastics company	
B. How to obtain new plastics business	
C. Concept of "costs"	
III. The Business Plan	2 *LE*
A. Purpose	
B. Participants	
C. Components of	
D. Typical structure for	
IV. Accounting basics	3 *LE*
A. Terms	
B. Income statements	
C. Balance sheets	
D. Types of economic analysis	
1.Worth Analysis	
2.Rate of Return (ROI)	
V. Financing-Time Value Of Money	3 *LE*
A. When done	
B. Types of interest & rates	
1.Simple vs Compound	
2.Nominal & Effective	
3.Continuous Compounding	
4.Changing Rates	
C. Sources for	
1.Commercial Loan Types	
2.Stocks - public/private	
3.Governmental Assistance	
VI. Plastics Company Costs	3 *LE*
A. Cost categories	
B. Cost classification	
C. Break-even point	
D. Direct & Indirect costs	
E. Distribution of costs based on "structure"	
VII. Cash Flow	1 *LE*
A. Cash flow diagrams	
B. Time-value equivalents	
VIII. Cash Analysis	2 *LE*
A. Present-worth comparisons	
B. Continuous interest	
C. Annual-worth	
D. Rate-of-return	
E. Lease vs buy analysis	
IX. Capital Budgeting	1 *LE*
A. Justification for	

B. Methods

X. Money Management — 1 *LE*
- A. Depreciation effect
- B. Inflation effect
- C. Before/after tax analysis
- D. Amortization

XI. Plastics Machine & Rate Decisions — 2 *LE*
- A. Clamp force issues
- B. Material capacity issues

XII. Product Quotation Development (Injection, Extrusion, Blow Molding) — 5 *LE*
- A. Customer information
- B. Calculations for primary processes
- C. Machine rate analysis/breakdown
- D. Effects of mis-quoting & profit

XIII. Cycle time estimation (Injection, Extrusion, Blow Molding) — 2 *LE*
- A. Cycle time components
- B. Automatic vs semi-automatic modes
- C. Safety factors

XIV. Cost structure comparisons — 1 *LE*
- A. Molding equipment work cells
- B. Press size grouping
- C. Plastics outsourcing

XV. Customer Pricing Programs — 1 *LE*
- A. Cost/price reduction
- B. Target pricing
- C. Profit "centers" and organization

XVI. Packaging Plastics Parts Overview — 1 *LE*
- A. Types of packaging
- B. Functions of packaging
- C. Plastics Products Packaging requirements

XVII. Fundamentals of expendable packaging — 2 *LE*
- A. "Fields" of use
- B. Automotive guidelines for plastics
- C. Basics of "Rule 41"

XVIII. Construction of expendables — 1 *LE*
- A. Flute design
- B. Linerboard design
- C. Sizing

XIX. Expendable container performance — 2 *LE*
- A. Typical Structure
- B. Applied Stress
- C. Terminology
- D. Performance structures/components

XX. Typical testing methods — 2 *LE*
- A. "G" value
- B. Five standard tests/test methods & machines
- C. ASTM plastics part packaging standards

XXI. Dunnage for plastic part packaging — 3 *LE*
- A. Types of internal dunnage
- B. Materials used
- C. Product design considerations
- D. Product fragility considerations

XXII. Returnable Packaging — 2 *LE*
- A. Uses
- B. Materials
- C. Impact on the Plastics Industry
- D. Designs/product considerations

XXIII. Plastics Processes used to produce packaging — 2 *LE*
- A. Thermoforming Method
- B. Injection Molding Method
- C. Other processes
- D. Significance of each
- E. Types/uses of

TOTAL LECTURE HOURS - 45

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

WINTER 2002
R.Pierce

Plastics and Rubber Engineering Technology Department

COURSE SYLLABUS

COURSE TITLE: PLTS-290: Technical Project and Presentation

COURSE DESCRIPTION: In this course the student will identify a suitable technical project in the plastics field, write an abstract for approval, complete the laboratory work for the project, write a paper and make a presentation at an approved conference about the results of his project work.

CREDIT HOURS: Two (2) semester hours

CONTACT HOURS: Lec. - one (1) hour per week
Lab - three (3) hours per week

PREREQUISITES: PLTS – 110, 121,corequisite with 211

TEXTBOOKS: None specified: All texts used in first, second, and third year plastics classes may be needed for reference. Other references may also be used.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:
The student will:

I. Demonstrate skills in technical writing through the acceptable preparation of;
   A. Write a project abstract for approval
   B. Research progress reports (including a MicroSoft Gant Charts)
   C. Final report on research short reports or papers on student or instructor selected subjects

II. Demonstrate speaking skills though the preparation and presentation of;
   A. Verbal presentation of research paper information and results
   B. Verbal presentation of progress reports
   C. Verbal presentations or speeches on subjects selected by the instructor or student

III. Demonstrate skills in;
   A. Organization
      1. Time management
      2. Timely delivery of assigned tasks
      3. Completion of final report on time
      4. Preparation of an outline for each verbal presentation
   B. Use of acceptable English style
   C. Researching of a given subject
   D. Statistical analysis of research findings; through the items in I. and II., plus any special or extra assignments.

TOPICAL UNIT OUTLINE OF MAJOR UNITS OF STUDY:

I. Completion of research

II. Presentation of written progress reports

III. Verbal presentation of research progress

IV. Preparation of final written research report

V. Preparation of final verbal presentation of research results
   A. Outline submission
   B. Presentation before class and invited guests

VI. Presentation of final oral report at an approved technical conference.

MINIMUM REQUIRED STUDENT LABORATORY ACTIVITIES DEFINED:

I. Library research

II. Writing, typing, and word processing

III. Presentation on verbal offerings

IV. Physical research for data if required by project definition

V. Organization and statistical analysis of data

VI. Counseling/advisement sessions with instructor on research progress

VII. Attendance at informational seminars or workshops in connection with research or presentation skills improvement

POLICIES:

I. GRADE SCALE

		A	96%	A-	92%
B+	89%	B	86%	B-	83%
C+	80%	C	76%	C-	72%
D+	68%	D	63%	D-	59%

II. ATTENDANCE

Each student will attend each scheduled class, unless an excused absence has been granted. Unexcused absences will result in reduction of grade.

III. ALL work will be graded on the Society of Plastics Engineers technical paper guidelines.

IV. LATE WORK will not be accepted!

V. Excused absence can be made up. Unexcused An absences may not!

VI. Tests and quizzes are not planned, but are at the discretion of the individual instructor.

VII. Off-SITE project requests are to be accompanied by a letter of understanding form the remote site supervisor.

INSTRUCTOR INFORMATION

	phone	office	E-Mail
Robert Pierce	2174	NEC 215	piercer@ferris.edu

office hours posted at office

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

Plastics and Rubber Engineering Technology Department

COURSE OUTLINE

COURSE TITLE: ***PLTS 212 Plastics Product and Tool Design 1***

COURSE DESCRIPTION: This course will provide the student with the knowledge of plastics product and tool design as it pertains to successful production tooling. Special emphasis will be given to understanding the role of the following critical elements in Plastic Product and Tool Design: Plastic Material selection, Mold filling analysis, Mold Components and their functions, Compression/Transfer Mold Design, Injection Mold Design, Plastic Part Design Criteria, Blow Mold Design, Extrusion/Die Design, Rotational Mold Design, Thermoform Mold Design, Heating and Cooling of Molds, Runner and Gate Design, Tool Steels / Heat Treating selection, Geometric Dimensioning and Tolerancing.

It is the intention of this outline to structure the course content in a consistent and logical manner. Each faculty reserves the right to make necessary modifications to reflect issues such as equipment availability, changes in technology, and the needs of students.

CREDIT HOURS: 5 Semester Hours

CONTACT HOURS: Lecture- 3 hours / week
Lab- 5 hours / week (1- 3hr. bench lab and 1 - 2hr. computer lab)
Maximum lab capacity 12

PREREQUISITES: Entrance into the Plastics Technology (A.A.S.) Program
Engineering Graphics Comprehensive (ETEC 140)

Evaluation related time allocation, i.e. quizzes, and lab finals are considered to be a component of the lecture and lab times. Evaluations, evaluation materials, and specific time allotments are at the discretion of the faculty member teaching the course.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS

	LEC	LAB
1. Introduction to Course Requirements	1	1
A. Course goals, requirements, grading policies		
2. Introduction to Plastic Tool Design	1	
A. Know the basics of the moldmaking industry including who builds molds, and where molds are built.		
B. The role of tooling in a successful end product.		
3. Introduction to Plastic Product Design	1	
A. Know the significant events in the history of plastics product design.		
B. Know the importance of plastic product design relative to the manufacture of plastic products.		
4. Mold Filling Analysis		30
A. Review of 2-D and 3-D CAD operation.		
B. Develop understanding of available mold fill software and advantages / disadvantages of each.		
C. Become familiar with the operation of 2-D and 3-D mold fill software.		
D. Know the effects of part / mold design on mold filling.		
1. Runner / gate specification		
2. Nominal wall		
3. Mold venting		
5. Compression / Transfer Molds	2	6
A. Identify types of compression molds and understand advantages and disadvantages associated with each.		
1. Positive		
2. Flash		
3. Semi-positive		
4. Landed plunger		
B. Identify types of transfer molds and their advantages / disadvantages.		
1. Pot		
2. Plunger		
C. Understand the similarities and differences between these two processes and how both tool and product design are affected.		
6. Injection Molds	2	11
Understand:		
A. The components of a typical 2-plate mold and their functions.		
B. The components of a typical 3-plate mold and their functions.		
C. The components of a typical stack mold and their functions.		
D. The design of family molds		
E. Determine shrinkage allowance to produce parts to a specified dimension for a given type of plastic.		
F. Calculation of projected area and required clamp tonnage for a given mold.		
G. Product design guidelines pertaining to injection molding.		
H. Disassembly of molds and component identification in lab.		

	LEC	LAB
7. Blow Molds	2	3

A. Identify types of Blow Molds and understand the advantages and disadvantages associated with each.
   1. Extrusion Blow Molds
   2. Injection Blow Molds

B. Understand tool design criteria specific to Blow Molds and such as pinch-off area design, core-rod design, and head tooling.

C. Understand product design criteria specific to blow molding (wall thickness control, injection-blow preform design).

8. Thermoforming Molds	2	

A. The student should understand the advantages and disadvantages associated with different types of thermoform tooling as well as their effect on the product design.
   1. Male / female molds
   2. Plug assist
   3. Matched-mold
   4. Trim tooling
   5. Pressure forming
   6. Dual sheet

9. Extrusion / Dies	2	3

A. Understand the design and construction of extrusion dies for extrusion processes as well as product design criteria associated with each.
   1. Sheet
   2. Profile
   3. Blown film
   4. Multi-layer / co-extrusion

10. Rotational Molds	2	

A. Understand the design and construction of rotational molds as well as applicable product design criteria.
   1. Cast aluminum
   2. Electroplated nickel
   3. Sheet metal

11. Mold Components	4	9

A. Describe how cavity and core blocks are mounted.

B. Describe types of side-actions and applications.

C. Describe ejector mechanisms (pins, blades, sleeves, etc.).

D. Become familiar with standard mold base and component suppliers

E. Discuss special design considerations for each type of tooling.
   1. Shut-off
   2. Cavity to insert edge distances
   3. Determining required mold size

	LEC	LAB
12. Defining Product Requirements	2	

A. Learn to evaluate the end-use application requirements in terms of functionality, environment, cost, and recycling.
Evaluate:
1. Customer requirements
2. Mechanical and thermal loads
3. Features required
4. Product life expectancy
5. Product / material recycling
6. Agency / regulatory issues
7. Environmental factors (chemicals, U.V.)
8. Design to cost

13. Selecting a Plastic Material	2	

A. Develop a students understanding of materials selection for specific part design scenarios.
Understand and compare:
1. Specific gravity issues
2. Mechanical properties
3. Processing concerns
4. Balance of properties
5. Effect of material change on product performance
6. Stress / strain effects on product
7. Cost as a property

14. Plastics Product Design Concepts	4	3

A. Develop a students understanding of basic "rules" of plastic product design. Evaluate plastics as an alternative to other materials (wood, metal, etc.). Review good and bad design case studies to illustrate the consequences of poor plastic product design.
Understand these basic concepts:
1. Nominal wall
2. Projections / depressions
3. Product assembly
4. Part quality
5. Print format
6. Part tolerance guidelines
7. Cost per product feature

B. Process selection criteria
1. Student will learn how to select an appropriate plastic process based on the product design constraints.

15. Printreading / Tolerancing	4	9

A. Understand basic part and tooling print format and construction.
1. Fundamental dimensioning rules
2. View layout
3. Tolerancing fundamentals

B. Student will learn how Geometric Dimensioning and Tolerancing is applied to ensure product functional requirements are met.
   1. GD&T symbols
   2. Datum selection
   3. Material conditions
   4. Tolerance development
   5. Impact on tool construction

16. Mold Steels 5

A. The student should understand the composition of various tool steels and their effect on tool life.
   1. Types of steels used in molds and their alloying elements.
      a. Oil hardened
      b. Air hardened
      c. C.R.S.
      d. Pre-hardened
      e. Water hardened
      f. Copper alloys
      g. Kirksite
   2. Machining characteristics of tool steels.
   3. Methods of prolonging mold life.

B. Student should understand the hardening / heat treating of mold steels.
   1. Hardening
   2. Normalizing
   3. Annealing
   4. Stress relieving
   5. Tempering
   6. Cyaniding
   7. Carburizing
   8. Nitriding
   9. Hardness testing

C. Develop students understanding of mold finishes and coatings / plating.
   1. Benching and polishing
   2. Texturing
   3. Plating
   4. Coating for wear / lubricity

17. Prototype Tooling 2

A. Student will develop an understanding of tool construction for prototype / short run parts and evaluate tool cost vs. number of pieces required.
   1. Rapid prototyping
   2. Epoxy tooling
   3. Aluminum tooling
   4. Machine from solid plastic
   5. Kirksite

	LEC	LAB
18. Runner and Gate Design	2	
A. The student will understand the function of runners and gates in molds		
B. Variations of runner and gate designs		
C. Advantages and disadvantages of runner and gate configurations.		
D. Understand the function and design of vents.		
19. Heating and Cooling of Molds	2	
A. Understand the types of heating or cooling used with molds.		
B. Pattern and placement of heating and cooling channels.		
C. Become familiar with mold cooling software.		
20. Runnerless Molding	1	
A. Understand the advantages, disadvantages, and application of runnerless molding methods.		
1. Hot runner		
2. Hot sprue		
3. Valve gating		
4. Temperature		
21. Tool Commissioning	2	
A. The student will become familiar with the steps involved in commissioning new tooling for plastic products.		
1. Vendor selection		
2. Required cavitation		
3. Standard nomenclature		
4. Tool acceptance criteria		
5. Tool features vs. cost competitiveness		
22. Project		
A. The student will complete a major project utilizing one or more of the following:		
1. Mold design		
2. Product design		
3. Mold filling analysis		
TOTALS	**45**	**75**

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

Plastics and Rubber Engineering Technology Department

COURSE OUTLINE

COURSE TITLE: ***PLTS 312 Plastics Product and Tool Design II***

COURSE DESCRIPTION: In this course, the student will study the concepts of part design starting with defining the "Customer/End-Use Requirements", through the "Design Cycle" guideline and product application. Special emphasis will be given to understanding the role of these critical elements in Plastic Product Design:

* Material Selection
* Prototyping and Modeling plastic part designs
* The Product Drawing
* Plastic Part Design Basics (the "Rules") - Review
* Form, Fit, and Function in the product application
* Part Quality ...when is the design/part acceptable
* Relationship of tool design to part design
* Advanced Tooling Concepts
* Relationship of process factors to part performance including use of CAD and flow software systems
* Part Costing and Design to Cost
* End-use factors that impact plastic part performance
* Mechanical Design with Plastic

It is the intention of this outline to structure the course content in a consistent and logical manner. Each faculty reserves the right to make necessary modifications to reflect issues such as equipment availability changes in technology, and the needs of the students.

CREDIT HOURS: 4 Semester Hours

CONTACT HOURS: Lecture - 3 hours/week
Lab - 3 hours/week *Maximum Capacity 12*

PREREQUISITES: Entrance into the Plastics Engineering Technology (B.S.) Program
Plastics Product and Tool Design I (PLTS-212)

Evaluation-related time allocation, i.e. tests, quizzes, and lab finals, are considered to be a component of the lecture and lab times. Evaluations, evaluation materials, and specific time allotments are at the discretion of the faculty member teaching the course

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS

	LEC	LAB
1. Introduction to Course Requirements	1	1
A. Know the course goals, attendance, and grading guidelines		
2. Introduction to Plastic Product Design REVIEW		
A. Know the significant events in the history of plastics product design	1	
B. Know the major importance of plastic product design relative to the manufacturing of plastic products		
3. Definition of Product Requirements	4	3
A. The student will learn to evaluate the required end-use application in terms of use, environment, functionality, cost, and recycling.		

Evaluate:

1. Customer Requirements
2. Mechanical and Thermal Loads
3. Features Required
4. Product Life Expectancy
5. Product/Material Recycling
6. Agency/Regulatory Issues
7. Environmental Factors (Chemicals,U.V.,etc.)
8. Optical Requirements

4. Selecting a Plastic Material	3	6

A. Develop students' understanding of materials selection for specific part design scenarios. Included will be elements of interpreting manufacturers technical information on physical, mechanical, thermal, electrical, environmental, and agency specifications. The student will learn that published technical data will be affected by part design and that a "balance" must be achieved to meet the customer's requirements.

Understand and Compare:

1. Specific Gravity Issues
2. Mechanical Properties
3. Processing Concerns
4. Balance of Properties
5. Effect of Material Change on Product Performance
6. Stress/Strain Effects on Product (Short and Long Term)
7. Creep Data and Application

		LEC/LAB
5.	Plastics Product Design Concepts	6 6

A. To develop students' understanding of the basic "rules" of plastics product design and how they may vary with the specific plastic materials being selected. The student will also explore plastic part design as an alternative for other materials(wood, metal, glass) and how the part design must be altered. Plastics part " Redesign " will be taught relative to both cost reduction and part performance improvement. Good and Bad design case studies will be reviewed to allow the student to avoid the "pitfalls" of poor plastic part design.
Understand these basic Plastic Design Concepts:

1. Nominal Wall
2. Projections/Depressions
3. Product Assembly (including Snap fits)
4. Part Quality
5. Print Format
6. Part Tolerance Guidelines
7. Application and Assessment of Stress Application (i.e. residual/shear/thermal etc)
8. Utilization of CAD and Design Analysis Software

6.	Process Selection Criteria/Unique Design Features	6 6

A. The student will learn how to select an appropriate plastic process based on the product design constraints. The various design factors for each of these plastic processes will be considered.

1. Injection Molding
2. Extrusion
3. Blow Molding
4. Thermoforming
5. Composite Manufacturing
6. Rotational Molding
7. Compression/Transfer

Comparative examples will be studied to illustrate the advantages and disadvantages of designing plastic part to be produced by these different manufacturing techniques.

		LEC/LAB
7.	Advance Tooling Technology	13 14
	A. Runnerless molding	
	-Hot runners	
	-Hot manifolds	
	-Control technology	
	B. Ejection Technology	
	-standard	
	-lifters	
	C. Cooling Technology/Heating Technology	
	-Balance	
	-Pull vs Pushing Coolant	
	-Mold Cooling Software	
	D. Side action/design	
	-Hydraulic	
	-Pneumatic	
	-Mechanical	
	-Design concepts	
	E. Mold Materials and Selection	
	-Heat Transfer	
	-Strength	
	-Coatings	
	F. Process Specific Exceptions	
	G. Shut-Off Designs	
8.	Advanced Part/Mold Design Concepts	11 9
	A. The student will learn how the part design affects the mold design with specific emphasis on parting line interpretation (using and avoiding complex mold functions i.e. cam-slides). State of the art tools for the part designer including stereolithography, selective laser sintering, part/mold flow and thermal analysis. Specific attention will be given to part prototyping and evolving into a production part design.	
	The student will be introduced to:	
	1. Prototyping Systems (functional and visual)	
	2. Analysis of Part Designs (including Computer Analysis)	
	3. Effect of part design changes on tooling	
	4. Plastic part design-to-cost analysis	
	5. Gating/Ejection, Surface Texturing	
	6. Material Specific Design Criteria	
		TOTAL >>>>>>> 45 45

Fall 2000

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

Plastics and Rubber Engineering Technology Department

COURSE OUTLINE

COURSE TITLE: ***PLTS 223: Plastics Testing and Physical Properties***

COURSE DESCRIPTION:
This course acquaints students with concepts of Procedures used in evaluating plastic materials, test samples, and molded parts, Standard testing methods used for evaluation of plastic materials, in particular ASTM and ISO. Interpretation of testing results with respect to raw materials selection, processing parameters, and part design considerations. Basic quality control/ quality assurance techniques related to plastics testing.

The sixty (60) lecture hours will be used to instruct the student in the theoretical and practical aspects of the testing of plastic materials properties, polymer nomenclature, and testing protocol. The forty-five (45) laboratory hours will be used to allow the student to become familiar with 10 to 15 different plastics testing procedures and the equipment involved with performing these tests. The student will be required to report the laboratory results in a consistent English style using the prescribed report structure. Established evaluation and statistical techniques will be required for each presentation of data.

CREDIT HOURS: ***5 semester hours***

CONTACT HOURS: ***Lecture: 4 hours/week***
Lab: 3 hours/week (Maximum Capacity 10)

PREREQUISITE: ***PLTS 110; MATH 116, CHEM 121***

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

I. Introduction: Orientation and Safety
II. A. Basic concepts
1. Demonstrate specified SAFETY behavior.
2. Learn the SAFETY requirements for the Plastics Laboratories.

3. Identify the locations of equipment required for SAFE operation of laboratories.
4. Apply specified laboratory techniques.
5. REPORT WRITING: the student will be instructed in the required format for preparing a laboratory report and will demonstrate the ability to prepare reports in this manner.

B. Relate the principles of Basic Statistical Methods
1. QC/QA
2. Product liability
3. Conditioning of specimens
4. Non-destructive testing
5. Supplier specifications
6. Failure analysis (brittle/ductile)
7. Testing cellular and composite products
8. Metrology Basics
9. Mean, Median, Mode, Std, Dev

C. Identify plastics:

D. Material Suppliers
1. Polymer Nomenclature
2. Polymer Trade Names
3. Raw Material State (Pellet/Powder/liquid)
4. Certificates of Compliance
5. Shipping <odes and Factors (sack vs. rail car)
6. Professional organizations
7. Terminology
8. Plastics Resources and WWW

C. Measurement equipment

D. 1. ANALYTICAL BALANCE (digital)
a. read and be prepared to answer questions on the procedure for operation of the analytical balance.
b. demonstrate the specified operation of the analytical balance in the laboratory.

2. Measurement tools
demonstrate the proper technique for using and applying the results of the following pieces of equipment.
a. MICROMETER
b. CALIPERS
c. MACHINIST/ENGINEERING SCALE

I. Mechanical Properties and testing

II. A. UNIVERSAL TESTING MACHINE(UTM)

1. Tensile strength/elongation/flexural
   a. demonstrate operation of UTM by determining the Tensile /Compression properties of several plastic materials
   b. calculate the required values for reporting Tensile/Compression properties of plastics materials.
   c. prepare a report with specified statistical analysis for the Tensile/Compression properties of plastics materials.

B. IMPACT
   1. Pendulum
      a. IZOD
         i. IZOD/CHARPY Impact testing apparatus, determine the raw data required to calculate/determine the IZOD impact resistance of at least three(3) plastics materials.
         ii. Calculate the IZOD impact resistance and tabulate using statistical analysis.
         iii. Prepare a report displaying and evaluating the IZOD impact resistance results.

      b. CHARPY
         i. Using the IZOD/CHARPY impact testing apparatus, determine the raw data required to calculate/determine the CHARPY impact resistance of at least three(3) plastics materials.
         ii. Calculate the CHARPY impact resistance and tabulate using statistical analysis.
         iii. Prepare a report displaying and evaluating the CHARPY impact resistance results.
      c. TENSILE IMPACT
         i. using the IZOD/CHARPY impact testing apparatus, determine the raw data required to calculate the determine the TENSILE impact resistance of at least three(3) plastics materials.

ii. calculate the TENSILE impact resistance and tabulate with statistical analysis.

iii. prepare a report displaying and evaluating the TENSILE impact resistance results.

d. Understand and explain the significance of notching test samples for each test where required.

i. Notch size

ii. Rate of notching

iii. Sharpness of notching blade and the quality of the notched surface

3. Falling Object

a. DART(for film)

i. Demonstrate SAFE and proper usage of the Falling DART test apparatus for determining the raw data required to determine the impact strength (resistance to impact) of polyethylene and other file products.

ii. Calculate the DART impact strength of three(3) plastics film products.

iii. Report the DART impact results with specified statistical analysis.

b. GARDNER(for sheet and parts) FALLING OBJECT

i. Demonstrate the use of the FALLING OBJECT test apparatus and determine the experimental values required to determine the impact resistance of the specified plastics products.

ii. Determine the FALLING OBJECT impact for at least three(3) plastics products.

iii. Prepare a report displaying the FALLING OBJECT impact results with specified statistical analysis and evaluating these results.

C. OTHER MECHANICAL PROPERTY Factors

Demonstrate the use of specified test apparatus, determine the experimental(raw) valued required to calculate the results, calculate the specified property values, prepare a report in the specified

form, and display the results with specified statistical analysis and evaluation for:

1. Hardness
2. Abrasion/tear
3. Shear
4. Fatigue resistance
5. Stress relaxation
6. Stiffness (flexure)
7. Creep (tensile and flexural)
8. Affect of Temperature on all mechanical properties

III. THERMAL PROPERTIES:

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for:

A. Heat Deflection Temperature(HDT) deformation under load
B. VICAT softening temperature
C. Maximum use temperature
D CTE (Coefficient of Thermal Expansion)
E. Shrinkage (Mold and Post Mold)
F. Service Temperature and Agency Specifications

IV. Material Characterization TS & TS

Rheology, melt flow index (MFI), viscosity, capillary rheometry, spiral flow analysis crystallinity, molecular weight and molecular weight distribution, DSC, TMA, TGA.

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for specified property tests.

V. Chemical Properties

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified

property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for specified property tests.

VI. Analytical Tests

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for:

A. Density/SPG
B. Moisture analysis
C. water absorption

VII. Identification Of Plastics Materials

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for specified property tests.

A. Thermal analysis
B. Visual and physical analysis
C. SPG, MP, IR, solubility, Mass.Spec.

PREAMBLE TO VIII. THROUGH XV.

Demonstrate the use of specified test apparatus, determine the experimental(raw) values required to calculate the results, calculate the specified property values, prepare a report in the specified form, and display the results with specified statistical analysis and evaluation for specified property tests.

VIII. Electrical Properties

Dielectric Properties, EMI/RFI

IX. Weathering Properties and Environmental Relationships

X. UV exposure

X. Optical Properties

Clarity, Color Analysis, Photoelasticity

XI. Flammability

XII. Failure Analysis

XIII. Products Testing
XIV. New Technology and Issues in Plastics
Property Assessment

XV. Design Considerations
Demonstrate the understanding of the relationships between testing, plastics physical properties, and plastics part design.

TOPICAL UNIT OUTLINE OF MAJOR UNITS OF INSTRUCTION:

I. Introduction
- A. Course goals
- B. Classroom policies
  1. SAFETY
  2. attendance, excused/un-excused absences
  3. grading
  4. laboratory practices and reports
  5. projects/research paper(s)
  6. laboratory notebook
- 5. tests

II. TESTING AND PROPERTIES OF PLASTICS
- A. MECHANICAL PROPERTIES
- B. THERMAL PROPERTIES
- C. MATERIAL CHARACTERIZATION
- D. CHEMICAL PROPERTIES
- E. ANALYTICAL TESTS
- F. PLASTICS MATERIALS IDENTIFICATION
- G. ELECTRICAL PROPERTIES
- H. WEATHERING PROPERTIES AND ENVIRONMENTAL RELATIONSHIPS
- I. OPTICAL PROPERTIES
- J. FLAMMABILITY
- K. FAILURE ANALYSIS
- L. TESTING FOAM PROPERTIES
- M. DESIGN CONSIDERATIONS
- N. PLASTICS PROPERTIES
- O. SUPPLIER SPECIFICATIONS

III. COMPREHENSIVE REVIEWS AND TESTS

MINIMUM REQUIRED STUDENT LABORATORY ACTIVITIES DEFINED:

I. During the forty five (45) laboratory sessions the student will become familiar with 10 to 15 different plastics testing procedures and the equipment involved with performing these tests.

II. The student will be required to report the laboratory results in a consistent English style using the prescribed report structure. Established evaluation and statistical techniques will be required for each presentation of data.

Fall 2001
~~Fall 2000~~

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

Plastics and Rubber Engineering Technology Department

COURSE OUTLINE

COURSE TITLE: PLTS300: ENGINEERING MANAGEMENT SYSTEMS

COURSE DESCRIPTION: This course provides the student with the current business related skills needed to accomplish the job duties typical to the engineering job classifications within a plastics manufacturing company. It assumes the student has had little exposure to these skills on a direct, participatory level. It explores and enhances those tools which assure success in a manufacturing environment. It provides the skills which make the implementation of the engineer's knowledge of (and with) products, processes, tooling, and materials both evolve and continuously improve. It provides management tools which assist in completing programs and projects, helping to optimize processes, setting up systems to assure customer satisfaction, and by which individual and company success can be measured. It is the intention of this outline to structure the course in a consistent and logical manner. However, each faculty teaching this course reserves the right to make necessary modifications to reflect issues such as teaching aid(s) availability, changes in technology or focus, and the needs of both industry and the students.

NOTE: It is the intention of this outline to structure the course in a consistent and logical manner. However, each faculty teaching this course reserves the right to make necessary modifications to reflect issues such as equipment availability, changes in technology, and the needs of the student.

CREDIT HOURS: 4 ~~3~~ **SEMESTER HOURS**
CONTACT HOURS: **LECTURE:** 2 ~~3~~ **HOURS/WEEK** **LAB:** 2 ~~3~~ **HOURS/WEEK**
PREREQUISITES: **MFGE-353, SENIOR STATUS IN THE PROGRAM**

COURSE OBJECTIVES:

UPON COMPLETION OF THE COURSE THE STUDENT WILL KNOW:

- THE STRUCTURES OF PLASTICS MANUFACTURING COMPANIES
- TYPICAL JOB CLASSIFICATIONS AND DUTIES WITHIN THE INDUSTRY
- THE DIFFERENCE BETWEEN PROPRIETARY, CUSTOM, PRIVATE, AND PUBLIC COMPANIES AND THEIR FOCUS
- PROJECT MANAGEMENT TOOLS AND SKILLS
- INDUSTRY BUSINESS AND QUALITY REQUIREMENTS
- THE MARKETS THE PLASTIC INDUSTRY SERVES
- TYPICAL PLASTICS INDUSTRY QUALITY AND PROCESSING IMPROVEMENT TOOLS FOR PRODUCTIVITY/PROFITABILITY
- THE IMPLEMENTATION OF JOB DESCRIPTIONS AND MEASURABLES
- THE INTERRELATIONSHIPS OF DIFFERENT DEPARTMENTS/DISCIPLINES
- THE IMPLEMENTATION OF BUSINESS TRACKING AND EVALUATION MEASURABLES
- HOW COMPANIES SURVIVE THROUGH THE USE OF BENCHMARKING
- COMPETITIVE STRATEGIES IN THE PLASTICS BUSINESS
- THEIR PLACE AND POSITION WITHIN THE COMPANY AND AREAS FOR ADVANCEMENT
- HOW TO WRITE PROJECT UPDATES, PROCEDURES, MEMOS, LETTERS, AND JOB DESCRIPTIONS. THE STUDENT WILL DO THESE IN THE LAB SESSIONS

STUDENT CAPACITIES: LECTURE - AS APPLICABLE PER LOADING LAB - 15 PER SECTION

NOTE: Topic sequence, time spent per topic, and the methods of delivery are all instructor specific. Evaluation-related time allocation, ie. tests, quizzes, and lab finals is considered to be a component of the lecture and lab times. Evaluations, evaluation materials, and specific time allocations are at the discretion of the faculty member teaching the course.

THE COURSE IS COMPRISED OF THE FOLLOWING UNITS OF INSTRUCTION:

		TIME ALLOCATION (HOURS) LECTURE (LE)	LAB (LA)
Lecture	THEME: Instructor/Course Introduction	1*LE*	
	A. Introduction to the instructor		
	1. Instructor's name, background, office, and office hours		
	2. Other methods for contacting		
	B. Know and understand the course objectives, and review the syllabus		
	1. Units of study to be covered		
	2. Course/meeting timeline - lecture & lab		
	3. Grading & expectations - lecture & lab		
Lecture	THEME: Plastics Industry Companies Overview	4*LE*	LA
	A. Types Of Companies		
	1. "Custom" & products		
	2. "Proprietary" & products		
	3. "Non-Product" Companies		
	B. Company Structures		
	1. Privately Owned		
	2. Publicly Owned		
	3. Single/Multi Plant Environments		
	C. Business Strategies/Operations		
	1. "Full Service" Company		
	2. "Full Service, In-House" Company		
	3. Value/Non-Value Added		
	D. Customer Focus - Satisfaction		
	1. Supplier Manuals		
	2. "Sales" Interface		
Lecture	THEME: Acquiring Business	4*LE*	LA
	A. Custom Processors		
	1. The Quoting Process		
	2. World-Wide Marketing		
	3. "Target" Pricing		
	4. Long-Term Contracts		
	5. Sales - "Targets"		
	6. The Sales "Engineer"		
	B. Proprietary Processors		
	1. Product "Lines"		
	2. Product Development		
	C. "Commodity" Concepts/Specialties		
	D. Multi-Process Tendencies		
	E. Contracts & Purchase Orders/Supplements		
	1. Obligations & Responsibilities		
	2. Legal Ramifications		
Lecture	THEME: Project Management	8*LE*	LA
	A. Definitions & Terms		
	B. Position Results Descriptions		
	1. Job Classifications		
	2. Job Duties		
	3. Individual Measurables		
	C. Time Management		
	1. "Project" vs "Program"		
	2. Definitions and Identification of Elements		
	3. Tools To Use		

D. Project Elements/Phases
    1. Planning
    2. Team Construction
    3. Task Identification
    4. Timeline Development
    5. Implementation
E. Project Tracking & Reports - Tools
    1. Resources/Costs/Etc.
    2. Controlling The Project
F. Gantt Chart Development
    1. "Input" Document
    2. Software Tools/Use

Lecture — THEME: Departmental/Functional Interfaces — 3*LE* — LA

A. Engineering
    1. Tooling
    2. Processing
    3. Quality
    4. Facilities/Equipment
B. Technicians
    1. Process
    2. Equipment
    3. Systems For PM/Repair
C. Product Cost Development
D. Design
    1. Product
    2. Tooling

Lecture — THEME: Self-realization & Management Techniques — 8*LE* — LA

A. Managerial Type - Self Classification
B. Interpersonal Skills
C. Management Styles and Skills
D. Dealing With Specific Groups Of People
    1. Difficult People
    2. Motivational Skills
E. Empowered Work Teams

Lecture — THEME: Quality Systems Overall — 8*LE* — LA

A. Prints & Specifications
    1. Dimensional Requirements
    2. Fit/Function/Finish
B. Purchase Order Requirements
    1. "Supplements" To P.O.'s
    2. Cancellations
C. Company "Obligations"
    1. Productivity Improvements
    2. Cost Reductions
D. Sample Submissions - PPAP
    1. Acronyms & Meanings
    2. Testing Lab Requirements
    3. Process Flow Charts
    4. FMEA Development
E. Supplier Relationships
F. Defects
    1. Customer Ratings
    2. "Zero Defects"
    3. Parts Per Million

Lecture	THEME: Manufacturing Costs	*2LE*	LA
	A. Overhead/Burden		
	B. Labor		
	C. Fixed Costs		
	D. Cost Of Quality Components		
	E. Packaging		
	F. Shipping		
Lecture	THEME: Continuous Improvement	*5LE*	LA
	A. Measurables For The Plastics Industry		
	1. Quality Operating System		
	2. Variable Data Opportunities		
	B. Plastics Problem Solving Techniques		
	1. "5D", "8D"		
	2. Process Monitoring		
	C. Synchronous Manufacturing In Plastics		
	1. Work Cells		
	2. Empowered Work Teams		
	3. "At The Point Of Manufacture"		
	D. Benchmarking		
	1. Definitions & Uses		
	2. Areas Of Comparison		
	3. Interpretation Of Results		
	4. Reaction		
Lecture	THEME: Open - Instructor Specific To Background	*2LE*	LA

TOTALS	
LECTURE	LAB
45 HRS	30 HRS

Textbooks for Plastics and Rubber Programs
Ferris State University

CRS	Textbook Title	Author	Publisher
PLTS 110	INDUSTRIAL PLASTICS THEORY 3rd ED.,	RICHARDSON	ITP DELMAR
PLTS 121	PLASTICS:Materials and Processing	Strong	Prentice Hall
PLTS 212	PLASTIC PART MANUFACTURING, VOL 8, TOOL & MFG ENG. HANDBOOK	MITCHELL	SOC. OF MFG ENG.
PLTS 223	POLYMER ENGINEERING PRINCIPLES 1-56990-151-1	PROGELHOF & THRONE	HANSER GARDNER
PLTS 223	HANDBOOK OF PLASTICS TESTING TECHNOLOGY, #001226, 2nd edition	SHAH	WILEY
PLTS 223	PLASTICS TESTING & PHYSICAL PROPERTIES LAB MANUAL, #7436	FACULTY	COPY CENTER
PLTS 300	FMEA-2, POTENTIAL FAILURE MODE & EFFECTS ANALYSIS, 2ND, 1995		AIAG
PLTS 300	Advanced Product Quality Planning & control Plan, APQP, 1st Ed		AIAG
PLTS 300	Production Part Approval Process, PPAP, 1st Ed.		AIAG
PLTS 312	PLASTICS PART MANUFACTURING, VOL. 8, TOOL AND MANUFACTURING ENG. HANDBOOK	MITCHELL, PHILLIP	SOCIETY OF MFG ENG.
PLTS 411	Decoration & Assembly of Plastic Parts	Muccio	ASM
PLTS 325	INDUSTRIAL PLASTICS THEORY, 3rd ED., #001029, For Manufacturing Eng. B.S.	RICHARDSON	ITP DELMAR
PLTS 410	What Every Engineer Should Know About Accounting and Finance	Shim	Dekker
PLTS 410	Understanding Plastics Packaging Technology	Selke	Hanser
RUBR 110	Basic Elastomer Technology	Baranwal	ACS Rubber Div.
RUBR 110	The Vanderbilt Rubber Handbook, 13 Ed	Ohm	Vanderbilt
RUBR 121	THE VANDERBILT RUBBER HANDBOOK, 13TH ED.	OHM	R.T. VANDERBILT CO.
RUBR 211	RUBBER PRODUCTS MANUFACTURING TECHNOLOGY	BHOWMICK, 1994	MARCEL DEKKER
RUBR 212	MOLDMAKING AND DIE CAST DIES	KLUZ	NTMA
RUBR 312	Rubber as an Engineering Material	Nagdi	Hanser
RUBR 321	RUBBER TECHNOLOGY, COMPOUNDING AND TESTING FOR PERFORMANCE	DICK	Hanser Gardner
RUBR 411	Rubber Injection Molding Machines (Rutil)	Coscia, Gianni	RMT Inc Eastlake, OH

FERRIS STATE UNIVERSITY

COLLEGE OF TECHNOLOGY

DESIGN & MANUFACTURING

PERSONNEL PROFILES

PLASTICS AND RUBBER PROGAMS

Gregory Conti
231/591-2963

Assistant Professor, Plastics Engineering Technology
BS, Plastics Engineering Technology and Applied Mathematics Ferris State University
AAS, Plastics Technology, Ferris State University
2 years of plastics industrial experience with ITT Baylock, and Keeler Brass in Michigan

Larry Langell
231/591-5260

Assistant Professor, Plastics Engineering Technology
BS, Plastics Engineering Technology Ferris State University
8 years of plastics industrial experience with Wright Plastics Products, Panduit Corporation, and General Electric Plastics in Michigan
Areas of expertise: plastics processes and tooling

Edward Muccio
231/591-2965

Professor, Plastics Engineering Technology
MS, Plastics Engineering, University of Massachusetts/Lowell
BS, Plastics Engineering, University of Massachusetts/Lowell
Author of plastics books on parts and processing technology
16 years of plastics industrial experience with Texas Instruments
Areas of expertise: plastic product and process development

Robert Pierce
231/591-2174

Assistant Professor, Plastics Engineering Technology
MBA, Central Michigan University
BSME, Michigan State University
26 years of plastics industry experience, Dow Chemical Company, and U.S. Plywood Corp.
Areas of expertise: Bulk storage, conveying, drying and color feeding. Injection molding, extrusion and blow molding.

Larry Schult
231/591-5261

Associate Professor, Plastics Engineering Technology
MA, Occupational Education, University of Michigan
BS, Industrial Education, Eastern Michigan University
16 years of plastics industrial experience, AMP Industries, Grand Traverse Plastics; and Northwood Industries, Michigan
Areas of expertise: plastics processing, secondary processes, and engineering management.

Robert Speirs
231/591-2964

Associate Professor, Plastics Engineering Technology
MS, Plastics Engineering, University of Massachusetts/Lowell
BS, Plastics Engineering, University of Massachusetts/Lowell
7 years of plastics industrial experience with Baxter Travenol in Illinois, Dow Chemical in Michigan, and US Army Materials Research
Areas of expertise: injection molding operation, plastics product design, plastics materials selection

Stephen Wolfer
231/591-2636

Associate Professor , Plastics Engineering Technology
MS, Industrial Engineering with Plastics Emphasis, Pittsburgh State University, BS, Industrial Engineering with Plastics Emphasis, Pittsburgh State University
Author of Injection Molding trouble shooting guide
6 years of plastics industrial experience with General Dynamics, Texas; Square D, Missouri; Rubbermaid, Ohio
Areas of expertise: injection molding trouble shooting and set up.

Auggie Gatt
231/591-5337
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Assistant Professor, Rubber Engineering Technology
MS, Industrial Technical Education, Bradley University, Peoria, Illinois, BS, Mechanical Engineering Technology, Bradley University, Peoria, Illinois
24 years industry experience with Gates Rubber Co, Gencorp, and Avon Rubber & Plastics
Areas of expertise: Rubber processing including mixing, extrusion, compression/transfer/injection molding, application of elastomers for product design.

Matthew Yang
231/591-5263
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Assistant Professor, Rubber Engineering Technology
MS, Polymer Science, University of Akron, Akron, Ohio
BS, Chemistry, National Taiwan Normal (Teachers) University, Taipei, Taiwan
25 years industry experience with Allied Signal Inc.(NJ), Alco Chemical Corporation(TN), Combustion Engineering Inc(PA), and Chan Sieh Chemical Corp.(Taiwan)
Areas of expertise: Rubber compounding, elastomer blends, manufacture and applications of elastomers, plastics, and water-borne polymers.

Administrative and Support Staff

Robert Marsh
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Director, Plastics and Rubber Programs
MS, Plastics Engineering, University of Detroit
BS, Chemical Engineering, University of Detroit
Registered Professional Engineer
30 years professional experience in the plastics & rubber industry with M.A.Hanna Color, E.I. duPont, United Plastics Division of ITT Corp., OXY Metal Industries, and BASF Corp.
Areas of expertise: Color and appearance, business planning, marketing and sales.

Brian Pacholka
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Administrative Technician, Plastics & Rubber Programs
20 years military experience in electrical and hydraulic systems.

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Secretary, Plastics & Rubber Programs
MS, Career and Technical Education, Ferris State University
BS, Office Automation, Ferris State University
8 years industrial experience in apparel manufacturing with Wolverine World Wide and RayShar Industries.

Direct Inquiries To:
Phone: 231/591-2640 FAX: 231/591-2642

Plastics or Rubber Engineering Technology Faculty
Ferris State University
College of Technology
National Elastomer Center, Rm 211
Big Rapids, MI 49307

SECTION XI

Enrollment Trends

ENROLLMENT TRENDS

There has been a decline in entering freshmen for fall, 2001 and fall, 2002. The attached table shows that approximately 60 students entered the A.A.S. program (PLTS110 Enrollment) from 1994 through 1997. Early in this period, there were 33 to 41 "pre-techs," many of whom met the qualifications for entry, but applied after the program was filled. In 1998, addition of a faculty position increased the entry capacity to 72. Freshman enrollment was very strong in 1998 through 2000, ranging from 68 to 82, but declined to 56 in 2001 and there will be a similar number in 2002.

Total enrollment varies from a maximum of 244 in 1995 to a low of 209 in 1999. These numbers include B.S. "pre-techs," as these students are Ferris Plastics students who are improving their qualifications so they may enter the B.S. Plastics Program. Because of the drop in freshman entrants, the 2002 total enrollment will probably fall below the 1999 level.

Retention is excellent. A study that was completed in December, 1999, showed that 78% of plastics students receive at least their A.A.S. degree and 84% of the A.A.S. graduates enter the B.S. program, which has an 85% graduation rate. Since these attrition rates compound, about 56% of the students who start the A.A.S. program receive their B.S.

The requirements to enter the B.S. program are a 2.5 overall GPA, a 2.7 GPA in plastics classes and a 2.5 GPA in MATH116/126. Certainly, some students do not continue into the B.S. program because of these restrictions. Those who are determined to obtain a plastics B.S. degree retake courses to meet the requirements. It is believed that the entrance requirements gives a higher quality graduate, but there is no statistical basis for that assumption.

Approximately 5 A.A.S. graduates from community colleges enter the B.S. program annually. This number represents about 1/3 of the non-Ferris plastics associates degree graduates in Michigan.

CONCLUSIONS

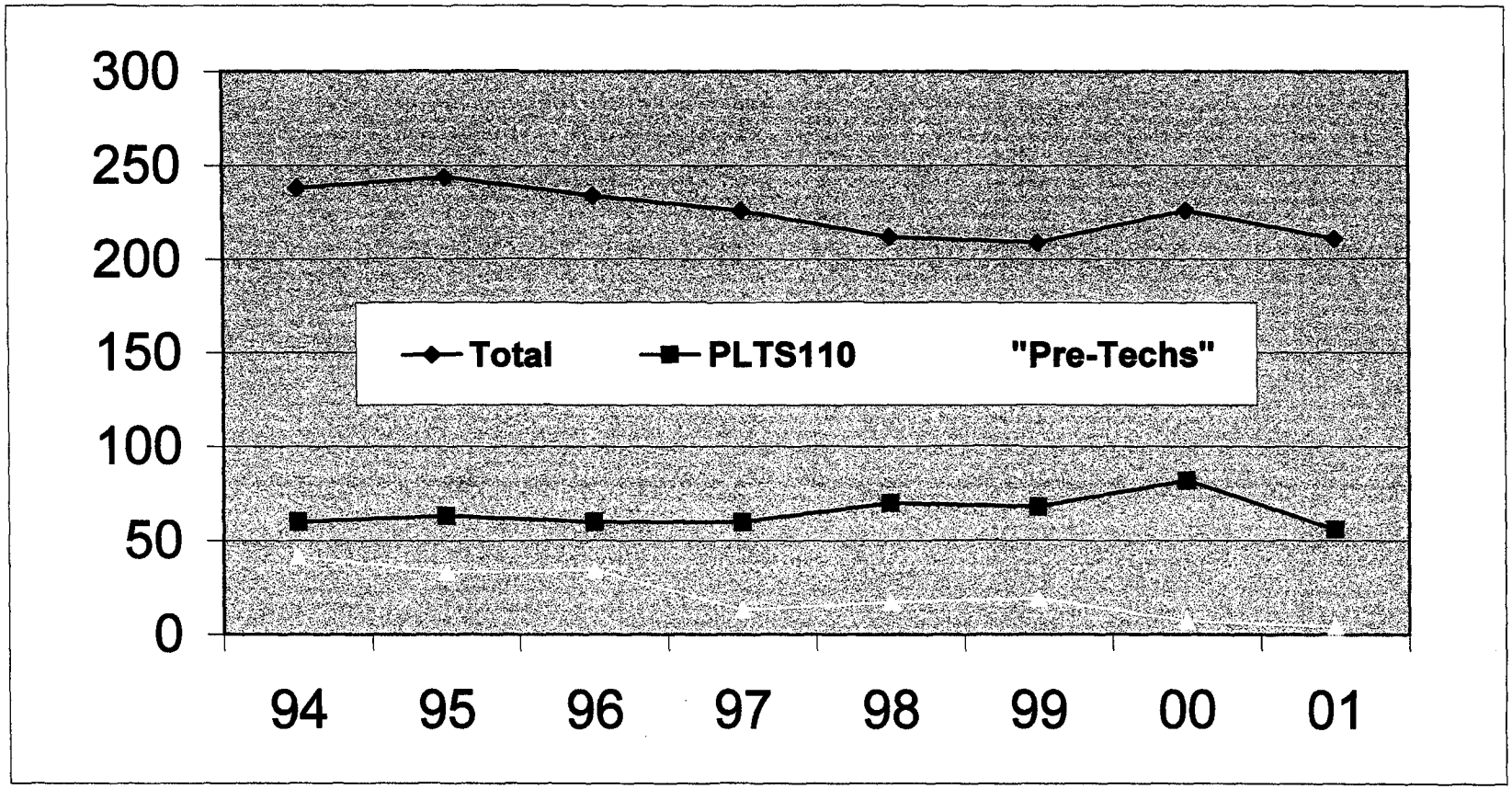
Student recruitment is the greatest need for the plastics programs. Recruitment is a focus for the current school year and beyond. A number of activities will be conducted by all members of the Department. The attached "Recruitment Plan Outline" will be refined into a detailed plan during the course of the fall, 2002 semester.

B.S. program entrance requirements should be reevaluated.

PLASTICS ENROLLMENT TRENDS

Fall Term of	94	95	96	97	98	99	00	01
Total Enrollment*	238	244	234	226	212	209	226	211
PLTS110 Enrollment	60	63	60	60	70	68	82	56
A.A.S. "Pre-techs"	41	33	34	13	17	19	7	4

* includes B.S. "Pre-techs"



enrollment trends.xls

PLASTICS COURSE ENROLLMENT

COURSE	93F	94W	94S	94F	95W	95S	95F	96W	96S	96F	97W	97S	97F	98W	98S	98F	99W	99S	99F	00W	00S	00F	01W	01S	01F	02W	02S
100																			13	10		8	9			11	
110	87			60			63			60	11					70									56		
121		77	6		52			57			50	10					62									46	
193	6	3	58	6	3	47		4	50	1	1	41	3	2	56			57	5		50			46			
211	31		13	61		9	50		5	55			52						57								
212	51		15	50			41			48			47						22	39							
220		61			80			60			59			61			34										
223		67			76			61			55			44						51							
290																7							23				
297			2						2	1		3	1	1	5					2	2						
300	31	29		39	31		31	35		15	45						40	9	5	34		13	48		4		
312	45			49			60		11	49			56			44						55					
320																						34					
321		61	7		60			60	10		59			48			40	7					52				
325		30			34			25			31			18			14			18			26			22	
342		31			39			19			30			44			36			22			31			12	
390													11	42		4	19		7			35			18		
393	14	13	36	4	6	52	3	8	53	5	4	51	3	6	38	1	5	43	2	3	35			44		2	
400	6	13		15	40		22	42	5	26	21		34														
410																										37	
411	26			38			50	10		50						42			41				10		45		
490											8		66														
497		1	2	2	5	2	2	3	9		3	5		2	4	1	1	2	1	6		7	1			1	
499	1	24		14	30		18	32		26	37		22	40		17	23		23	21					16	32	
A.A.S. Grads	14	25	12	10	37	3	23	22	5	31	13	1	23	20	8	22	22	12	17	24	5	8	27	3	6	36	
TOTAL/YR			51			50			50			45			51						46						
B.S. Grads	18	22	10	17	29	6	25	18	5	30	33	7	21	29	9	18	19	3	20	25	1	18	26	2	15	24	
TOTAL/YR			50			52			48			70			59			40			46						
Pre-A.A.S.		35		41	43	7	33	43		34	20	5	13	18	5	17	21	6	19	25	7	7	9		4	6	
A.A.S.		122			110	53		82			102	56		110	65		117	71		111	59		129	69		117	
Pre-B.S.		4		29	11	7	37	39		26	32	30	16	9	7	9	6	8	2	3	3	7	5		8	10	
B.S.		92			95	41		92			86	39		80	36		62	40		72	35		71	38		64	
Off campus		3		9																							
TOTAL		256			259	108		256			240	130		217	113		206	125		211	104		214	107		197	

RECRUITMENT PLAN OUTLINE

* Activity is being pursued

1. *Recruit FSU Career Exploration students **Marsh**
2. *Mailings to students who express interest in similar areas via ACT test **Gregory, Marsh**
3. *Visit high schools (1/semester/faculty?): **Langell, Pierce, Speirs, Yang**
    a. * St. Clair Intermediate School District Plastics Academy **Marsh**
    b. *Kent Career Technical Center **Marsh**
    c. Skill centers
    d. ISD's
4. *Invite high schools to visit Ferris **Yang**
    a. Major Career Day for many high schools
    b. FSU Dawg Days for undecideds (Marsh did this, poor response)
5. Visit Michigan community colleges:
    a. *Grand Rapids Community College **Schult, Marsh**
    b. *St. Clair County Community College **Schult, Marsh**
6. *Visit Ohio & Indiana community college plastics programs (long-term, set up articulation agreements) **Pierce, Marsh**
7. *Contact advisors of SPE student groups to determine student interest in continuing education at Ferris **Pierce**
8. *Presentations at SPE & ACS Rubber Group meetings **Gatt, Marsh, Speirs**
9. *Campaign to have SPE, ACS, SPI, APC, etc. to make plastics/rubber college education a more visible part of their publicity **Pierce**
10. *Scholarships for student recruiters **Pierce, Marsh**
11. *Visit FSU chemistry, physics classes, CDTD, Machine Tool **Speirs**
12. *Alumni mailing with Program Review questionnaire **Speirs, Marsh**
    a. Admission fee waiver
    b. Recruiting packages to alumni (& other interested parties) **Marsh**
13. *Faculty to visit recruits when they visit interns **Wolfer**
14. *Offer plastics/rubber survey class in metro areas to HS seniors (may not be feasible) **Marsh**
15. Participation in Project Lead the Way
16. Participate in science fairs
17. Participate in PlastiVan
18. *Produce video, CD or DVD **Schult/Muccio**
19. *Improve Plastics web site **Langell**
20. Develop Rubber web site
21. COT Newsletter to HS students
22. Community service ads
23. Ads in HS newspapers
24. Programs in plastics factories
25. Web course for use by HS teachers
26. Sponsor HS plastics competition
27. *Standardized email attachments for recruits **Gregory, Marsh**
28. *Letters to students on Orentec screen on SIS **Gregory, Marsh**
29. Develop recruiting kit & send to skill centers & college prep classes
30. *Phone campaign **Marsh**
31. Develop posters for high schools, community colleges, etc.
32. *Offer continuing ed to high school teachers **Gatt**
33. Pursue NSF grant for articulation agreements
34. *FSU cable TV announcement **Muccio/Schult**
35. *Upgrade displays on first floor **Muccio/Schult**
36. *Develop technical electives that create interest **Muccio/Schult**
37. *Local news features **Muccio/Schult**
38. *Coordinate activities of RMA & West MI Rubber Group **Marsh, Gatt**
39. *Introduce interested FSUS-100 undecided students to the Plastics Programs **Muccio**

Conti	**24, 31**	**Muccio**	**18, 34, 35, 36, 37, 39**
Gatt	**8, 32, 38**	**Pierce**	**3, 6, 7, 9, 10**
Gregory	**2, 27, 28**	**Schult**	**5a & b, 18, 34, 35, 36, 37**
Langell	**3, 19**	**Speirs**	**3, 8, 11, 12**
Marsh	**1, 2, 3a & b,5a&b, 6, 8, 10, 14, 27, 28, 30, 38**	**Wolfer**	**13**
		Yang	**3, 4**

3/22/02

SECTION XII

Plastics program productivity and cost

PLASTIC PROGRAM PRODUCTIVITY/COST

Productivity

The productivity of the Plastics Programs is traditionally lower than that of the College of Technology, but the most recent data available (2000 – 2001 AY) show Plastics to be better than COT overall:

AY	PLASTICS SCH/FTEF	COT SCH/FTEF	FSU SCH/FTEF
96 – 97	306	333	447
97 – 98	298	323	442
98 – 99	267	331	457
99 – 00	303	332	455
00 – 01	364	344	451

Most plastics classes have both lecture and laboratory components. Multiple lab sections are taught in one lecture. Because of the number of stations available, the section limits are 10 to 15, depending upon the course. The length of the labs ranges from 2 to 8 hours.

We strongly believe that the "hands-on" emphasis of the plastics programs is key to the success of our graduates. Their entry-level positions require good knowledge of the design and manufacture of plastic products, which can only be really understood by "doing." This pedagogical approach is central to our very identity.

Productivity could be improved through the addition of more laboratory stations. This is generally an expensive proposition, with some equipment costing $100,000 or more. Much of our laboratory equipment is on consignment from industry, so we must continually work with our supporters to maintain the number of stations.

Program Cost

The most recent cost data are from the 1999 – 2000 academic year. The plastics A.A.S. program is less expensive than the averages for both the College of Technology and Ferris State University. The B.S. program is less expensive than the College of Technology average, but more expensive than the FSU average:

	Instructor Cost/SCH	Department Cost/SCH	Dean's Cost/SCH	Total Cost/SCH
Plastics Tech (A.A.S.)	$135.69	$40.46	$13.69	$189.84
Plastics Eng'g Tech (B.S.)	158.98	47.18	15.97	222.13
College of Technology	165.38	46.05	15.35	226.78
Total FSU	138.26	36.83	16.43	191.53

Conclusion

Our productivity and program cost are comparable to the averages of the College of Technology. We will continue to look for cost reductions and efficiency improvements.