Plastics Technology; Plastics Engineering Technology

APRC 1996-1997

Section 1 of 4

PLASTICS TECHNOLOGY (AAS)

PLASTICS ENGINEERING TECHNOLOGY (BS)

Program Review Panel Report

December 17, 1996

Program Review Panel Members:

***Program** Review Chair: Gregory Conti*
***Program** Director (tentative): Eugene Whitmore*
***Program** Faculty: Ed Muccio*
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Individual with Special Interest (Engineer with Evart Products): Jeff Totten
Faculty Member outside the College of Technology (College of Arts & Sciences): Charles Hurt

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PLASTICS PROGRAM REVIEW OVERVIEW

IN-COMING AAS

Sixty(60) to eighty-four(84) students have entered the FSU AAS in PLASTICS Technology each year since 1987 when the new PLASTICS building was completed. The mix of these students with respect to experience and education is as follow:

- twenty to forty percent(20-40 %) are true freshman, entering college for the first time
- fifteen to thirty percent(15-30%) are transfers from non technical programs on campus, with an associate degree
- forty to sixty percent(40-60 %) are on campus transfers from non-technical programs
- fifteen to twenty percent(15-20 %) are transfers from other colleges, and
- ten to twenty percent(10-20 %) are students returning to college with bachelors, associates degrees, or large number of college credits.

The back-log, or waiting list varies somewhat from year to year, but the following situation is the norm:

- The in-coming entry class for a following Fall is closed to additional admissions between November and January.
- By September each year the waiting list(those who are eligible, but admitted after the quota was filled) equals the number(60) in the quota. This back-log has prompted some students to search for another career.(*)

IN-COMING BS:

The majority of the students admitted to the FSU PLASTICS Engineering Technology Program are FSU AAS in PLASTICS Technology graduates. Transfers from other colleges with associate degrees in PLASTICS have varied from none to as high as fifteen(15) in 1994, of the thirty(30) to fifty(50 admitted each year. The predominate number of transfers are from Grand Rapids Community College, with a scattered few from Kalamazoo Valley, St. Clair County, and out of state community college programs(*).

GENDER AND ETHNIC MAKE-UP OF THE PROGRAM:

The majority of the students in the program are white, males. The enrollment of females has increased other the past few years, with the 1995-1997AAS and BS classes averaging ten to fifteen percent(10-15 %). Ethnic minorities have varied much more from none to ten percent(10 %)(*)..

GRADUATION FROM PROGRAM

In the1970s and 1980s, it was common for a student with an associate degree in PLASTICS Technology to enter another bachelors program at FSU, even after the FSU BS in PLASTICS was started in 1982. Since 1990, there have been few who continued on to a bachelors program, who have not chosen PLASTICS. This has led to overcrowding in the bachelors classes and ancillary manufacturing offerings(*).

The number of associate degrees awarded is skewed to the low side because many of the students who continue on to their BS in PLASTICS do not see the need to receive an associate degree credential.

(*Reference for above statistics is personal records and FSU records for the past ten academic years.)

FSU Plastics Advisory Board Survey Summary:

Overview:

Surveys were sent to fourteen (14) advisory board members. Nine (9) returned the survey. There were some definite trends to the replies. The overwhelming strong point from the surveys was the hands-on and technical orientation of the program. Weak points were perceived in funding from the university and in program direction and leadership.

Section Summaries:

Instructional program content and quality showed high scores. The program is geared toward industries needs and has a good balance of hands-on and theory instruction.

Instructional equipment and machinery reflects equipment being used in today's industry, but lacks funding from the university for new equipment, maintenance, and machine:student ratio.

The placement services for this program received good marks, and support the needs of the students and industry.

The Staff showed lower marks in staff:student ratio. The board also showed low marks for leadership and representation in university operations. The staff received high marks for growing with industry.

The Advisory board section showed positive results toward the scope of their activity and the direction they receive.

Conclusion:

The plastics program has been very successful in meeting the needs of employers in a variety of industries. This in part is due to the overwhelming support from industry through machinery donations, grants, and hours of dedicated service. A general "tone" from the advisory board survey suggests that funding needs to be lead by the university. The plastics program is very technical in nature and requires a high dollar amount per student to be successful. Without appropriate facilities and faculty, the students time and knowledge gain is inefficient. A ratio of three students to one machine (in a lab setting) allows each student a chance to get involved and learn. The survey suggests that more involvement from upper management is desired. The involvement should come through strong representation and support for the program.

FSU Plastics Advisory Board Survey:

There are fourteen (14) members of the advisory board. Nine (9) members responded to the survey. The survey consisted of nineteen (19) statements requiring the respondent to rate their concurrence (to the statement), and three open ended questions, requiring comment.

The statements and results are listed on the following page. The open ended questions and answers are summarized below:

1. What are the strong points of the program?

- Focus on hands-on technology.
- Hands-on plus theory plus communication skills.
- Keeping up with needs of the industry.
- Dedicated and knowledgeable staff. Close contact with industry.
- Students get hands-on experience with processing equipment reinforced by internships.
- Hands-on and technical education.
- Hands-on: Technology vs. theory.
- Hands-on, broad exposure to many processes.

2. What are the weak points of the plastics program?

- Leadership and direction for rubber and plastics program consolidation.
- Strong team leader is missing.
- Lacks organization with strong leadership and direction.
- Funding for equipment, maintenance and staff.
- Ratio of students to equipment may not provide enough exposure. Some equipment in poor repair. Staffing may be light.
- Funding, not receiving it's share.
- Crowded, underfunded program. Can't keep up with demand.
- Understaffed, profs. need more opportunity to update new technologies.

3. Do you have any additional comments?

- Most of my exposure has come through the issues of funding, organization and ACEPART. We haven't had much of an opportunity to be proactive and offer advice.
- Faculty self interests need to be coordinated and directed into more unified effort.
- I feel the board needs to give more input. Give more recommendations, more feedback from all arenas.

4. What is your interpretation of the advisory board's goals and responsibilities?

- We are the fan club and cheer leaders. The faculty and administration are the team, the students the product, and the industry is the customer. We represent industry. We assist and bring assistance to the program wherever needed. Equipment, material, supplies. When students were needed, we recruited, when locations were needed for internships, even a new facility (1984-1986).
- To keep the facility up-to-date on current relevant issues to industry.
- To provide direction to the staff about what is needed in instruction and equipment for the plastics program.
- Responsible for keeping program current with industry requirements. Provide feedback to faculty based upon student input. Provide feedback to admin on staffing.
- Help guide program for now and future.
- To facilitate maintenance and advancement of the program. To lobby for support and additional funding.
- Bottom line, to make a student(s) education, the best it can be.

Ferris State Plastics Programs' Advisory Board Survey (Summary of Results):

14 surveys were sent-out, 9 were received.

How many years have you served on the advisory board? **5.13** **(Skewed by a 22 year member)**

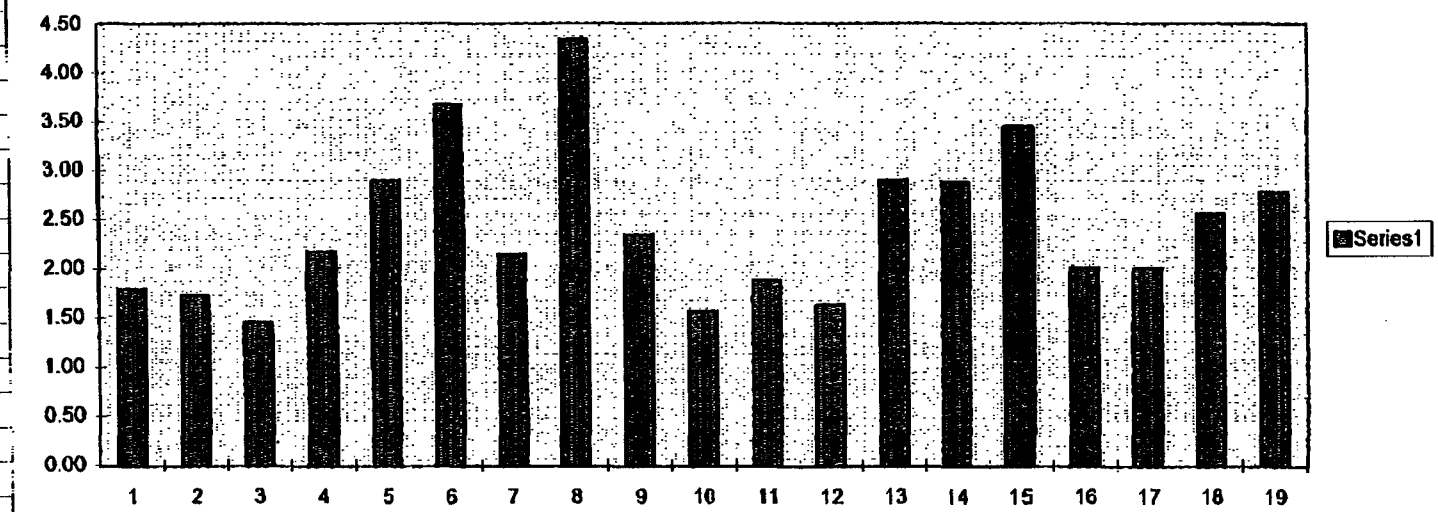
Did you attend classes in the Ferris State Plastics Program? YES (1) NO (7)

Has your company hired plastics interns or graduates from Ferris? YES (4) NO (4)

INSTRUCTIONAL PROGRAM CONTENT AND QUALITY:						
1. Is keeping with industry trends and changes:	1 44%	2 33%	3 22%	4	5	Don't Know
2. Satisfies a broad range of industries (auto, furniture, household, etc.):	1 33%	2 33%	3 11%	4	5	Don't Know 22%
3. Has a good balance of hands-on vs. theory education:	1 56%	2 44%	3	4	5	Don't Know
INSTRUCTIONAL EQUIPMENT AND MACHINERY:						
1. Is updated to reflect latest technology used in industry:	1 22%	2 44%	3 22%	4 11%	5	Don't Know
2. Is maintained in good running condition:	1 11%	2 11%	3 56%	4 22%	5	Don't Know
3. Is sufficient for the number of students enrolled (students/ machine in lab, number of rooms, etc.):	1	2	3 56%	4 22%	5 22%	Don't Know
4. Meets health and safety standards:	1 22%	2 22%	3 33%	4	5	Don't Know 22%
5. Is appropriately funded by the university (excluding grants and gifts from industry):	1	2	3 11%	4 44%	5 44%	Don't Know
6. Represents sound industry standards (house keeping, procedures, etc.):	1 11%	2 44%	3 44%	4	5	Don't Know
THE PLACEMENT SERVICES FOR THIS PROGRAM:						
1. Knows the level of need for professionals in the plastics industry.	1 44%	2 56%	3	4	5	Don't Know
2. Are valuable to the student for finding employment and help students evaluate good vs. bad positions/companies:	1 33%	2 44%	3	4 11%	5	Don't Know 11%
3. Shows that industry comes to FSU looking for students:	1 33%	2 56%	3	4	5	Don't Know 11%
STAFF:						
1. Is adequate in student:instructor ratio:	1 11%	2 22%	3 33%	4 33%	5	Don't Know
2. Has sufficient opportunity to grow with industry (technology, etc.):	1	2 56%	3 11%	4	5 22%	Don't Know 11%
3. Is represented by strong leadership practices and has a voice in the university operations.	1 11%	2	3 33%	4 44%	5 11%	Don't Know
ADVISORY BOARD:						
1. Time is used wisely and input is considered/utilized:	1 22%	2 56%	3 22%	4	5	Don't Know
2. Meeting agendas are representative to tasks at hand:	1 22%	2 56%	3 22%	4	5	Don't Know
3. Meets often enough to provide proper direction to the program:	1 22%	2 33%	3 22%	4 11%	5 11%	Don't Know
4. Is provided adequate and proper direction to function efficiently:	1	2 56%	3 22%	4 11%	5 11%	Don't Know

FSU Advisory Board Survey Summary (Plastics)

						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	Yrs.On	Attend FSU		Hire Grads		Instruct Content			Instructional Equip. & Mach.						Placement				Staff		Board			
	Board	Yes	No	Yes	No	1	2	3	1	2	3	4	5	6	1	2	3	1	2	3	1	2	3	4
	6		1	1		1	1	1	2	4	4	3	5	3	2	2	2	3	3	5	3	2	1	3
	22		1	1		2	2	1	1	3	3	3	4	2	2	2	2	2	2	4	2	3	2	2
	2		1		1	1	1	2	2.5	2	3	2	3	2	1	1	2	4	2	4	1	2	2	2
	0.5		1	1		2	2	2	3	3	4	3	5	3	2	2	2	4		3	2	2	3	2
	5		1		1	2		2	2	3	3		4	2	1		2	3	2	3	2	2	1	2
						1	2	1	2	3	3	2	4	2	1	1	1	1	2	3	2	1	2	2
	2		1		1	3	3	2	2	4	5	1	4	3	2	2	1	4	5	4	3	3	4	3
	2	1			1	1	1	1	1	1	5	1	5	1	1	1	1	3	5	1	1	1	5	5
	1.5		1	1		3		1	4	3	3		5	3	2	4		2	2	4	2	2	3	4
AVE:	5.13	1	7	4	4	1.78	1.71	1.44	2.17	2.89	3.67	2.14	4.33	2.33	1.56	1.88	1.63	2.89	2.88	3.44	2.00	2.00	2.56	2.78



Survey Background:

On Oct. 12, 538 surveys were mailed out to plastics alumni, going all the way back to 1971 (the first graduating class). Since the mailing list was obtained from FSU alumni records the addresses were assumed to be the last billing address for many of these grads and thus quite out-of-date. Even so, 213 completed questionnaires were returned before the Nov. 22 deadline. That represents a 40% response rate. No follow-up mailings were attempted due to lack of funds and time. Also late questionnaires (received after the deadline) were not included in this survey summary. The large number of returns, spanning all the graduating classes, would appear to make the data significant and due to the serendipity of the grads even receiving the survey instruments, this would suggest the respondents are a random sampling of the population of FSU plastics alumni. The survey seeks information on the graduates' perceptions of how well the plastics program has served them in retrospect. What follows are copies of the cover letter introducing the survey, the survey instrument, numerical summaries of the data, a complete copy of all relevant comments, and finally a narrative summary of the data and comments.

October 12, 1996

Greetings Plastics Alumnus:

I hope this mailing finds you happy and healthy. In fact, with many of these addresses being so out-of-date, I'd be happy if this mailing just finds you, period. As you may or may not be aware, the Plastics program conducts a program review every 6 years as required by the University. Well, its that time again. In an effort to honestly and effectively evaluate our curriculum and our ability to achieve the University's and Plastics program's objectives, we must gather information from various sources (such as, the advisory board, labor market statistics, employers' surveys, student surveys, faculty perceptions, etc.) One very valuable source of program and employment follow-up information for us is the graduate survey which you will find enclosed. Your participation in this survey would be greatly appreciated because the larger the number of respondents, the more statistically significant the data will be. Please fill out the Questionaire and return it using the postage-paid return envelope provided or if more convenient, you may FAX it to the Plastics office directly at 1-616-592-2642. Since the "information gathering" phase of this program review process is scheduled to conclude in mid-November, it is important that you respond as quickly as possible. If you have any questions about the survey or would simply like to "touch bases" feel free to call the Ferris State Plastics office at 1-616-592-2640. And again, thank you for your participation.

Sincerely,

Greg Conti

Program Review Panel Chair

Ferris State Plastics Programs' Graduate Survey

Instructions: Please respond to all questions and statements below (check or circle responses where appropriate) then either mail the completed survey to Ferris (use the enclosed postage-paid envelope), or simply FAX this survey to the Plastics Dept. (616-592-2642).

1) Highest degreed level completed in the Plastics program. (A) AAS (B) BS

2) In what year did you graduate from the Plastics program? 1 9 _____

3) Are you currently employed in the Plastics Industry? (A) YES (B) NO

4) Check the categories that most closely describe your job responsibilities. (Check all that apply.)

1st job	current job		1st job	current job	
____	____	Owner/Partner/President/CEO	____	____	General or Plant Manager
____	____	Product Design/Development	____	____	Production/Manufacturing/Process Management
____	____	Marketing/Sales	____	____	Production/Manufacturing/Process Engineering
____	____	Research and Development	____	____	Quality Control/ Quality Assurance
____	____	Technical Service	____	____	Cost Estimating
____	____	Machine Set-up and Maintenance	____	____	Purchasing
____	____	Moldmaking	____	____	Mold design
____	____	Educator	____	____	Mold Maintenance and Repair
____	____	Project Manager	____	____	Other _____

5) What types of plastics processing is done at your company? (Check all that apply.)

____ Injection Molding	____ Extrusion	____ Blow Molding
____ Thermoforming	____ Compression/Transfer	____ Rotational Molding
____ RIM	____ Composites	____ Decorating
____ Assembling	____ Finishing	____ Others_____

6) Does your company have any testing facilities? (A) YES (B) NO

7) Are you currently employed in Michigan? (A) YES (B) NO

8) Was your first job located in Michigan? (A) YES (B) NO

9) The technical skills acquired at Ferris have been relevant to my plastics career. Agree 5 4 3 2 1 Disagre

10) The processing equipment use to instruct at Ferris were representative of the industry. Agree 5 4 3 2 1 Disagre

11) The testing equipment use to instruct at Ferris were representative of the industry. Agree 5 4 3 2 1 Disagre

12) The technical support courses taken at Ferris (elect., hydraulics, manufacturing, graphics) were relevant to the industry and my career. Agree 5 4 3 2 1 Disagre

13) Non-technical courses taken at Ferris have been relevant to my life and my career. Agree 5 4 3 2 1 Disagre

14) Lecture and theory discussed in the plastics courses were relevant to the industry and my career. Agree 5 4 3 2 1 Disagre

15) I learned to apply analytical thinking skills in my plastics courses at Ferris. Agree 5 4 3 2 1 Disagree

17) In the plastics courses, laboratory work was vital to my educational experience at Ferris. Agree 5 4 3 2 1 Disagre

18) The lab component of the plastics curriculum has proved to be useful in my career. Agree 5 4 3 2 1 Disagre

19) The internship(s) was(were) a valuable component to my plastics education at Ferris. Agree 5 4 3 2 1 Disagr

20) I consider my career successful thus far. Agree 5 4 3 2 1 Disagr

21) With reference to the above question; What percentage of this success would you attribute to the Plastics program? _____%

22) Would you recommend the Ferris State Plastics Program to family, friends, and colleagues? (A) YES (B) NO

23) Please take a moment to make any comments, suggestions, explanations and/or observations you may have to any of the above statements or anything else you may feel pertinent to the Ferris State plastics program/curriculum learning experience. What did we do rigl and what did we miss? Your thoughts are important to us. Feel free to attach a separate sheet of paper to this survey form if more space is required or just use the backside of this form. **Thank You for Participating in this Survey.**

AAS vs BS and Totals --- all years

1) Highest degreed level completed in the Plastics program. (A) AAS=57 (B) BS=156 Total=213

3) Are you currently employed in the Plastics Industry? **YES AAS= 84% (48) BS= 96% (149) Total= 92% (197)**

4) Check the categories that most closely describe your job responsibilities. (Check all that apply.)

AAS	BS	Total		AAS	BS	Total	
21%	2%	7%	Owner/Partner/President/CEO	10%	2%	4%	General or Plant Manager
13%	30%	25%	Product Design/Development	8%	13%	12%	Production/Manufacturing/Process Management
33%	15%	20%	Marketing/Sales	25%	37%	34%	Production/Manufacturing/Process Engineering
17%	22%	21%	Research and Development	17%	10%	12%	Quality Control/ Quality Assurance
19%	19%	19%	Technical Service	15%	17%	16%	Cost Estimating
10%	9%	9%	Machine Set-up and Maintenance	6%	7%	7%	Purchasing
4%	5%	5%	Moldmaking	19%	19%	19%	Mold design
8%	8%	8%	Educator	8%	9%	9%	Mold Maintenance and Repair
33%	40%	38%	Project Manager	2%	2%	2%	Other _____

5) What types of plastics processing is done at your company? (Check all that apply.)

85%	Injection Molding	22%	Extrusion	14%	Blow Molding
11%	Thermoforming	7%	Compression/Transfer	5%	Rotational Molding
10%	RIM	7%	Composites	27%	Decorating
55%	Assembling	23%	Finishing	11%	Others_____

6) Does your company have any testing facilities? (A) YES=83% (B) NO=17%

7) Are you currently employed in Michigan? **YES AAS= 68% (39) BS= 74% (116) Total= 73% (155)** NO Total= (46)

8) Was your first job located in Michigan? **YES AAS= 79% (45) BS= 70% (109) Total= 72% (154)** NO Total= (50)

	AAS	BS	Total
9) The technical skills acquired at Ferris have been relevant to my plastics career	4.28	4.62	4.53
10) The processing equipment use to instruct at Ferris were representative of the industry	3.77	4.31	4.17
11) The testing equipment use to instruct at Ferris were representative of the industry	3.89	4.14	4.08
12) The technical support courses taken at Ferris (elect., hydraulics, manufacturing, graphics) were relevant to the industry and my career.	3.96	3.90	3.92
13) Non-technical courses taken at Ferris have been relevant to my life and my career	3.63	3.29	3.38
14) Lecture and theory discussed in the plastics courses were relevant to the industry and my career	4.02	4.46	4.34
15) I learned to apply analytical thinking skills in my plastics courses at Ferris	3.88	4.24	4.15
17) In the plastics courses, laboratory work was vital to my educational experience at Ferris	4.51	4.58	4.56
18) The lab component of the plastics curriculum has proved to be useful in my career	4.37	4.51	4.47
19) The internship(s) was(were) a valuable component to my plastics education at Ferris	4.51	4.65	4.61

20) I consider my career successful thus far. **AAS= 4.74 BS= 4.75 Total= 4.75**

21) With reference to the above question; What percentage of this success would you attribute to the Plastics program?
AAS= 65. 8% BS= 74. 0% Total= 71. 8%

22) Would you recommend the Ferris State Plastics Program to family, friends, and colleagues? **YES= 99.5% (212)** NO= (1)

AAS vs BS and Totals — from 1990-on

1) Highest degreed level completed in the Plastics program. (A) AAS=12 (B) BS=124 Total=136

3) Are you currently employed in the Plastics Industry? **YES AAS= 92% (11) BS= 96% (119) Total= 96% (130)**

4) Check the categories that most closely describe your job responsibilities. (Check all that apply.)

AAS	BS	Total		AAS	BS	Total	
0%	0%	0%	Owner/Partner/President/CEO	0%	2%	1%	General or Plant Manager
18%	29%	26%	Product Design/Development	0%	13%	12%	Production/Manufacturing/Process Management
27%	13%	14%	Marketing/Sales	18%	38%	35%	Production/Manufacturing/Process Engineering
18%	22%	21%	Research and Development	27%	9%	10%	Quality Control/ Quality Assurance
27%	20%	20%	Technical Service	18%	18%	17%	Cost Estimating
9%	10%	10%	Machine Set-up and Maintenance	8%	7%	7%	Purchasing
9%	7%	7%	Moldmaking	18%	21%	20%	Mold design
0%	7%	6%	Educator	18%	10%	10%	Mold Maintenance and Repair
55%	39%	38%	Project Manager	9%	3%	4%	Other _____

5) What types of plastics processing is done at your company? (Check all that apply.)

91%	Injection Molding	21%	Extrusion	12%	Blow Molding
1%	Thermoforming	8%	Compression/Transfer	5%	Rotational Molding
1%	RIM	5%	Composites	29%	Decorating
58%	Assembling	25%	Finishing	9%	Others_____

6) Does your company have any testing facilities? (A) YES=89% (B) NO=11%

7) Are you currently employed in Michigan? **YES AAS= 90% (10) BS= 81% (96) Total= 82% (106)** NO Total= (30)

8) Was your first job located in Michigan? **YES AAS=100% (12) BS= 76% (91) Total= 79% (103)** NO Total= (33)

	AAS	BS	Total
9) The technical skills acquired at Ferris have been relevant to my plastics career	3.92	4.62	4.56
10) The processing equipment use to instruct at Ferris were representative of the industry	4.17	4.40	4.38
11) The testing equipment use to instruct at Ferris were representative of the industry	4.00	4.19	4.18
12) The technical support courses taken at Ferris (elect., hydraulics, manufacturing, graphics) were relevant to the industry and my career.	4.00	3.85	3.87
13) Non-technical courses taken at Ferris have been relevant to my life and my career	3.17	3.19	3.19
14) Lecture and theory discussed in the plastics courses were relevant to the industry and my career	4.00	4.51	4.46
15) I learned to apply analytical thinking skills in my plastics courses at Ferris	3.83	4.31	4.27
17) In the plastics courses, laboratory work was vital to my educational experience at Ferris	4.58	4.59	4.59
18) The lab component of the plastics curriculum has proved to be useful in my career	4.25	4.52	4.49
19) The internship(s) was(were) a valuable component to my plastics education at Ferris	4.58	4.59	4.59

20) I consider my career successful thus far. **AAS= 4.75 BS= 4.72 Total= 4.72**

21) With reference to the above question; What percentage of this success would you attribute to the Plastics program?
AAS= 65. 0% BS= 74. 4% Total= 73. 5%

22) Would you recommend the Ferris State Plastics Program to family, friends, and colleagues? **YES= 100%**

Summary Analysis:

The data was sorted from several different "view" points in order to gain further insights into trends or relationships. Sorting by years yielded no obvious long-term trends nor did it single out any specific year as unusual. Again sorting, this time dividing the group by quarter/semester transition, which was accompanied by a minor curriculum revision, also yielded no conclusive results. In fact the only sorting that gives us usable trends are by: degree (AAS vs BS), sorting by recent grads (1990-on) vs older grads, and sorting by educational experience in the old building with the older donated and purchased equipment vs the new, much larger plastics building with the newly consigned and purchased equipment.

Summary of data findings common to all sortings:
Almost all FSU plastic graduates are still employed in the plastics field and about half of those few who are not, are working in a closely related field in marketing (ie. vinyl windows) or manufacturing (ie. automotive quality control).

Most employers of grads have on-site testing facilities.

Approximately 3/4s of the graduating students stayed in Michigan and a few of those who chose not to stay initially, eventually came back.

By far the most common plastics process used in the plants is injection molding with many of these also performing some assembly, finishing, and/or decorating.

Large numbers of graduates go on to perform job functions in Product Design, Sales, R&D, Technical Service, as Project Managers, Process Engineers, and in Mold Design.

Strongest points of the plastics program: Internships; the "hands-on" lab component of the plastics courses; relevance of the technical skills being taught; relevance of lecture material and theory being taught.

Weakest points of the plastics program: Non-technical courses that are University required.

The highest scores were obtain on personal career success of the graduate thus far. Grads felt very successful in their careers. Moreover, almost 3/4s of this success was felt directly attributable to the Plastics Program at Ferris.

Finally, an overwhelming number of alumni (212 out of 213) would and have (see comments) recommended the Ferris State Plastics Program to family, friends, and colleagues.

AAS vs BS Summary findings:
There appears to be several trends both perceptual and also real career differences, by highest plastics degree awarded, that seem to hold true across the years. These are:

More AAS degreed graduates seem the be in sales and quality control than BS grads while a smaller number go into engineering and product design.

Equipment used at Ferris is seen as more representative of the industry by the BS degreed graduates. (The more advanced classes use more sophisticated equipment.)

Lecture and theory discussed, along with the "hands-on" lab component is seen as more relevant by the BS graduates.

Also it seems that the plastics courses that demand analytical thinking skills be applied are the more advanced courses of the 4 year program.

And finally, the BS graduates feel that the success in their career is more (10%) attributable directly to the Plastics Program.

Recent Graduates of the Program vs Older (prior to 1990) Graduates:
(This also correlates to graduates from 1990-on with experiences only in the new facility vs the graduates from the older lesser equipped building)

A greater percentage of recent graduates work for injection molders at the expense of thermoformers and RIM molders. This could be due to curriculum changes or simply a sign-of-the-times. Other areas of processing remain fairly constant.

Many more recent graduates have chosen to stay and work in Michigan than in the past. Though this could be as much a function of the job market and plastics industry in Michigan or an increased program recognition as well as program changes.

Obviously a function of age, we find that the older graduates are now in positions of company ownership, or higher-level management.

Equipment use at Ferris is now more representative of the industry as perceived by the more recent graduates.

All support courses, both technical and non-technical are now seen as less relevant than in past years.

Lecture and theory along with the application of analytical thinking is has also become more relevant in recent years.

And finally, a slightly greater degree of success is perceived to be attributable to the Plastics Program by the newer graduates.

Summary of Comments:
A very large number of respondents chose to contribute personal views and perceptions of the plastics program. A short summary of these suggestions and observations follow:

Most often mentioned (17 times) was a need for more (classes, in-depth study, etc.) in the area of mold design.

The great importance of the "hands-on" aspects of the program were next most cited (9 times).

Many (7) felt that the internship was an integral part of the program, with 3 grads suggesting that 2 internships were not enough.

Grads (7) felt that the program has grown and improved with regards to equipment and curriculum.

Some (6) reported FSU plastics program as having a strong reputation in the industry.

Several (5) suggest more part/product design courses.

Some other areas that were touched with some frequency (4) were: more trouble-shooting of all equipment; importance of communication skills; more business courses; vital importance of labs; more on hot-runner systems

There was one other point expressed out-right by 2 individuals (that can be found on the following pages) but hinted at by many others in more personal comments or read between-the-lines. This had to do with the need for a mechanism by which a graduate could feel more connected to the Ferris Plastics Program. Unfortunately at this time the SPE golf outing and the Christmas dinner are the only such mechanisms.

GRADUATE SURVEY COMMENTS by Year and Degree

71AASSince I was in the first graduating class my exposure was a long time ago. Any shortcomings I recall have been addressed with the addition of the new building and the new processing equipment. The program did look a little short on extrusion and blow molding however. Good program.

72AASConsidering I was the second class graduated in the plastics program and at the time the program itself was experimental, I can't say that everything was done right or wrong. But, the fact that I know anything about plastics when I graduated helped me immensely in a fledgling plastics industry.

73AASFerris State gave me a great start in my career! I do recommend Ferris to a great deal of people!

76AASI'm glad to see that the program has expanded into areas other than just the technical and mechanical areas of the plastics industry. Much of the challenge and excitement in the industry lies in the business and management areas. This was the shortcoming in the early program. But, I use some of what I learned in the program as I purchase vinyl window products for a residential window distributor.

77AASI never got involved in the plastics industry. Also have a B.S. in marketing which was used more than plastics degree.

78AASBack in the late 70's the plastics program was just starting to get its feet wet. I have had an opportunity to see the facility since then and am very pleased with the 4 year degree and courses offered. Keep up the good work!

79AASI would not have gotten involved in the field of plastics had it not been for my time spent at Ferris.

79AASThe courses were a good mix. The hands on experience was the most important.

79AASRIGHT: 1)Lab work very important for thinking, documentation skills. 2)Equipment variety and chance to experiment with equipment is/was valuable. 3)Courses in mfg, elect, hyd were valuable when troubleshooting, test setups, lab work. MISSES: 1)General classes were too easy (not enough depth). My background included more advanced courses. More time in electronics, hydraulics would have been helpful.

81AASHaving the right attitude is very important to the young people graduating and having excellent communication skills!

82AASSince my first job moved me out of state, I have not been able to come back and visit the campus. But, from what I've heard and read, the plastics program has really grown and expanded. Hooray for a school that didn't stop while it was ahead, but continued to increase its lead!!!

82AASI feel, from what I have heard and seen, the program is more complete and geared more to industry than when I graduated. It seems that it is more structured to help the students be able to step into industry and pick things up mush quicker. You need the stepping stone to get started but you can't beat being on a production floor and work and learn at a different pace.

84AASKeep up the good work!

84AASIncrease math and people skills (management) in the program

84AASI feel that the instructors at the time I was in the program were out-dated at that time, as well as the equipment we had in the lab. The program was a way to start a career, but didn't deal enough in real life manufacturing situations. Quality, efficiency, utilization were not a focus but are extremely important in "real" manufacturing. Real life machine set-up and troubleshooting skills were not a focus and should be. I am sure all of these points have been greatly improved upon since I left FSU. I have had interns from FSU working for me in the past years and from what I gather from them, the program has made vast improvements.

85AASNeed to educate students on different types of thermoplastics - PC; PA 6 and 6,6 and 6,12 and 11 and 12; acetal; etc.

85BS More math and physics would be nice.

85BS Technical is good but it doesn't prepare you for management. More business classes are needed to help in the transition. We have interviewed today's graduates and we are disappointed that they expect the industry to pay them more than what people with more education and experience are making. It is not practical to be paid before you can do a good job.

86AASDue to the reputation of Ferris, obtaining a job prior to graduation was automatic. The stepping stone to success included basic technical skills taught at Ferris State. The internship program is a must!! Although a machine operator should not qualify. Working at a smaller plant where you get your hands dirty in everything is a great experience for interns.

86AASTech support courses need refinement (ie. need more emphasis depending on student's goal) as they stood the taste we got was not overly relevant. My suggestion is "breaking up" the program based on student's goals. For example with a goal of tooling design CAD/design is very important, whereas hydraulics is less important. In the "real world" we need 12 months to train people. This type of specialization would cut this curve. We have hired both Eastern and Ferris grads over the past 10 years. Ferris grads are better hands-on, but have real issues in learning the ways of the world. Eastern grads are book literate and learn simple molding concepts. Bottom line is our grads need more refined training verses broad tech knowledge.

86BS The Ferris program was great basic training. The industry teaches so much more than the classroom/lab can provide. The internships provided intense "on the floor" training that all students should get. Remind your students that graduation is the beginning of learning, not the end, to make them understand that they are "green"; not experts.

87AASThe Associate program gives a general knowledge of the plastics industry. I would recommend to someone that they only receive their Bachelors if you want a job in this field. I feel the curriculum is an excellent one and wish I could have enrolled in it in my first year and not my fourth. Keep up the good work!

87BS Things done right: - labs - internships - technical support classes Things missed: - more math - heat transfer class - dynamics class - polymer chem class - DOE class - plant accounting

87BS I believe all plastics courses should be a continued requirement however I think core options should be offered, for example processing, polymer chemistry, design, etc. along with the general format offered when I attended.

87BS It would be beneficial to arrange maybe an alumni gathering at FSU to review current curriculum, re-establish roots, contacts, assess one's own previous education.

87BS My career has gone from engineering with .... to account manager with.... One observation I've made in having dealt with many Lowell grads is that their program focuses on the theoretical nature of the plastics industry, in my opinion too strongly. And yet FSU does not focus strongly enough. Or at least didn't when we went through. I would suggest 1 or 2 chemistry courses devoted to understanding the molecular make up of each of the major resin families. Another thought would be to include a more in depth series of materials courses detailing characteristics, where they are used etc. Hope things continue to go well at FSU.

88AASKeep up the good work!

88AASIt would be nice to be better connected to the program. There is a group of us that would like to come back for the golf weekend if we knew 2 months in advance. The alumni relations are poor compared to the other colleges I have been affiliated with.

88BS One area to improve the potential of the plastics program is to reach beyond the Michigan borders. This program has significant things to offer the plastics industry -- it prepares the students well for a career.

88BS The Ferris plastics program provided me with an excellent start in my career.

89AASIn 1989 I graduated from Ferris with: BS-Business and AAS-Plastics Tech. This landed me a job in sales, selling plastic wiring and communications products. Next, I was promoted to a position as product manager. This position benefitted from my plastics education. It was very helpful. I now work for a $2.5 billion distributor of communication products. I am a marketing manager. This position does not require a great deal of plastics education, but I would not be where I am today without Ferris and the plastics program.

89BS Fortunately or unfortunately, I left the plastics field after 4 years to pursue a quality career. I am however heading back to the plastics industry, and will pursue my original goal as plastics engineer. I hear good things about the plastics program from former students and have even visited the building about 4 years ago. Keep up the good work.

89BS The plastics program has opened many doors since there are relatively few degreed plastics engineers in Michigan. Most molders in Michigan are familiar with the program and look highly upon its graduates. The "hands-on" focus of the program makes the graduates more employable than if it were a more engineering or theory (such as a M.E. program) based program. It would be interesting to look into the feasibility of a masters program in the future. I think it would be successful.

89BS The plastics courses/program at Ferris is a very beneficial program and gives an added edge to your experience required to work in the plastics field.

89BS A class on moldmaking with hands-on experience in various machining processes would have been very helpful. CAD/CAM experience would have helped.

89BS I believe the internships were so valuable to my work career. I see too many engineers come into our company that get overwhelmed because they have difficulty with the corporate environment. I would advise requiring 3 internships or possibly more work type credit. In addition, I would push to have even more variety of molding equipment in the lab settings.

90AASI must say that the plastics experience I received at Ferris has played a major role in the growth of my career. Having that experience has opened doors that are closed to kids with general degrees.

90AASThe program needs much more reference in the area of mold construction and moldmaking. Also engineering resins need to be used more at Ferris ie. glass-filled, Ultem, PEEK, etc. (in the advanced classes of course).

90BS May want to expand the tooling aspects of the program. Continue with the "hands-on" labs as well as the internships.

90BS I feel the plastics program is very strong in preparing for industrial positions. Changes I would recommend 1)less chemistry - not really needed in industry 2)more plastics product design 3)more math - calculus for BS 4)add some program mgt courses

90BS Calculus math class would have been helpful. I feel the plastics program at Ferris is as good or better than any other programs at other universities.

90BS The hands-on use of the processing and testing equipment was excellent. It provided a good understanding of the theory. The drafting course was useful for blueprint reading and preparing part sketches. The Engineering Economics course was a waste of time.

90BS - Program mgmt techniques/responsibilities not reviewed - Importance of SPC not emphasized (Cpk, Cp, 3sigma) - It would have been nice if the program was an actual engineering degree (technology) - Great overall! - the program has national recognition!

91BS 1)Product/part design - more courses would have been very helpful in my career. 2)Tool design/tool build - more courses in tool design and courses required in machine tool would have been very helpful in my career.

91BS - GD&T should be of more importance in the curriculum. - Tooling is very important to all aspects in plastics. -die draw -parting line development etc..... *more tooling classes would be very beneficial.

91BS Anyone can learn it, its what the individual does with what is learned that counts. More: Tooling, statics and strength, math, personal skills (I run into a lot of FSU people who have difficulty in communicating. Use the word "ain't" too much. Less: General Chemistry

91BS Please don't sacrifice the quality of our graduates in pursuit of quantity. It impacts the overall reputation associated with Ferris graduates - past, present, and future!

91BS The ability to receive an engineering degree would be very beneficial (in addition to the technology degree). Also graduate level classes in plastics.

91BS The Ferris program provided me with an excellent opportunity to learn (theory and hands-on) about plastics. I am very grateful for the personal touch of the professors in the plastics program. The only recommendation that could enhance the program anymore are: 1)maintenance and troubleshooting the injection molding machine and auxiliary equipment 2)more details in tooling (steel selection, design, and practical applications) Other than the above Ferris in my eyes represents the finest school for plastics in the country.

91BS During my ride on the Ferris wheel, I would have liked to become more familiar with polymer chemistry.

91BS Ferris provided excellent training in plastics theory and processing. Tooling education was also top-notch. Equipment troubleshooting needs more improvement. (Solenoids, valves, processors, calibration, machine print reading hydraulic-electrical)

92BS I believe that Ferris' plastics staff did a great job emphasizing good work habits. More emphasis was needed on 1)Tool design and 2)Good part design.

92BS Up-dated material testing/characterization (DSC/TGA) *Needed process monitoring and instrumentation experience *Need to improve electrical and hydraulics classes to focus on practical areas *Solicit companies to sponsor project classes. The quality of projects completed were low tech.

92BS Try more emphasis on tooling: Prints, assembly, disassembly, tool shop equipment, water lines.

92BS Possibly improve the projects class to emulate typical milestones/tasks distinctive to a plastics project. Overview on QS-9000? AIAG standards (eg. APQP, PTAP, etc.)? Maybe include a sales/marketing class?

92BS What you do right: Taught the plastics processing side of the industry What you missed: 1) Costing 2) Business aspects of the industry (finance, marketing) 3)Project management theory 4)Plant management theory

92BS -Should have Mold Flow/C-Mold courses as part of curriculum - Should have a rheology course or two - Should have instrumentation/electronics courses - Get rid of the humanities (never use them)!! - Ferris has a strong program, but we need to make it stronger.

92BS A solid understanding of quality practices would be helpful, I feel that I didn't get enough of that (difficult, I understand). Some more of the "pure engineering" side would be helpful too, though I understand that it's tough to get it all in. A suggestion for projects courses - maybe the project topics should be specified by the professor. Seldom do engineers get to choose their projects anyway, so why not give the students a taste of a real customer driven project? The experience I received at Ferris as a whole was very positive and the best part of it was the Plastics Program. Thanks!

92BS Was a moldmaker prior to Ferris and returned to moldmaking after Ferris because salary was higher.

93BS More tooling, processing, electrical, cost estimating....longer study/hands-on This needs to be hit home hard, imbedded in students minds. Not just test and forget about. Need to do over and over. Certain areas more time/understand.

93BS Lab work with decorating equipment would have been beneficial, but I believe this is in place now. I think the processing classes with all the lab time was most beneficial for my career. All in all, I enjoyed my time in the plastics curriculum and believe it is a very good program.

93BS The professors were vital to my success. The program and curriculums have helped me but my connections that I have obtained through my past and present jobs have helped me achieve the position that I currently have.

93BS Overall, I felt that the curriculum was excellent, but the degree of learning largely depended upon the professor chosen.

93BS Overall good injection molding experience acquired at FSU!! A few things that may need to be focused on a little bit more: 1) Hot runner molds - heater locations, why?, wiring, design; 2) Tooling Issues - assembly/disassembly, minor mold repair, side actions 3) Cost - part cost, machine purchase justification, potential cost savings(scrap reduction, machine downsize, labor reduction, process instruments 4) Machine maintenance - electrical, hydraulics, pneumatics

93BS I read in a magazine about the elastomer program added to the plastics program. I think that would be an excellent choice. I work in the elastomer area now. Some extra attention in this area is needed.

93BS I feel that an elective class on "automotive systems" would be a great benefit. This class might go over AIAG standards, big three submission processes, QS-9000...etc. Just a thought.

93BS I received an excellent education at Ferris. The plastics program/curriculum is leaps and bounds above other schools. I was very well prepared for my job and industry. The placement office also does an excellent job.

93BS Ferris plastics program is Top Notch across the industry and the nation.

93BS Have a program management class using computer programs to track and show a program's critical path and how to adjust to changes within that path.

93BS In my plt. experience, I have encountered testing equipment that was not available at Ferris when I went through the program. They are: 1)color match test equipment 2)ash content ovens We are also going through ISO-9000 and QS-9000 at my company. This is a big issue in the plt. industry right now. If you are currently covering these topics, that's great! If not, it is strongly suggested.

93BS Hands-on definitely a plus (testing, processing, manual drafting of molds and parts). Hydraulics, electronics and fluid power have served me well in addition to technical plastics classes (include metallurgy as well). More training in elastomer materials and processing would have aided me, as well as training to ensure a competitive edge verses mechanical engineers.

93BS I would recommend discussing hot-runner systems in plastics classes. The hot-runner business is growing immensely in the plastics industry.

94BS - May want to incorporate some end-product testing and calibration, and not just material testing such as dog-bones on tensile tester, etc. - As a product engineer, the design class offered was very beneficial for me. - May want to touch upon GD&T, DFMEA's, PFMEA's more. - Do more exercises in part stack-ups/tolerances. - My internships really gave me the experience I needed to get my feet in the door of my current job.

94BS I believe more time should be spent with the design of plastics components as well as metal components.

94BS I have found that with my current job, more training in mold design would have been helpful. Aside from this I feel the program was superior.

94BS Things to add to the program that need to be covered in detail: 1) Hot manifold systems - types, heater elements, structure, wiring, troubleshooting; 2) Mold structure; - side action, repairs, print reading, total disassembly and assembly of molds; 3) Troubleshooting all the equipment - Thermolators, hot runner box, dryers

94BS 1)since the automotive industry bases engineering and sales on program management, sales and marketing would be an important elective 2)program planning, FMEA, 8-D's, and PSW submission to the big three are the most important topics that need to be taken into industry

94BS Need more emphasis on quality: Statistical Analysis CMM Analysis

94BS Maybe incorporate some "mock" program launches. - Concept through production Include everything needed to start-up a new operation -The first two processing classes were redundant - Concentrate more on the concepts in the third processing course. Tool Design was an excellent class - In general, all of the technical courses were useful.

94BS Items for future consideration: - Corporate politics - Running meetings - Meeting minutes - Items to get out of a meeting: what is the issue .. responsibility .. timing .. corrective action/back up plan

94BS The Ferris plastics program does a great job preparing students for the plastics industry. Of course, rest of the learning takes place on the job, but Ferris gives a very solid base to start. Overall, the Plastics program was a great experience and so it was going to Ferris.

94BS I feel that I was as adequately prepared as possible. The vast amount of information seems to keep coming around!

94BS A metrology lab would be helpful as an introd.. to CMM and other equipment used for accurate parts measurement.

94BS I feel that more emphasis on mold design and tooling/part design would be extremely beneficial for the plastics program and the students.

94BS Please investigate a more comprehensive tooling class. There was almost too much theory, and I felt when I was first out, practical type of knowledge was more needed, like taking raw designs and analyzing them for moldability. More practical cost estimating. I was very pleased, however with the quality education I received at Ferris, and am proud to say I am a graduate. It is a very respected program in the industry as well. Thank you all on the staff for your time and patience and I hope you are all doing well. I am at ----- , and I love my job. I am doing everything. As a project engineer I am required to take a program from cradle to grave and I feel Ferris has prepared me very well. Thanks and keep up the good work.

95BS Could of used some more mold design classes. Knowing mold components and their utilization in the design is something that I really wasn't exposed to. We covered a lot of the basics, but seeing them in application really helps. Internships are a must!!

95BS The program at Ferris has been excellent for me. It gave me the basic tools to go out into industry and build on for the future. Thank you to everyone there for the dedication and hard work put into the students' education. Good luck in the future and growth of the program.

95BS I feel a more in-depth aspect of Hot Runner Systems should be put into the program.

96AASI feel there is more need to teach about structural foam. As in this survey, structural foam was not touched on very much. However, I believe it deserves special attention. There has been a large growth in structural plastics. Thank You.

96BS An internship every summer, instead of every two, would give a student a chance to learn a lot more of what goes on in our industry.

96BS I completed the tech drafting program prior to plastics. Upon completion, I chose the mold design field. The tech drafting program is where I learned the mold design basics. A suggestion is to create a complete product/mold design class. Because not everyone has this interest, it may be offered as an elective with other classes. I recently convinced my employer into purchasing an injection molding press. Having learned about the dos and don'ts of purchasing new and or used equipment would have been very helpful.

96BS A course on basic troubleshooting techniques could be helpful. Also more CAD work (uni-graphics, autocad, mold-flow, etc.) should be emphasized. ALGOR is out-of-date. Stereo-lithography?

96BS I feel that the program gave me the skills to succeed in industry. Everything I learned has helped me learn in the job place. The program's influence on computers and precision in reports have already helped me. I also appreciate the professors taking time to answer small questions and help when there is a need. Great Job!

96BS I feel the plastics program should assist more in job and internship help for the student. More processing lab practices for the student.

96BS I feel the lab sections were very beneficial.

96BS Although it's difficult and maybe unfair, focusing on how plastics engineering affects or is related to the auto industry should be discussed more in classes

ANALYSIS OF SURVEY

PLASTIC DIVISION MANUFACTURING ENGINEERING TECHNOLOGY DEPARTMENT

The faculty questionnaire was sent to eleven (11) faculty/professional and ten(10) were returned.

Following is the analysis of those responses that stood out. They were either 70-80% above expectation or below.

1. ABOVE EXPECTATION:
   A. The advisory committee for this program is active and representative of the occupation.
   B. Faculty members in this program have five or more years in relevant employment and/or teaching experience.
   C. This program includes information which is valuable to students once they have entered the work force.
   D. Opportunities are provided for related work experience, cooperative education, or internship for students in the program. Student participation is well coordinated with classroom instruction and employer supervision.

2. BELOW EXPECTION:
   A. All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.
   B. The University encourages and supports the continuing professional development of faculty through such opportunities as conference attendance, curriculum development, and work experience.
   C. Scheduling of facilities and equipment is planned and used in a manner consistent with quality instruction.
   D. Adequate funds are allocated in the University's operating budget to support achievement of approved program objectives. Allocations are planned to consider instructor budget input.
   E. Funds are allocated to provide for new equipment as well as new equipment replacement and repair. Fund allocation is consistent with the objectives of this program and based on instructor input.

1 2 3 1. Written goals for the PET program state realistic outcomes (such as planned enrollments, completions, placements).

1 2 3 2. Written measurable objectives have been developed for all occupational courses in this program and are used to plan and organize instruction.

1 2 3 3. Current data on labor market needs and emerging trends in job openings are systematically used in developing and evaluating this program.

1 2 3 4. Current data on job performance requirements and trends are systematically used in evaluating course content of this program.

1 2 3 5. Current follow-up data on graduates are consistently and systematically used in evaluating this program.

1 2 3 6. Instruction in all required courses recognizes and responds to individual student interest, learning styles, skills, and abilities through a variety of instructional methods.

1 2 3 7. 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.

1 2 3 8. Opportunities are provided for related work experience, cooperative education, or internship for students in the program. Student participation is well coordinated with classroom instruction and employer supervision.

1 2 3 9. Students and potential students of this program are identified through recruitment activities, treated equally in enrollment selection, and are not discouraged by unrealistic prerequisites.

1 2 3 10. Instructors or other qualified personnel advise students on program and course selection.

1 2 3 11. Instructors or other qualified personnel providing career planning and guidance services have current and relevant occupational knowledge and use a variety of resources to meet individual student career objectives.

1 2 3 12. This program includes information which is valuable to students once they've entered the work force.

1 2 3 13. The University has an effective system for locating jobs and coordinating placement for students in this program.

1 2 3 14. Success and failure of program graduates is assessed through periodic follow-up studies. Information learned is used to modify this program.

1 2 3 15. An active, organized effort is made to inform the public of the program training objectives, to encourage community support.

1 2 3 16. Responsibility, authority, and accountability for this program are clearly identified and assigned.

1 2 3 17. All persons responsible for directing and coordinating this program demonstrate a high level of administrative ability.

1 2 3 18. Student to faculty ratio in this program is sufficient to permit optimum program effectiveness.

1 2 3 19. Faculty members in this program have five or more years in relevant employment and/or teaching experience.

1 2 3 20. The University encourages and supports the continuing professional development of faculty through such opportunities as conference attendance, curriculum development, and work experience.

1 2 3 21. Paraprofessional (aides or laboratory assistants) are used when appropriate to provide classroom help to students and to ensure maximum effectiveness of instructors in this program.

1 2 3 22. Office and clerical assistance is available to instructors and used to ensure maximum effectiveness of instructors.

1 2 3 23. 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 students' needs.

1 2 3 24. Equipment for this program is operational, safe, and well maintained.

1 2 3 25. Computer hardware and software used in this program are in sufficient supply to meet the needs of instructors and students.

1 2 3 26. Instructional facilities meet the program objectives and students needs, are functional, and provide maximum flexibility and safe working conditions.

1 2 3 27. Scheduling of facilities and equipment is planned and used in a manner consistent with quality instruction.

1 2 3 28. Instructional materials and supplies are readily available and in sufficient supply to support quality instruction.

1 2 3 29. Learning resources for this program are available and accessible to students, current and relevant to the occupation.

1 2 3 30. Library resources are adequate to meet the program needs.

1 2 3 31. Adequate funds are allocated in the University's operating budget to support achievement of approved program objectives. Allocations are planned to consider instructor budget input.

1 2 3 32. The advisory committee for this program is active and representative of the occupation.

1 2 3 33. Funds are allocated to provide for new equipment as well as new equipment replacement and repair. Fund allocation is consistent with the objectives of this program and based on instructor input.

Please add your comments to clarify any of the above issues or regarding the program in general.

Faculty Questionnaire Response

BACHELOR OF SCIENCE IN PLASTICS ENGINEERING TECHNOLOGY
AND
ASSOCIATE IN APPLIED SCIENCE PLASTICS TECHNOLOGY

Questions	Above Expectation	Acceptable	Below Expectation
1	0	7	3
2	3	4	3
3	4	4	2
4	2	4	4
5	1	5	4
6	3	6	1
7	0	7	3
8	7	2	1
9	2	5	3
10	5	4	1
11	3	7	0
12	8	2	0
13	2	7	1
14	1	5	4
15	1	7	2
16	0	4	6
17	2	1	7
18	2	4	4
19	8	2	0
20	1	1	8
21	0	6	4
22	4	3	3
23	4	5	1
24	2	2	6
25	0	5	5
26	2	7	1
27	1	2	7
28	1	5	4
29	0	5	5
30	0	4	6
3I	0	3	7
32	7	3	0
33	0	2	8

FACULTY/PROFESSIONAL GENERAL COMMENTS

A. The plastics program lacks leadership to move the program forward. For the past four years all that has been attempted has been a focus of "maintaining". The focus should be to improve and move forward.

B. Not enough room to make all my comments, give me a call, or stop in and see me if you have any questions.

C. Program leadership & representation to the College of Technology and the university is sorely needed. The program itself is very successful and of high caliber, but as of late, it has happened in spite of our current "environment". If left unattended, it will decay and erode away. I know of no objectives or goals, or any "model" of what the program is or should be. It is what it is because it has worked in the past. The question is, will it work in the future without planning? The faculty has initiated curriculum planning, upgrading, etc. "Systems" and procedures need developing student "managing" is lacking.

D. The major areas of concern and need are in leadership. The current program director is not able to manage program. This revised - improved leadership needs to detail the funding and capacity of the program to optimize the students experience. Equipment and maintenance is a joke. The program has grown beyond the skills/capability of current resource. A true maintenance professional needs to be hired.

E. The plastics program at FSU is over populated with students, especially BS candidates. There are 270 in the system, in plastics on a quota of 180. The strain on equipment and faculty has not been relieved by increased maintenance and operating funds. New equipment, funds from University allocations are non existent. Maintenance funds are not sufficient to establish a functional preventative maintenance plan.

F. If current budget/administrative support trends continue, as the program enrollment increases, we will be very "hard pressed" to maintain our current national reputation. The administration is continually referencing, "Plastics", as a rising star and one of the university's most important programs yet they do not seem to be concerned with the day to day operations. We have been drifting for over 2 years! Last year, we were told an administrative change was going to occur and there seems to be no 'action' since that initial statement. We continue to drift.

The plastics program has the potential to grow and offer a large variety of specialty degrees and even a masters, current facility load constraints make it almost impossible to develop a new course, let alone a new curriculum. There have been no firmly stated directions given to the program with regards to loads and class sizes. I do believe an agenda exists. However, and until the program has a clean set of "orders" from its administration many developmental opportunities will not occur.

There is a lot of discussion about computers as a tool for the engineering technologist, finally PC are being purchased for our program. Problem: What are the implementation plans? What software will be used? How will we use these computers? (Which classes? How much?) This challenge needs to addressed and managed. We have 4 or 5 people giving input but no one is disseminating the information and managing it!

The library is woefully under stocked, they have made great strides recently but more must be taken.

I believe the program is being treated like all the other small programs in the COT while the Plastics enrollment is approximately 14.5% of the COT and approximately 3% of the University. Our students continually say "there's nothing in the library". We need to increase the information resources so students and industrialists recognize our library as an excellent resource.

G. The Plastics program has been lacking in leadership for the past 5 plus years owing in part to incompetence, fear of confrontation, and failing health. It seems to be perceived by all close to the program that plastics has been losing momentum and "ground" during these past years. What amazes me is that, in light of the large enrollment (including backlog) the program represents and the supposed "enhanced" status of the program, no one outside the department has seemed to notice the obvious short comings of the leadership (really a lack of leadership) as well as all the unfortunate results that have sprung forth: scheduling problems of grand proportions <u>every</u> semester for years, increased machine downtime - again of grand proportion (some machines have been down for years), lack of materials (must rely solely on donations to operate labs), <u>NO, "MODEL"</u> of the programs either present or <u>future</u> exists, unrealistic lab sizes or teaching overloads without pay, at best infrequent program meetings, apparently no visibility in the university, etc. Without planning and leadership, I feel much talent is being wasted and morale in general has suffered greatly. I can't help but believe that somehow these problems and attitudes do trickle down and affect our customers, the students and the employers of our interns and graduates. Do we wait until we lose all momentum and actual enrollment drops significantly before someone takes notice?

Summary of Employer Evaluation

One-hundred employers were identified and surveyed to evaluate the Plastics Program's needs and effectiveness. This information is used so Ferris State University can make informed decisions about allocating resources. These are the highlights of the 32 responses that were collected:

- The majority of the companies surveyed: are custom molders, employ from 100-250 people, and have 2 Ferris State Graduates on staff.
- Of the companies surveyed, 81% classify themselves as being directly related to the injection molding process.
- From the survey, it was determined that Ferris Graduate's greatest strength was their understanding of plastic terminology.
- From the survey, it was determined that the Ferris Graduate's greatest deficiency was in their technical writing skills.
- 94% of the companies surveyed would hire another Ferris Student if given the opportunity.

FERRIS STATE UNIVERSITY

Ferris State University
Plastics Department
919 Campus Dr. Plt.-104
Big Rapids, MI 49307

October 14, 1996

Employer of Ferris State Plastics Graduate

Dear Employer:

Your company has been identified as an employer of one or more Ferris State University Plastics Graduates. The Plastics Department is conducting a survey of its program to evaluate its needs and effectiveness so the University can make informed decisions about resource allocations.

Please take a moment to fill out the enclosed survey and mail it back to us in the enclosed S.A.S. envelope. Your quick response is appreciated.

Sincerely,

Steve Wolfer, Plastics Program Faculty

Airflow Research & Manufacturing
ATTN: HR Manager
7565 Haggerty Road
Belleville, MI 48111

Aristech Chemical Corporation
ATTN: HR Manager
1000 Tech Center Drive
Monroeville, PA 15147

Blue Water Plastics Inc.
ATTN: HR Manager
1515 Busha Highway
Marysville, MI 48040-0129

Comptech
ATTN: HR Manager
3409 W. 14th Street
Erie, PA 16505

Drake Molding Company
ATTN: HR Manager
801 Fairplains
Greenville, MI 48838-0458

FAYCO Plastics, Inc.
ATTN: HR Manager
180 University Drive
Lemont Furnace, PA 15456

General Electric Plastics
ATTN: HR Manager
2851 Charlevoix Drive, #120
Grand Rapids, MI 49546

HRU-Technical Resources
ATTN: HR Manager
5123 W. St. Joseph Street
Lansing, MI 48917

IKU USA, INC.
ATTN:HR Manager
1100 W. Broadway
Three Rivers, MI 49093

Inverness Castings Group
ATTN: HR Manager
4242 44th Street NE
Kentwood, MI 49512

Albis Corporation
ATTN: HR Manager
1338 Pamela Court
Naperville, IL 60540

Badger Meter, Inc.
ATTN: HR Manager
4545 W. Brown Deer Road
Milwaukee, WI 53223

Cellasto Plastics
ATTN: HR Manager
820 Industrial Road
Marshall, MI 49068

Creative Techniques, Inc.
ATTN: HR Manager
2441 N. Opdyke Road
Auburn Hills, MI 48326-2442

Fawn Industries
ATTN: HR Manager
P.O. Box 429
Middlesex, NC 27557

General Electric Plastics
ATTN: HR Manager
25900 Telegraph Road
Southfield, MI 48034

Hamilton Glass Products
ATTN: HR Manager
2000 Chestnut Street, P.O. Box 317
Vincennes, IN 47591

Hughes Plastics
ATTN: HR Manager
P.O. Box 86
St. Joseph, MI 49085

INCOE Corporation
ATTN: HR Manager
2111 Stephenson Hwy
Troy, MI 48083

Johnson Controls
ATTN: HR Manager
290 McCormick
Lapeer, MI 48446

Jones Plastics & Engineering
ATTN: HR Manager
2410 Plantside Drive
Jefferstown, KY 40299

Key Plastics
ATTN: HR Manager
40300 Plymouth Road
Plymouth, MI 48170

Leon Plastics
ATTN:HR Manager
4901 Clay Avenue SW
Grand Rapids, MI 49501-0350

Modern Engineering
ATTN:HR Manager
15201 Commerce Drine N.
Dearborn, MI 48120-1201

NIBCO, INC.
ATTN:HR Manager
P.O. Box 1167
Elkhart, IN 46515-1167

North American Truck Platform
ATTN:HR Manager
31 E. Judson
Pontiac, MI 48342

Otto Industries
ATTN:HR Manager
12700 General Drive
Charlotte, NC 28241

Phillips Plastics
ATTN:HR Manager
P.O. Box 29
Phillips, WI 54555

Phillips Plastics Corporation
ATTN: HR Manager
1233 International Drive
Eau Claire, WI 54701

Plastics Engineering Corporation
ATTN: HR Manager
1821 Vanderbilt Avenue
Kalamazoo, MI 49002

Kantus Corporation
ATTN: HR Manager
400 Galaria Officeentre, Ste. 417
Southfield, MI 48034

L. Lewallen Company, Inc.
ATTN:HR Manager
22900 Interstate Drive
Clinton Twp., MI 48035

Menasha Corporation
ATTN: HR Manager
P.O. Box 367
Neenah, WI 54957-0367

Monsanto Plastics
ATTN:HR Manager
2401 Walton Blvd.
Auburn Hills, MI 48326

North American Truck Group - GM
ATTN: HR Manager
31 E. Judson
Pontiac, MI 48342

Northern Indiana Public Service Com.
ATTN: HR Manager
5265 Hohman Avenue
Hammond, IN 46320

Owens Illinois Incorporated
ATTN: HR Manager
One SeaGate 29L-PE
Toledo, OH 43666

Phillips Plastics Corporation
ATTN: HR Manager
28580 Orchard Lake Rd, Ste 102
Farmington Hills, MI 48334

Pilot Industries
ATTN: HR MANAGER
2319 Bishop Circle East
Dexter, MI 48130

Plastipak Packaging
ATTN: HR Manager
1351 Hix Road
Westland, MI 48185

Proctor and Gamble
ATTN: HR Manager
6090 Center Hill Ave-A2W36
Cincinnati, OH 45224

RHE_TECH, INC.
ATTN:HR Manager
1500 E. N. Territorial Road
Whitmore Lake, MI 48189

Solvay Automotive
ATTN: HR Manager
2565 W. Maple Road
Troy, MI 48084

TOMCO Plastics, Inc.
ATTN:HR Manager
730 E. South Street, P. O. Box 430
Bryan, OH 43506

Hewlett-Packard
ATTN: HR Manager
18110 SE 34th Street
Camus, WA 98607

Dow Corning Corporation
ATTN: HR Manager
220 W. Salzburg Road
Midland, MI 48686

Toledo Molding & Die
ATTN: HR Manager
4 East Laske Road
Toledo, OH 43612

Avon Injected Rubber & Plastics
ATTN: HR Manager
5638 Old Saunders
Lockport, IL 14094

Bekum America, Inc.
ATTN: HR Manager
1140 West Drand River
Williamston, MI 48895

Cadillac Products
ATTN: HR Manager
1250 Allen
Trot, MI 48083

R & B Machine Tool Company
ATTN: HR Manager
1705 Woodland Drive
Saline, MI 48176

Seaquist Valve Company
ATTN: HR Manager
1160 N. Silver Lake Road
Cary, IL 60013

Team one Plastics
ATTN: HR Manger
927 Elliot Road
Albion, MI 49224

Toyota Motor Corporate Services
ATTN: HR Manager
4000 Town Center, Suite 800
Southfield, MI 48075

Mulay Plastics
ATTN: HR Manager
100 Laura Drive
Addison, IL 60101

Bivona Medical Technologies
ATTN: HR Manager
5700 W. 23rd .Avenue
Gary, IN 46406

Adac Plastics
ATTN: HR Manager
3801 36th St. S. E.
Grand Rapids, MI 49588

Bayer Intl.
ATTN: HR Manager
100 Bayer RD.
Pittsburgh, PA 15205

Best Plastics, Inc.
ATTN: HR Manager
19300 Grange St.
Cassopolis, MI 49031

Cascade Engineering
ATTN: HR Manager
1960 28th Street
Grand rapids, MI 49508

Casmer Manufacturing Inc.
ATTN: HR Manager
G-7211 N. Saginaw
Mount Morris, MI 48548

Concord Plastics Corp.
ATTN: HR Manager
5566 Grand Haven Rd.
Muskegon, MI 49441

Deckerville Plastics
ATTN: HR Manager
3729 Marquette St.
Deckerville, MI 48427

Delco Electronics
ATTN: HR Manager
3224 Davidson Rd.
Flint, MI 48556

Display Pack
ATTN: HR Manager
1340 Monroe NW
Grand Rapids, MI 49503

Dow
ATTN: HR Manager
1702 Building
Midland, MI 48647

EPC
ATTN: HR Manager
53150 N. Main St.
Mattawan, MI 49071

Evart Products
ATTN: HR Manager
601 W 7th St.
Evart, MI 49631

Franchino Mold
ATTN: HR Manager
5867 West Grand River Rd.
Lansing, MI 48906

Gemtron Corporation
ATTN: HR Manager
1455 Lincoln Ave.
Holland, MI 49423

Goshen Rubber. Co.
ATTN: HR Manager
1525 South 10 th St.
Goshen, IN 46527

GRAFCO
ATTN: HR Manager
7447 Candlewood Rd.
Hanover, MD 21076

Grand Traverse Plastics
ATTN: HR Manager
5780 Moore Rd.
Williamsburg, MI 49690

Holland Plastics Corporation
ATTN: HR Manager
14000 172nd Ave.
Grand Haven, MI 49417

INTEC
ATTN: HR Manager
2295 West State Rd. 114
Morocco, IN 47963

ITT Automotive
ATTN: HR Manager
645 Aulerich Rd.
East Towas, MI 48730

ITT Automotive
ATTN: HR Manager
4740 N. Industrial Row
Oscoda, MI 48750

ITW B&L Plastics
ATTN: HR Manager
One Industrial Rd.
Rockford, MI 49341

Jac Products
ATTN: HR Manager
1901 E. Ellsworth
Ann Arbor, MI 48108

JAE Oregon
ATTN: HR Manger
11555 S. W. Leveton Dr.
Tualatin, OR 97062

Kalfact Plastics Co.
ATTN: HR Manager
864 Fairplains
Greenville, MI 48838

Lexalite Intl. Corp.
ATTN: HR Manager
10163 US 31 North
Charlevoix, MI 49720

Modular Plastics Products
ATTN: HR Manager
6300 Hughes
Sterling Heights, MI 48312

Plastics Plus Inc.
ATTN: HR Manager
32400 Howard St.
Madison Heights, MI 48071

Prince Corporation
ATTN: HR Manager
35 Madison
Holland, MI 49423

RJG Associates
ATTN: HR Manager
3111 Park Dr.
Traverse City, MI 49684

Sturgis Molded Products
ATTN: HR Manager
70343 Clark St.
Sturgis, MI 49091

Woolin Products
ATTN: HR Manager
4295 N. Roosevelt Rd.
Stevensville, MI 49127

Creative Techniques
ATTN: HR Manager
2441 N. Opdyke
Auburn Hills, MI 48326

Great Lakes Plastics
ATTN: HR Manager
7941 Salem Rd.
Salem, MI 48175

Lawrence Plastics Inc.
ATTN: HR Manager
3250 Oakley Rd.
Walled Lake, MI 48390

Mid-American Products
ATTN: HR Manager
1623 Wilwood Ave.
Jackson, MI 49204

Molemec/Avon Division
ATTN: HR Manager
2776 Commerce Dr.
Rochester Hills, MI 48309

Primera Plastics Inc.
ATTN: HR Manager
8717 Riley St.
Zeeland, MI 49464

Purforms Inc.
ATTN: HR Manager
655 Godfrey S. W.
Grand rapids, MI 40503

Soo Plastics
ATTN: HR Manger
1351 Industrial Park Drive
Sault St. Marie, MI 49783

Wamar Products Inc.
ATTN: HR Manager
5041 68th Street S. E.
Caledonia, MI 49316

Rapid Design Service
ATTN: HR Manager
Towerline Rd.
Saginaw, MI 48601

Engineered Plastic Components
ATTN: HR Manager
53150 N. Main St.
Mattawan, MI 49071

Port Huron Products
ATTN: HR Manager
1717 Beard St.
Port Huron, MI 48060

Employer Evaluation of Ferris State Plastic Students

Company Name: _____
Approximate Number of Employees at Your Location: _____
Approximate Number of Ferris State Graduates Hired: _____
Custom or Captive: _____
Check the main classification of your company:

__	Injection Molding	__	Blow Molding
__	Extrusion	__	Reinforced Processing
__	Compression/Transfer	__	Thermoforming
__	MoldMaking	__	Compounding & Formulating
__	Education/Training	__	Marketing/Sales
__	Research and Development	__	Design
__	Other_____		

Instructions: For each of the following scales, please circle the word that best fits the Ferrris State Graduate'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 plastic equipment	1	2	3	4	5
Employee(s) contribution towards the operation's goals	1	2	3	4	5
Employee(s) understanding of plastic terminology	1	2	3	4	5

Would you hire another Ferris Student? Yes _____ No _____
Please Comment on Employee(s) Strengths and Weaknesses:

Summary of Employer Evaluation of Ferris State Plastic Students

Number of Mailings Sent Out- 100
Number of Mailings Returned- 32
32% Response
Number of Employees at Location:
0-50**(4)**; 51-100**(5)**; 101-250**(11)**; 251-500**(7)**; 501-1000**(0)**; 1001+**(2)**; No response**(3)**

Approximate Number of Ferris State Graduates Hired:
1**(12)**, 2**(5)**, 3**(2)**, 4**(2)**, 5**(4)**, 6**(2)**, 7**(0)**, 8**(1)**, 9**(0)**, 10**(0)**, No response**(4)**

Custom**(14)**, Captive**(4)**, No response**(14)**

Check the main classification of your company:

26	Injection Molding	1	Blow Molding
3	Extrusion	__	Reinforced Processing
__	Compression/Transfer	1	Thermoforming
2	MoldMaking	__	Compounding & Formulating
__	Education/Training	1	Marketing/Sales
1	Research and Development	1	Design
__	Other- Engineering and Design/ Assembly/ Specialty Machine Tools/ Engineering Consulting/ Stretch Molding/ Polyurethanes		

	Poor				Superior	
Employee(s) problem solving skills	1	2(1)	3(7)	4(20)	5(3)	No response(1)
Employee(s) technical writing skills	1	2(1)	3(14)	4(13)	5(3)	No response(1)
Employee(s) presentation skills	1	2(1)	3(11)	4(13)	5(3)	No response(4)
Employee(s) interpersonal skills	1	2(1)	3(9)	4(16)	5(5)	No response(1)
Employee(s) technical level	1	2	3(6)	4(20)	5(6)	No response(0)
Employee(s) time management skills	1	2(1)	3(8)	4(19)	5(3)	No response(1)
Employee(s) accuracy in job performance	1	2(1)	3(7)	4(16)	5(6)	No response(2)
Employee(s) speed in job performance	1	2(1)	3(8)	4(18)	5(4)	No response(1)
Employee(s) understanding of plastic equipment	1	2(1)	3(5)	4(17)	5(8)	No response(1)
Employee(s) contribution towards the operation's goals	1	2(1)	3(3)	4(21)	5(6)	No response(1)
Employee(s) understanding of plastic terminology	1	2	3(4)	4(15)	5(10)	No response(3)

Would you hire another Ferris Student? Yes 30 No 0 No response 2

Please Comment on Employee(s) Strengths and Weaknesses:

Alumni Leland Richards promoted to Avon Injected Rubber And Plastics as General Manager and as of 11/1/96 promoted again to Director of Operations, Americas for our parent Avon Rubber and Plastics, Cadillac, MI. We'll count him for this eval.

We have no Plastic Program Students at this time. All of our FSU grads are working in Metal Cutting. Thanks, Tim C.

Both are very good. We would welcome a summer intern for 1997!

Both are an excellent fit with TMD- We are actively recruiting 3-4 more December graduates.

We currently do not in our employ any Ferris State University Graduates.

Strengths- Generally are stronger in Plastics Knowledge/computer knowledge, weaker in time mgt./organization/business knowledge.

Jon Honore, Jim Genzel

Too organized. Needs to raise output! Technical output! Technically competent.

Equipment and mold design are areas that require greater attention.

Our experience was very good- We hope to have the intern back and soon.

The student who remained with Gentron throughout the summer was very knowledgeable in plastics and demonstrated a positive attitude in working with fellow employees. We have invited him to return to work during his upcoming holiday break.

Would like to see more winter interns.

We hired a Ferris student for the summer. This student would be an excellent addition to our staff.

I would be very cautious hiring a Ferris student. Analytical skills have been poor to medium in students I have worked with. Students have a general understanding of concepts, but don't have the level of detailed understanding I would expect from a 4-year program.

n/a=not sufficient experience to grade performance
-very conscientious
-not fast but steady performer
-could improve on neatness/professionalism of work.

Most graduates have a very high level of plastics terminology and equipment skills. Their level of processing (actual hands on) doesn't seem to match, but it takes very little time for the majority to catch on. Interpersonal skills in the organization are weak and it takes months before you see a sharing and team effort outside their assigned areas.

PLASTICS PROGRAMS REVIEW

LABOR MARKET SUMMARY

The demand for PLASTICS Products has caused the increase in the manufacture of products made from PLASTICS in the U.S.A., to $100 billion sales in 1995; with projections of $119 billion to greater than $130 billion sales by 1998(1)(2)(3).

In Michigan there are approximately 1400 companies which contribute to the manufacture of PLASTICS products(4). These companies employ 140,000 workers, of which approximately ten percent(10%) are technical/professional employees(4)(5)(7). In the state of Michigan, all the degree offering schools provided a total of 241 graduates in 1995, of which there were 61 associate degrees(50 AAS at FSU), 139 bachelors degrees(45 BS at FSU), and 41 graduate degrees(4)(6)(8). Since the vast majority of masters and doctors recipients do not go into manufacturing and several of the bachelors graduates can be expected to enter graduate school, a practical number of PLASTICS professionals provided by Michigan schools to the PLASTICS Industry is 200 per year(4)(5)(6)(7).

It has been adjudicated that approximately ten percent(10%) of the PLASTICS professionals retire or leave PLASTICS manufacturing each year(5), leaving a need for 1400 technically trained replacements annually. The Michigan colleges and universities are providing but fifteen percent(15%) of this need(7).

The situation in the remainder of the country is similar or worse, with all the universities in the U.S.A. providing no more that ten percent(10%) of the PLASTICS professionals needed nationwide each year(5). It may be noted that although the number of available PLASTICS graduates in Michigan is fraction of the need, Michigan is in a better position than other areas with less or no colleges offering classes in PLASTICS(6).

Therefore, it is concluded that an increase in the FSU facilities to develop more PLASTICS Engineering Technology and PLASTICS Technology graduate is logical and that even large multiples of the present number of graduates would have little chance of catching up with the need for at least ten(10) years.

JOB AVAILABILITY

There are about 50,000 job openings for PLASTICS professionals each year nation-wide(5), with twenty percent(20%) or 10,000 of these positions in Michigan. Sixty to seventy percent(60-70%) of the jobs available are in thermoplastics injections molding associated positions(4)(7). The remainder is employed in other thermoplastic processing jobs and the five to ten percent(5-10%) employed in the thermoset industry.

The recycling industry is divided by post-consumer, post-manufacture, and intra-manufacturing types. Post-consumer recyclers traditionally do not employ PLASTICS professionals(7), and the post- and intra- manufacturing recycling operational duties are usually handled by an employ with other primary responsibilities at the plant. Although the PLASTICS recycling operations are growing, the demand for graduates in this specific area has not been noted(2)(7).

The surveys, both published and unofficial, indicate that the large majority of the FSU PLASTICS Program live and work in Michigan. This is cause by a combination of reasons. The first reason is that ninety percent(90%) of the students in the program were reared in Michigan. The second reason is the availability of high paying positions established by the big-three automobile manufacturers, and their major suppliers(7).

The PLASTICS industry companies that have been polled(4) indicate that the need for PLASTICS Technicians, Technologists, and Engineers has not diminished for the past ten(10) years. The need for degreed PLASTICS professional is only exceeded by the need for entry-level PLASTICS molding and processing personnel. Except for highly research based organizations, there appears to be limited interest in graduates with masters or doctors degrees in PLASTICS.

REFERENCES:

1. *1995 FACTS & FIGURES OF THE US PLASTICS INDUSTRY; The Society of PLASTICS Industry(SPI)*
2. *CONTRIBUTION OF PLASTICS TO THE US ECONOMY; February 1996; SPI.*
3. *FIFTH ANNUAL PLASTICS INDUSTRY OUTLOOK-1996-1998; June, 1995; CIT Group.*
4. *MICHIGAN PLASTICS INDUSTRIAL ROUND-TABLE; 1994-1996.*
5. *SURVEY OF PLASTICS EDUCATION IN US COLLEGE AND UNIVERSITIES; 1995 ANTEC Paper: Dr.R.D.Deanin; University of Massachusetts-Lowell, PLASTICS Department.*
6. *LISTING OF COLLEGES, UNIVERSITIESAND INSTITUTES OFFERING FOR-CREDIT PLAASTICS CLASSES: May 20, 1995:E.M.Whitmore, Ferris State University PLASTICS Programs.*
7. *PERSONAL SURFEY OF EMPLOYMENT AND COLLEGE ENTRAINTS POSITION AND LOCATION*
8. *LISTING OF COLLEGE OFFERING PLASTICS CLASSES; Society of PLASTICS Engineers.*

PLASTICS PROGRAM SELF-EVALUATION
STUDENT SURVEY SUMMARY
NUMERIC SCORING

The survey for existing students within the program was given across all current plastics classes for the Fall, 1996 Semester. A total of 200 students are currently enrolled for this semester in classes (including internships). A total of 189 surveys were received and included in the following data. This gave a 95% participation rate prior to the cut-off date.

The data was not broken down and illustrated with percentages. This was due to the fact that it is significant to observe the actual number of students responding to an individual item in order to comprehend the scope/range of actual response. This is in contrast to using percentages which may lead to "general" oversight of important or insignificant responses.

It might also be noted that one of the categorization methods which was built into the survey did not serve the function that was intended. An item the student was to pick was to indicate his or her student class status *within the plastics program.* However, in observing the number of responses given per class category some students appear to have given their status within the university versus within the program.

Attached are copies of the survey itself with the individual responses totaled per statement from the following groupings: 1 - total population, 2 - freshmen/ sophomore (Associate's Degree), 3 - junior/senior (Bachelor's Degree) and 4 - those not indicating a class ranking. The break-down by class status was as follows: 37 freshmen, 42 sophomores, 33 juniors, 66 seniors, and 11 did not state a class status at all.

A summary of the more obvious numeric reactions/issues found through the survey include:

- Dissatisfaction tendencies with the elective/support classes required for the program summarized as follows:
  - Lower scores on them being meaningful or worth-while
  - Lower scores on the choices for subjects that may be fitting to this program
  - Lower scores on being taught by instructors who know the plastics industry
  - Lower scores on the classes being "in-step" with the core classes of the program

Plastics Technology; Plastics Engineering Technology

APRC 1996-1997

Section 2 of 4

- Another area that indicated a tendency for dissatisfaction was in the computer/resource area which included:
  - Lower scores on "adequate availability of computers"
  - Lower scores on "adequate reference materials available"

  (both of these are in reference to the lack of computers & an up-to-date resource library in the Plastics Building)
- A final area of dissatisfaction appears to be in the faculty advising area:
  - Lower scores in the "proper advising from my professor advisor" statement.

On a positive note, those areas doing numerically better than the norm include:

- Descriptive use of course syllabi
- Course content understood by teaching professors
- Teaching methods used that apply instructor's knowledge
- Instructor's knowing subject/occupational requirements
- Meaningful & worth-while internships
- Students would choose this program over again
- Students would recommend this program to others
- High overall rating of this program

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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 which 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 you 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 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..

	1	2	3	4	5	NA
1. Courses in the Plastics Program are:						
- Based on realistic industry requirements	0	2	30	79	64	14
- Up-to-date in their content	0	9	25	82	63	10
- A "value" to me at their current tuition cost	7	10	49	71	40	12
2. The courses taught in Plastics have:						
- Written objectives which are available to me	0	3	35	68	72	11
- Syllabi which tell me what I will learn	0	2	20	55	109	3
- Resources built in to utilize for information	2	8	51	67	54	7
3. The course content taught is:						
- Up-to-date with the practices of industry	1	4	24	73	64	20
- In line with my needs and interests	2	8	15	90	68	6
- Understood by the professors teaching	1	7	15	58	104	4
4. The teaching methods used in the course:						
- Utilize the latest technology	1	8	40	70	59	11
- Utilize techniques which help me understand	0	7	29	86	66	1
- Apply knowledge from instructor experience	2	0	14	64	107	2

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 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..

	1	2	3	4	5	NA
5. When laboratory activities accompany lecture:						
- State-of-the-art equipment is utilized	3	15	58	67	38	8
- Experiences parallel the lecture topics	1	3	29	87	68	1
- Hands-on experiences are "paced" well	1	6	25	71	86	0
6. Aside from the structured class topics/sessions:						
- I find the instructor's experience meaningful	1	1	24	86	77	0
- I can gain insight into future positions	4	5	28	90	58	4
- I am given consistent information	2	5	30	84	64	4
7. Other Plastics Industry information:						
- Is attainable from past graduates whom I can contact	19	33	60	29	19	29
- Is attainable from extra-curricular activities presented by and supported through the program	8	18	45	72	33	13
- Opportunities are published through the instructors	4	15	47	65	39	29
8. The program instructors:						
- Know the subject matter and occupational reqmts	1	0	17	64	103	4
- Are available to provide help when I need it	2	12	28	64	82	1
- Provide interesting & meaningful subject matter	1	2	23	92	68	3
- Are fair and equal with students in general	1	4	32	80	70	2
9. Instructional lecture and laboratory facilities:						
- Are up-to-date and kept that way	1	10	43	84	46	5
- Provide a positive environment for learning	0	3	21	87	78	0
- Are safe, functional, and well maintained	4	8	30	62	83	2
- Include enough work stations for class sizes	7	16	37	62	66	1
10. Instructional equipment such as:						
- Text books-are good, clear, and meet class needs	3	19	49	75	43	0
- Sufficient lab equipment & materials for class	3	10	43	74	57	2
- Lab equipment-is safe, functional, and maintained	2	10	33	72	71	1

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 item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES *and use the "Don't Know" column for items you are unsure about..*	1	2	3	4	5	NA
11. The elective/support classes required are: - Meaningful and worth-while	21	33	62	52	16	5
- Fitting choices for the overall program and degrees	15	24	58	63	24	5
- Taught by instructors who can relate to plastics.	36	47	40	37	25	4
- Are "in-step" with the core classes in the program	17	39	64	46	16	7
12. The "internship" requirements of the program: - Are meaningful and worth-while (1st & 2nd)	1	4	11	27	101	45
- Give insight into the expectations of the industry	1	0	13	27	109	39
- Are faculty assisted and followed up by them	6	6	31	49	45	52
- Are appropriate in quantity, time, or reqmts	1	2	19	49	74	44
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)	5	14	26	62	81	1
- By my instructor in the classroom (student ratio)	4	4	38	70	67	6
14. My classroom experiences include: - Adequate "challenges" given by professor	1	1	21	88	76	2
- Adequate availability of computers	23	30	39	58	33	6
- Adequate reference materials available	23	22	39	70	33	2
15. I receive proper advising: - Within the program classes	8	11	41	72	55	2
- From my professor "advisor"	21	11	45	50	61	1
16. Overall, I would: - Choose this program again as I first did	3	2	12	42	126	4
- Recommend the program to another	2	3	10	45	126	3
- Rate the program	1	1	12	83	91	1

ADDITIONAL COMMENTS SPACE

FRESHMEN/SOPHOMORE RESPONSE

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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

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

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

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

Check you 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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
1. Courses in the Plastics Program are: - Based on realistic industry requirements		1	10	26	33	9	
- Up-to-date in their content		3	10	27	32	9	
- A "value" to me at their current tuition cost	2	7	17	26	19	8	
2. The courses taught in Plastics have: - Written objectives which are available to me		2	14	27	30	6	
- Syllabi which tell me what I will learn		1	8	17	52	1	
- Resources built in to utilize for information	1		30	31	31	6	
3. The course content taught is: - Up-to-date with the practices of industry		2	8	19	30	10	
- In line with my needs and interests	1	4	4	32	34	4	
- Understood by the professors teaching	1	3	6	16	50	3	
4. The teaching methods used in the course: - Utilize the latest technology		6	14	24	25	10	
- Utilize techniques which help me understand		5	10	30	34		
- Apply knowledge from instructor experience	1		4	21	52	1	

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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
5. When laboratory activities accompany lecture: - State-of-the-art equipment is utilized	1	8	24	22	19	5	
- Experiences parallel the lecture topics			10	32	36	1	
- Hands-on experiences are "paced" well		2	8	30	39		
6. Aside from the structured class topics/sessions: - I find the instructor's experience meaningful			9	32	38		
- I can gain insight into future positions		2	12	35	28	2	
- I am given consistent information		1	11	34	31	2	
7. Other Plastics Industry information: - Is attainable from past graduates whom I can contact	7	8	23	13	9	19	
- Is attainable from extra-curricular activities presented by and supported through the program	1	3	20	26	20	9	
- Opportunities are published through the instructors	3	5	18	26	12	15	
8. The program instructors: - Know the subject matter and occupational reqmts	1		8	19	49	2	
- Are available to provide help when I need it	1	5	12	24	36	1	
- Provide interesting & meaningful subject matter		2	11	35	29	2	
- Are fair and equal with students in general		2	5	34	37	1	
9. Instructional lecture and laboratory facilities: - Are up-to-date and kept that way		1	19	31	24	4	
- Provide a positive environment for learning		1	6	33	39		
- Are safe, functional, and well maintained	1	1	8	29	40		
- Include enough work stations for class sizes		2	9	31	36		
10. Instructional equipment such as: - Text books-are good, clear, and meet class needs		1	21	34	23		
- Sufficient lab equipment & materials for class		2	12	34	30	1	
- Lab equipment-is safe, functional, and maintained		3	7	32	37		

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 item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES *and use the "Don't Know" column for items you are unsure about..*	POOR 1	2	3	4	GOOD 5	Don't Know	COMMENTS
11. The elective/support classes required are: - Meaningful and worth-while	4	12	25	36	10	2	
Fitting choices for the overall program and degrees	1	10	20	33	12	3	
Taught by instructors who can relate to plastics.	8	16	16	22	15	2	
Are "in-step" with the core classes in the program	3	14	23	23	12	4	
12. The "internship" requirements of the program: - Are meaningful and worth-while (1st & 2nd)		1	6	5	28	39	
- Give insight into the expectations of the industry			4	6	34	35	
- Are faculty assisted and followed up by them	2		6	15	12	44	
- Are appropriate in quantity, time, or reqmts		1	5	13	19	41	
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)	3	4	7	26	39		
- By my instructor in the classroom (student ratio)	2		13	34	30		
14. My classroom experiences include: - Adequate "challenges" given by professor		1	7	35	35	1	
- Adequate availability of computers	6	12	16	24	16	5	
- Adequate reference materials available	5	2	14	34	22	2	
15. I receive proper advising: - Within the program classes	4	3	16	30	24	2	
- From my professor "advisor"	11	1	18	20	28	1	
16. Overall, I would: - Choose this program again as I first did	2		4	16	56	1	
- Recommend the program to another	1		4	20	52	2	
- Rate the program	1		5	31	41	1	

ADDITIONAL COMMENTS SPACE

JUNIOR/SENIOR
RESPONSE

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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 which 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 you 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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
1. Courses in the Plastics Program are: - Based on realistic industry requirements		1	18	48	27	5	
- Up-to-date in their content		5	14	49	30	1	
- A "value" to me at their current tuition cost	4	2	29	42	18	4	
2. The courses taught in Plastics have: - Written objectives which are available to me		1	20	34	39	5	
- Syllabi which tell me what I will learn		1	12	32	52	2	
- Resources built in to utilize for information	1	8	29	40	20	1	
3. The course content taught is: - Up-to-date with the practices of industry	1	2	15	48	30		
- In line with my needs and interests	1	4	11	51	30	2	
- Understood by the professors teaching		2	8	37	49	1	
4. The teaching methods used in the course: - Utilize the latest technology	1	2	22	41	32	1	
- Utilize techniques which help me understand		2	19	49	28	1	
- Apply knowledge from instructor experience	1		10	37	50	1	

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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
5. When laboratory activities accompany lecture: - State-of-the-art equipment is utilized	2	9	30	41	17	3	
- Experiences parallel the lecture topics	1	3	18	48	29		
- Hands-on experiences are "paced" well	1	4	17	36	41		
6. Aside from the structured class topics/sessions: - I find the instructor's experience meaningful	1	1	13	48	36		
- I can gain insight into future positions	3	3	16	49	26	2	
- I am given consistent information	2	4	18	48	26	1	
7. Other Plastics Industry information: - Is attainable from past graduates whom I can contact	11	24	35	11	8	10	
- Is attainable from extra-curricular activities presented by and supported through the program	7	13	24	38	13	4	
- Opportunities are published through the instructors	1	9	27	33	25	14	
8. The program instructors: - Know the subject matter and occupational reqmts			9	39	49	2	
- Are available to provide help when I need it	1	7	16	33	42		
- Provide interesting & meaningful subject matter	1		10	51	36	1	
- Are fair and equal with students in general	1	1	26	42	28	1	
9. Instructional lecture and laboratory facilities: - Are up-to-date and kept that way	1	8	21	48	20	1	
- Provide a positive environment for learning		2	14	49	34		
- Are safe, functional, and well maintained	3	6	22	28	38	2	
- Include enough work stations for class sizes	7	13	27	27	25	1	
10. Instructional equipment such as: - Text books-are good, clear, and meet class needs	2	17	25	38	17		
- Sufficient lab equipment & materials for class	3	7	30	34	24	1	
- Lab equipment-is safe, functional, and maintained	2	6	25	34	31	1	

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 item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES *and use the "Don't Know" column for items you are unsure about..*	POOR 1	2	3	4	GOOD 5	Don't Know	COMMENTS
11. The elective/support classes required are: - Meaningful and worth-while	16	20	33	23	5	2	
Fitting choices for the overall program and degrees	13	13	32	29	10	2	
Taught by instructors who can relate to plastics.	25	30	22	13	7	2	
Are "in-step" with the core classes in the program	13	23	37	21	3	2	
12. The "internship" requirements of the program: - Are meaningful and worth-while (1st & 2nd)	1	2	3	21	69	3	
- Give insight into the expectations of the industry	1		7	18	71	2	
- Are faculty assisted and followed up by them	3	6	22	30	32	6	
- Are appropriate in quantity, time, or reqmts	1	1	12	31	52	2	
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)	1	10	18	33	37		
- By my instructor in the classroom (student ratio)	1	4	23	38	32	6	
14. My classroom experiences include: - Adequate "challenges" given by professor			13	48	38		
- Adequate availability of computers	15	15	23	30	15	1	
- Adequate reference materials available	15	20	24	32	8		
15. I receive proper advising: - Within the program classes	4	8	24	37	26		
- From my professor "advisor"	9	10	26	26	28		
16. Overall, I would: - Choose this program again as I first did	1	2	7	23	64	2	
- Recommend the program to another	1	3	5	22	68		
- Rate the program			7	49	43		

ADDITIONAL COMMENTS SPACE

"NO CLASS" DESIGNATION RESPONSE

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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

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

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

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

Check you 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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
1. Courses in the Plastics Program are: - Based on realistic industry requirements			2	5	4		
- Up-to-date in their content		1	1	6	3		
- A "value" to me at their current tuition cost	1	1	3	3	3		
2. The courses taught in Plastics have: - Written objectives which are available to me			1	7	3		
- Syllabi which tell me what I will learn				6	5		
- Resources built in to utilize for information			2	6	3		
3. The course content taught is: - Up-to-date with the practices of industry			1	6	4		
- In line with my needs and interests				7	4		
- Understood by the professors teaching			1	5	5		
4. The teaching methods used in the course: - Utilize the latest technology			4	5	2		
- Utilize techniques which help me understand				7	4		
- Apply knowledge from instructor experience				6	5		

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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
5. When laboratory activities accompany lecture: - State-of-the-art equipment is utilized		1	4	4	2		
- Experiences parallel the lecture topics			1	7	3		
- Hands-on experiences are "paced" well				5	6		
6. Aside from the structured class topics/sessions: - I find the instructor's experience meaningful			2	6	3		
- I can gain insight into future positions	1			6	4		
- I am given consistent information			1	2	7	1	
7. Other Plastics Industry information: - Is attainable from past graduates whom I can contact	1	1	2	5	2		
- Is attainable from extra-curricular activities presented by and supported through the program		2	1	8			
- Opportunities are published through the instructors		1	2	6	2		
8. The program instructors: - Know the subject matter and occupational reqmts				6	5		
- Are available to provide help when I need it				7	4		
- Provide interesting & meaningful subject matter			2	6	3		
- Are fair and equal with students in general		1	1	4	5		
9. Instructional lecture and laboratory facilities: - Are up-to-date and kept that way		1	3	5	2		
- Provide a positive environment for learning			1	5	5		
- Are safe, functional, and well maintained		1		5	5		
- Include enough work stations for class sizes		1	1	4	5		
10. Instructional equipment such as: - Text books-are good, clear, and meet class needs	1	1	3	3	3		
- Sufficient lab equipment & materials for class		1	1	6	3		
- Lab equipment-is safe, functional, and maintained		1	1	6	3		

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 item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES *and use the "Don't Know" column for items you are unsure about..*	POOR 1	2	3	4	GOOD 5	Don't Know	COMMENTS
11. The elective/support classes required are: - Meaningful and worth-while	1	1	4	3	1	1	
Fitting choices for the overall program and degrees	1	1	6	1	2		
Taught by instructors who can relate to plastics.	3	1	2	2	3		
Are "in-step" with the core classes in the program	1	2	4	2	1	1	
12. The "internship" requirements of the program: - Are meaningful and worth-while (1st & 2nd)		1	2	1	4	3	
- Give insight into the expectations of the industry			2	3	4	1	
- Are faculty assisted and followed up by them	1		3	4	1	2	
- Are appropriate in quantity, time, or reqmts			2	5	3	1	
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)	1		1	3	5	1	
- By my instructor in the classroom (student ratio)	1		2	3	5		
14. My classroom experiences include: - Adequate "challenges" given by professor	1		1	5	3	1	
- Adequate availability of computers	2	3		4	2		
- Adequate reference materials available	3		1	4	3		
15. I receive proper advising: - Within the program classes			1	5	5		
- From my professor "advisor"	1		1	4	5		
16. Overall, I would: - Choose this program again as I first did			1	3	6	1	
- Recommend the program to another			1	3	6	1	
- Rate the program		1		3	7		

ADDITIONAL COMMENTS SPACE

PLASTICS PROGRAM SELF-EVALUATION
STUDENT SURVEY SUMMARY
COMMENTS SUMMARY

In reviewing the survey "comments" sections, the numeric scores didn't always reflect some of the re-occurring comment topics. A summary of the most frequent comments is below, with a complete listing of them on the following pages.

For purpose of this review, "frequent" will mean those comments or topics which re-occurred a minimum of 5 times. They will not be given by category or survey "section", but as stand-alone topics as follows:

- Tuition too high - expensive.
- Poor and out-of-date references - need updated/good library.
- Professor understanding of course content/subject: excellent-to-poor.
- Need some updated equipment/lab technology.
- Need improved maintenance functions, equipment "down".
- Class/lab sizes too big, but being "bumped-out" due to caps also.
- Text books not appropriate, may not be used, are expensive.
- Elective courses not needed or worth-while.
- Lack of plastics knowledge in elective course instructors.
- Internships are costly but very good/important to person & program.
- Lack of computer support - lab open times/computers in our building.
- Good-to-poor advisory assistance.
- Class scheduling needs re-structuring/help.
- Overall good-to-excellent program.

COMMENTS:

1. Courses in the Plastics Program are:
   A. Based on realistic industry requirements

   B. Up-to-date in their content
      Only upper level classes.
      Some teachers are up to date, some are not.

   C. A "value" to me at their current tuition cost
      Tuition too high
      Expensive for low income family
      Only upper level classes
      Poor - out-of-state
      High
      If tuition increases, shouldn't course content?
      Tuition seams to be expensive
      Tuition keeps going up, it's not plastics fault though
      Summer interns should be two credits for what you get. $600 for summer is too much.
      General electives should be dropped
      Have gone from <$100/credit to approx. $149/credit

2. The courses taught in Plastics have:
   A. Written objectives which are available to me

   B. Syllabi which tell me what I will learn
      And didn't learn
      Not relevant for learning
      What they say isn't always accurate

   C. Resources built in to utilize for information
      Poor library sources in some areas
      We desperately need a real "plastics" library
      Organization of resources is a problem
      Need an up-to-date technical library
      We need new references, most are out-of-date
      Some are out-of-date, some are very up-to-date
      Library is poor, resources not always pointed out, hard to find

3. The course content taught is:
   A. Up-to-date with the practices of industry
      Exception
      Some classes (EEET 317) Why? You will never use this info in that depth
      Upper level only - Tooling is not
      Some teachers are up to date, some are not
      Need more high tech, like "lost core molding"

   B. In line with my needs and interests
      Most deal with injection molding and most people go into that
      More design, technical communications
      Need one more materials class and one more design class

C. Understood by the professors teaching
   - Excellent
   - The one I have had is very good
   - Exception
   - Depends on teacher
   - Some are good, some don't have a clue
   - Exception
   - Exception

4. The teaching methods used in the course:
   A. Utilize the latest technology
      - Some equipment could be updated
      - Depends on the teacher
      - Most instructors use powerpoint and other media well
      - No ethernet

   B. Utilize techniques which help me

   C. Apply knowledge from instructor experience
      - Some teachers are more knowledgeable than others, more helpful

5. When laboratory activities accompany lecture:
   A. State-of-the-art equipment is utilized
      - Most of the time
      - This was poor when I took processing but it is pretty good now
      - What's your definition of state-of-the-art?
      - Getting some new equipment but need more new machines
      - Except for Van Dorns the equipment is junk, no robots
      - When available
      - Newer machines are desired
      - Hardly ever working up to desired level

   B. Experiences parallel the lecture
      - Most times
      - Not always at time of lab
      - Lab instructor needs to equal lecture instructor

   C. Hands-on experiences are "paced" well
      - Sometimes too fast
      - Sometimes you don't have enough lab time to see results
      - Sometimes experience precedes lecture

6. Aside from the structured class topics/sessions:
   A. I find the instructor's experience meaningful
      - Too out-of-date for most

   B. I can gain insight into future positions
      - I have difficulty seeing what to expect in a job

   C. I am given consistent information
      - Info varies from teacher to teacher
      - Teacher to teacher is very different

7. Other Plastics Industry information:
   A. Is attainable from past graduates whom I can contact
      Would like to have more feedback from graduates
      Need to get a network started for students
      Am not sure of how

   B. Is attainable from extra-curricular activities presented by and supported through the program
      SPE is helpful

   C. Opportunities are published through the instructors

8. The program instructors:
   A. Know the subject matter and occupational requirements
      Excellent
      Exception
      Depends on teacher
      Some
      Most do, some out of touch
      For the most part
      Most
      Some material is out-dated

   B. Are available to provide help when I need it
      Some professors are available
      Some class conflicts with office hours
      Some
      Varies from instructor to instructor

   C. Provide interesting & meaningful subject matter
      With a few exceptions

   D. Are fair and equal with students in general
      Some are, some are <u>not</u>
      Except during registration
      Not all
      Exception

9. Instructional lecture and laboratory facilities:
   A. Are up-to-date and kept that way
      Machines need upgrading
      Need more space, Materials are not exactly what they say they are, old machines
      Some of the equipment that we have is junk (donated for tax write off)
      When available
      Need good water lines, <u>Big</u>/small, as well as fittings
      Most machines are up-to-date, but some are not at all

   B. Provide a positive environment for learning

C. Are safe, functional, and well maintained
- Maintenance could improve
- Lab needs to be better maintained
- Machines do not get fixed fast enough when broken
- Maintenance is not always up to date
- Sometimes not well maintained
- Not maintained

D. Include enough work stations for class sizes
- Have been bumped out of two classes
- Classes could be longer if more stations were provided
- Too many people in labs
- Need more classes offered, scheduling is a nightmare
- If classes are kept to small sizes for student/professor ratios
- Getting crowded

10. Instructional equipment such as:

A. Text books-are good, clear, and meet class needs
- Some books are either unused or are too complex to find info needed process 1 & 2
- Some books are never used and cost a lot of money
- Text book sucks
- Questions at end of chapter in industrial plastic 2nd editions are hard to find
- Some out dated, mold design
- Usually don't follow books (lectures)
- Some classes good, some classes bad
- $
- 411 needs a book
- In some classes the book is very good-others-they aren't even opened
- Pay too much

B. Sufficient lab equipment & materials for
- Too many students per machine
- Some classes have small caps, cause problems with people graduating
- Half the time you don't have material from injection molding machines
- Test bars?

C. Lab equipment is safe, functional, and maintained
- Need to be maintained & kept running
- Too many machines break down & don't get used in lab
- Need a maintenance man
- Maintenance is not always up to date
- Some machines were down over a year!
- Sometimes not well maintained
- Seems to always be broken
- Not well maintained

11. The elective/support classes required are:

A. Meaningful and worth-while

Social Awareness and Cultural Enrichment electives aren't needed
Are a joke, only one out of 12 is useful
If you mean tech related, they are good. If they are cultural and social enrichment, they serve no purpose to a plastics student.
4's for tech classes, 1's and 2's for the social awareness classes
Not electives
I would prefer that the electives contain subject matter more dedicated to my field
ETEC needs serious help or restructure
Some classes don't relate to field-like Anthropology
Less cult. Enrich/soc. Awareness is more appropriate
one less of each to free up time for additional plastics classes
No need, waste of time and money
Use time/credit towards major, new plastics classes
Too many credit hours, could put towards other plastics classes
Too many EEET
Give wider elective decisions

B. Fitting choices for the overall program and degrees

Some classes are non-useful
I think more math should be required
All the electives we have to take is a joke!
Most

C. Taught by instructors who can relate to plastics.

Most know we have a plastics program, but don't know anything about it
Not always
Some instructors know nothing about plastics (not "core" instructors)
Only Chem and Manufacturing teachers relate
Most upper level
Not always the case, some instructors have no clue
Some classes for plastics in EEET and MFG are not taught without plastics base
Some know what they're talking about and some don't have a clue
They really don't know a thing

D. Are "in-step" with the core classes in the program

If the classes were available when students were really to take them, they fill too fast

12. The "internship" requirements of the program:

A. Are meaningful and worth-while (1st & 2nd)

Need to be a grade, not just credit
From what I have read or heard
Interns provide valuable information that can be applied to classroom
It is very good to have the 2 internships
The companies are very helpful
The most important requirement in program
But the cost is out of control

B. Give insight into the expectations of the industry

C. Are faculty assisted and followed up by them
Had trouble getting a hold of .....
Intern should be less credits so credit could be used for additional classes
Never visited or rarely contacted

D. Are appropriate in quantity, time, or requirements
May be lengthened a bit, 12 or 13 weeks
Cost is somewhat high

13. I am given adequate individual attention:

A. By my instructor in the laboratory (student ratio)
Lab assistants a plus
Too many students in labs
Core classes are way over loaded, too many in program

B. By my instructor in the classroom (student ratio)
Too many students

14. My classroom experiences include:

A. Adequate "challenges" given by professor
Very challenging/educational

B. Adequate availability of computers
Not enough, broke or locked up often
Yes, but none in this building
No computers in plastics building and no account is given for COT01
Would like them available in plastics building
Labs close too early or are not available due to classes
Not enough computer labs & times are bad
Need open lab from 8:00 a.m. to 1:00 a.m.
Not enough and all hours during the day.
Swan has a problem
Plastics needs a computer lab of its own
There is not enough labs that we can use, you're always being kicked out.
There are computers in Swan but they are terrible when you get on one.
Not open on weekends
Could use a system in plastics building

C. Adequate reference materials available
Needs great improvement/updating
Open the computer labs on weekend
Need library
Not up to date
Need a better plastics library with more references
Only thru internet
Poor organization
Would be nice to update
Remove all pre-90's material in library
Need new material in plastics library & Timme library
Need some major improvements to plastics library
Sometimes hard to locate
New resources could be beneficial
Library is poor/Timme needs more info on plastics
Library needs more books and updating

More, more, more! Need wider variety of available info
Library needs organization
Plastics library needs more books
Could be better organized
Finding info is nearly impossible

15. I receive proper advising:

A. Within the program classes

At MSU I found that they were useless to me. So I learned to get by on my own. They didn't care.
Speirs is good.
Where is he?
Some professors better than others
I did not receive very much help at all. This could be due to my advisor
Do it mostly by myself
When I see him, it seems to be a waste of my time.

B. From my professor "advisor"

He added a year on to my schedule because he missed a class when I scheduled.
I walked in for advice and he told me to do what I wanted, I wanted a suggestion!
Not their fault, they have full schedules.
Where is he?
Seems to not help a lot but does help me a little.
Could give more suggestions & guidance
Do it mostly by myself

16. Overall, I would:

A. Choose this program again as I first did

Not first program gone through
Excellent program
Would have gone to Penn State Erie, but I am also very happy with this program
I would take a look at more choices but would possibly come back
Prior to may other majors
Yes, but I still want to be a cop

B. Recommend the program to another

Absolutely
But with some of the ins/outs of the "system"

C. Rate the program

Bad electives
But the town sucks
100-100
Excellent
Need more professors or less students so scheduling won't be such a chore

GENERAL COMMENTS:

Wouldn't waste so much time if we didn't have to fill out these stupid evaluations every week. Especially a 3 page one!

There are many instances when I was put on a waiting lists for classes because there wasn't enough room. If the interest is there, why not accommodate the students who are willing to take the classes. It has been this way the 3 years I have been involved with the program.

I like the plastics program so far. I look forward to coming to plastics class during the week. I've never had a dull or boring plastics class or lab. That's probably why I like it so much. It's fun.

Excellent program with excellent opportunities to excel in it. One flaw is the plastics 110 book does not meet my standards, is not very well organized.

With the exception of ETEC, I would rate this program very good. Although ETEC is not an official plastics class, it relates to my overall plastics experience. I am a senior and ETEC is by far the worst class I've ever taken. Class content, structure, and grading are poor. Actual teaching is good (concepts), but is lacking in all other areas.

This has been a very challenging major, and for a first semester FSU student, I believe I am doing well, I am working very hard and love the plastics program. I wish I had more time to devote to this class.

My overall look at the plastics program is not good!! Any questions, feel free to call me at .....

Some teachers don't give enough help, so on assignments I am left in a daze, especially when the majority of this is new to myself. However, many of the teachers are very good with what they do and offer good comments and teaching from past experiences.

The infrastructure of the program needs to be rebuilt (leadership/systems). How students are going through the program in regards to class scheduling & class standing in program scores a "1" poor.

Need computer lab open 24 hours, 7 days a week.

I feel plts 121 (1st processing) should include or be more like PLTS 211 to allow more time is following processing classes to learn even more materials.

Plts 212 needs to more thoroughly describe parts of a mold to people who have never seen them.

Schedule & waiting list need to be considered to improve the overall success of the program.

Clean up the library, don't just throw ten copies of the same magazine in. Get rid of old books. Increase advisor/student relations.

Get new reference materials, better materials, and newer machines. Keep machines running, need less downtime when one breaks.

I'm not sure that the program will prepare students for the job market. Employers aren't going to day $40K for someone who knows "the basics".

Rather than so many cultural enrichment or social awareness electives, there should be at least one more material science class. Most students lack excellent plastic material knowledge.

300 & 400 are in need of restructure.

Reference need to be updated and many more are needed in the plastics building as well as the library (Timme). Need better access to computers. Computer programs (CAD/Mold flow) are not current with industry.

There is a great need to resolve scheduling problems. This matter of taking classes in order and not being able to get classes because there are too many people in the program, is a major problem.

PLTS 411, I believe it is sort of ridiculous to put so much emphasis on this class. I believe it is somewhat important, but for a field that probably one out of 50 will go in to after graduation, come on!

It would be nice to have a computer lab open more often and that there were not classes in so you wouldn't have to worry about being kicked out.

Lighting for chalkboards in plastics building are not bright enough. When the board is dirty, can't see the writing from 4 or 5 rows back (room 110).

More library materials on plastics would be helpful.

Class scheduling is terrible! As much as we use computers, we could use a few in our building for student use.

Class scheduling is horrible.

Something has to be done about scheduling. "True" juniors and transfer students are fighting for same classes. Hire a trained moldflow teacher. Library has modern plastics encyclopedias from 1956. Lighting on chalkboards is poor also. Overall program is really good, just a few glitches.

This is a great program, and the internships are of great importance/strength. Problems are: scheduling classes, computer availability, and extra-curricular involvement of faculty in SPE activities with students!

PLTS 121 should start out teaching more advanced skills and then advance it even further in 211. PLTS 121 is just taking another 110 over with out-of-date machines. No one will ever use like Newbury and Rosade. Restructure tool construction class also.

Parking sucks. Need a lot for us or parking structure. Scheduling is a joke. Improvements are needed.

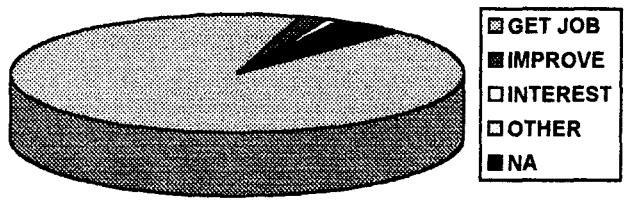
Need to update some of the machines. Must get into new types of processes. Get the scheduling problem fixed.

PLASTICS PROGRAM SELF-EVALUATION
STUDENT SURVEY SUMMARY
OBJECTIVES/CHOICE SUMMARY

The survey also contained choices pertaining to the student's overall objective for attending college (this page), and reason why he or she picked the Ferris Plastics Program for a curriculum (next page). The summaries of the responses by total participant percentages are as follows :

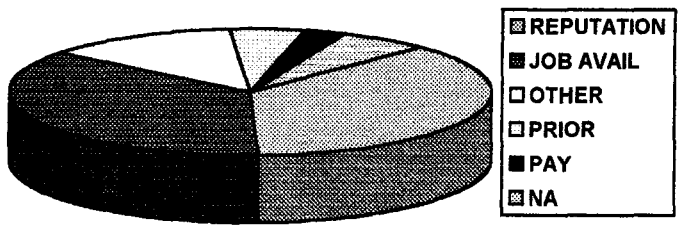
College Objective

91% said their objective was to prepare to get a job.
2% said it was to improve their job skills for present occupation
1% said it was personal interest
.5% said for some "other" reason
4.5% did not know or did not respond



Reason for picking FSU Plastics Program

37% said it was due to the existing reputation of the program
36% said it was due to the availability of a job upon graduation
13% said it was due to "other" considerations
5% said it was due to not liking the program they were in
3% said it was due to the published pay rates of the industry/career
6% did not know or did not respond



TO: PLASTICS FACULTY 11/11/96

FROM: LARRY SCHULT

REFERENCE: PROGRAM EVALUATION STUDENT SURVEY

I will be distributing the "student survey" portion of the program evaluation process (which we are currently doing) on several days this week. I will begin tomorrow (Tuesday) morning by putting those surveys (by class) that I need done that day in your mailbox. This process will continue through the week until all the classes and students have had the survey. I will monitor which students out of which classes still need to take the survey as the week progresses. I will tell you which students in your particular class still need to take it. Please monitor it as closely as possible to avoid duplicate information and invalid conclusions.

I would appreciate it if you would plan for a 20 minute time block during your class(es) which would allow them to complete it. You may want to dismiss the students who have already taken it out of that particular class for the time period, or whatever. There will also be an introductory statement to read prior to the administration of the survey, to explain consistently the focus of the survey and their response.

My *tentative* schedule (which follows our existing lecture sections class schedule) for survey distribution is as follows:

CLASS	INSTRUCTOR	DAY
312	SPEIRS	TUESDAY
300	PIERCE	TUESDAY
211	CONTI	TUESDAY
312	MUCCIO	TUESDAY
211	CONTI	WEDNESDAY
110	PIERCE	WEDNESDAY
211	WOLFER	WEDNESDAY
411	MUCCIO	WEDNESDAY
212	BRAMMER	WEDNESDAY
499	SPEIRS	WEDNESDAY
110	SCHULT	THURSDAY
411	SCHULT	THURSDAY
400	WHITMORE	FRIDAY

Return completed surveys to my mailbox.

Please watch your mailbox for the surveys or any schedule alterations. Also, let me know if there is any problem with this procedure. Thanks for your assistance with this process.

PLASTICS PROGRAM REVIEW
STUDENT SURVEY

The survey you are about to take is being used to review the overall quality of the Plastics Program here at Ferris State. There are several surveys being given to several groups of people - from people in the industry, to alumni of the program, to you (the student currently enrolled in the program).

The survey is intended to capture your ***overall*** perception of the Plastics Program, and **not** to reflect any *stand-alone* individual or personal incident, class, or instructor experience (be it bad or good). Again, it is an instrument being used to assess your perception of the quality of the overall program.

Please place an "X" within the box area for each question which represents your feeling about the statement and rates your feeling from "poor" to "good". If you are unsure about a statement or topic, please put that "X" in the "Don't Know" column instead of offering a guess.

Additional comments or clarifications to specific questions can be made in the space provided on the front of the survey, or use the back of the pages if needed.

Thank-you for your help in this important assessment.

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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 which 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 you 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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
1. Courses 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: - Up-to-date with the practices of industry							
- 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 techniques which help me understand							
- Apply knowledge from instructor experience							

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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
5. When laboratory activities accompany lecture: - State-of-the-art equipment is utilized							
- Experiences parallel the lecture topics							
- Hands-on experiences are "paced" well							
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 program							
- Opportunities are published through the instructors							
8. The program instructors: - Know the subject matter and occupational reqmts							
- 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 sizes							
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							

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 item is more than adequate, at the top PLACE AN "X" IN THE BOX THAT APPLIES *and use the "Don't Know" column for items you are unsure about..*	POOR 1	2	3	4	GOOD 5	Don't Know	COMMENTS
11. The elective/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							
12. 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 reqmts							
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)							
- By my instructor in the classroom (student ratio)							
14. My classroom experiences include: - Adequate "challenges" given by professor							
- Adequate availability of computers							
- Adequate reference materials available							
15. I receive proper advising: - Within the program classes							
- From my professor "advisor"							
16. Overall, I would: - Choose this program again as I first did							
- Recommend the program to another							
- Rate the program							

ADDITIONAL COMMENTS SPACE

TO: Plastics Faculty

FROM: Larry Schult

DATE: November 13, 1996

Reference: STUDENT SURVEY-MISSING STUDENTS

If a student is not present in the class you are surveying, please use the following guidelines:

1) If I have given you a survey with that person's name specifically stapled on survey: please keep it & administer it the next class or opportunity that you have them. Then return to me as soon as possible.

2) If it is a case where you don't know who it is (generic survey, no name), I will distribute generic surveys next week on Monday, Tuesday, and Wednesday only for you to "ask" your class if anyone has missed taking it. Wednesday, 11/20/96 will be the final day, so I can get results tabulated.

Thanks for your help.

PLASTICS PROGRAM REVIEW
STUDENT SURVEY

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Please place an "X" within the box area for each question which represents your feeling about the statement and rates your feeling from "poor" to "good". If you are unsure about a statement or topic, please put that "X" in the "Don't Know" column instead of offering a guess.

Additional comments or clarifications to specific questions can be made in the space provided on the front of the survey, or use the back of the pages if needed.

Thank-you for your help in this important assessment.

PLEASE FILL OUT AND RETURN TO MR. SCHULT IN ENCLOSED ENVELOPE.

THANKS

FOR INTERNS (MAILED)

PLASTICS PROGRAM REVIEW
STUDENT SURVEY

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THANKS

IT IS ANONYMOUS
RETURN BY 11/20

COLLEGE OF TECHNOLOGY
PLASTICS PROGRAM

STUDENT PERCEPTIONS OF TECHNOLOGY PROGRAMS

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

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

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

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

Check you 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 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	2	3	4	GOOD 5	Don't Know	COMMENTS
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- Hands-on experiences are "paced" well							
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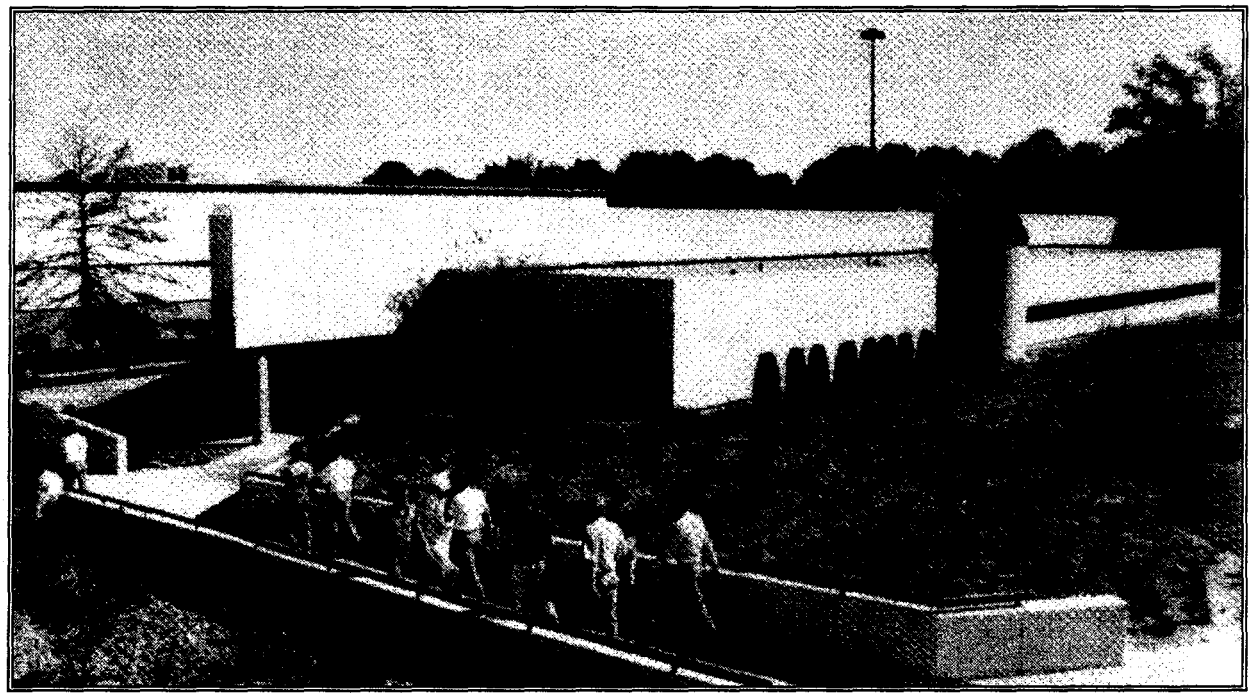
Fitting choices for the overall program and degrees							
Taught by instructors who can relate to plastics.							
Are "in-step" with the core classes in the program							
12. The "internship" requirements of the program: - Are meaningful and worth-while (1st & 2nd)							
- Give insight into the expectations of the industry							
- Are faculty assisted and followed up by them							
- Are appropriate in quantity, time, or reqmts							
13. I am given adequate individual attention: - By my instructor in the laboratory (student ratio)							
- By my instructor in the classroom (student ratio)							
14. My classroom experiences include: - Adequate "challenges" given by professor							
- Adequate availability of computers							
- Adequate reference materials available							
15. I receive proper advising: - Within the program classes							
- From my professor "advisor"							
16. Overall, I would: - Choose this program again as I first did							
- Recommend the program to another							
- Rate the program							

ADDITIONAL COMMENTS SPACE



Plastics Program Review
Curriculum, Facilities, and Equipment

Plastics Program Review

1. **Curriculum**
   - Plastics Program Checklist
   - Plastics Curriculum Analysis
   - Plastics Concentration Analysis and Dynamics
   - Plastics Curriculum Delivery
   - Lecture Format
   - Laboratory Format
2. **Plastic Programs' Faculty**
3. **Plastics Programs Enrollment Analysis**
4. **Plastics Programs Funding Analysis**
5. **Plastics Programs Facility Analysis**
6. **The Virtual Plastics Engineering Technology Center**
7. **Plastics Programs Equipment Summary**
8. **Equipment Analysis**
9. **Cosigned/Owned/Donated Equipment**
10. **Equipment Utilization**
11. **The Plastics Laboratory Environment**

The Plastics Programs Curricula

The Plastics Programs are defined as a ***2 + 2*** progression. Students apply for entry into the ***Plastics Technology*** portion of study which is a two-year curriculum that terminates with and Associate of Applied Science (A.A.S.) degree.

Students that receive an A.A.S. degree in ***Plastics Technology***, and meet the entrance requirements for progression, can apply for entrance in the ***Plastics Engineering Technology*** program which is a two-year curriculum that terminates with a Bachelor of Science (B.S.) degree.

The ***A.A.S. Plastics Technology*** curriculum is designed to provide the student with sufficient knowledge and skills to be a successful technician within the plastics industry.
It should be noted that the majority of the students continue their studies by applying to the ***Plastics Engineering Technology*** program. A few students opt to continue their studies in Business and Marketing.
Those students who decide to use their A.A.S. degree in ***Plastics Technology*** do so for two main reasons:

1. Economic Need (most return to obtain a B.S. degree after their financial status has improved
2. Unable to meet the requirements for entrance into the ***Plastics Engineering Technology*** program

The main impetus for continuing on to receive a B.S. in Plastics Engineering Technology is economics. The job market prefers a B.S. and the average starting salary is 30%-60% greater for graduates receiving a B.S. degree versus an A.A.S. degree.

:

Plastics Programs Check Sheet

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

PLASTICS PROGRAMS CHECK-SHEET

Entrance Requirements
2.0 GPA; Algebra (MATH 110 or Equivalent: ACT = 19
High School Chemistry (or CHEM 103 or Equivalent)
Associate in Applied Science (AAS)
Plastics Technology (PT)
Fall Semester 96/97

First Year Fall Semester (16 credits)			Credits	First Year Winter Semester (15 credits)			Credits
PLTS	110	Introduction to Plastics Technology	3	PLTS	121	Plastics Processing #1	3
ETEC	140	Engineering Graphics Comprehensive	3	MATH	126	Algebra & Analytical Trigonometry	4
ENGL	150	English 1	3	CHEM	121	General Chemistry 1	5
MATH	116	Algebra & Numeric Trigonometry	4	____	___	Cultural Enrichment Elective	3
____	___	Social Awareness Elective (ANTH 122 recommended)	3				

Summer Semester - Freshman/Sophomore			
PLTS	193	Industrial Internship	4

Second Year Fall Semester (16 credits)				Second Year Winter Semester (18 credits)			
PLTS	211	Plastics Processing #2	4	PLTS	220	Plastics & Elastimer Material	4
PLTS	212	Plastics Tool Construction (DP)	2	PLTS	223	Plastics Testing & Properties	4
MFGT	150	Manufacturing Processes (DP)	2	MECH	250	Fluid Power withControls	2
CHEM	211	Fundamentals of Organic Chemistry	4	EEET	227	Electronics Technology for Plastics	2
PHYS	211	Introductory Physics	4	ENGL	250	English 2	3
				COMM	121	Fundamentals of Public Speaking	3

Total semester hours required for AAS graduates: 65 (69 with internship)

Entrance Requirements: AAS Plastics (Including FSU Chemistry Requirements)
2.7 GPA in Plastics Classes: 2.5 GPA in MATH and 2.5 GPA Overall
Applications Review as Received until March 1 of Each Year
Plastics Engineering Technology (PET)
Bachelor of Science (BS)
Fall Semester 96/97

Third Year Fall Semester (18 credits)				Third Year Winter Semester (16 credits)			
PLTS	312	Plastics Product Design	4	PLTS	321	Plastics Processing #3	4
MECH	240	Statics & Strengths	4	PLTS	300	Plastics Project Management	2
ENGL	311	Advanced Technical Writing	3	MFGE	353	Statistical Quality Control	3
EEET	317	Automation for Plastics	4	CHEM	311	Polymer Analysis	3
MFGE	351	Intro Industrial Engineering	3	CADD	322	CAD/CAE for Plastics	4

Summer Semester - Junior/Senior			
PLTS	393	Industrial Internship	4

Fourth Year Fall Semester (14 credits)				Fourth Year Winter Semester (13 credits)			
PLTS	411	Plastics Decorating & Assembly	3	PLTS	499	Plastics Senior Assessment & Seminar	1
PLTS	400	Plastics Projects	3	____	___	Social Awareness	3
MFGE	423	Engineering Economics	2	____	___	Social Awareness (300+)	3
MFGE	451	Introduction to Plant Engineering	3	____	___	Cultural Enrichment	3
____	___	Business Elective	3	____	___	Cultural Enrichment(200+)	3

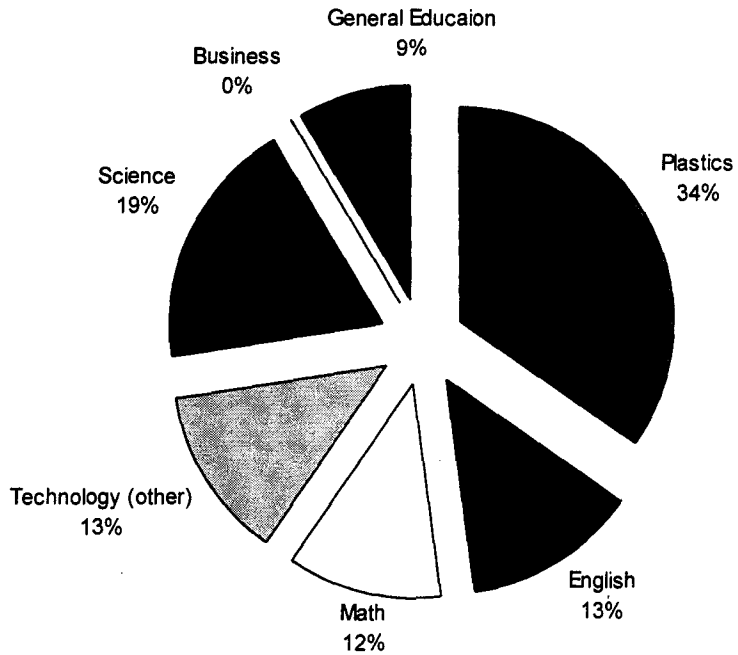
Total Semester hours required for BS graduate: 126 (134 with internships)

96F (OVER)

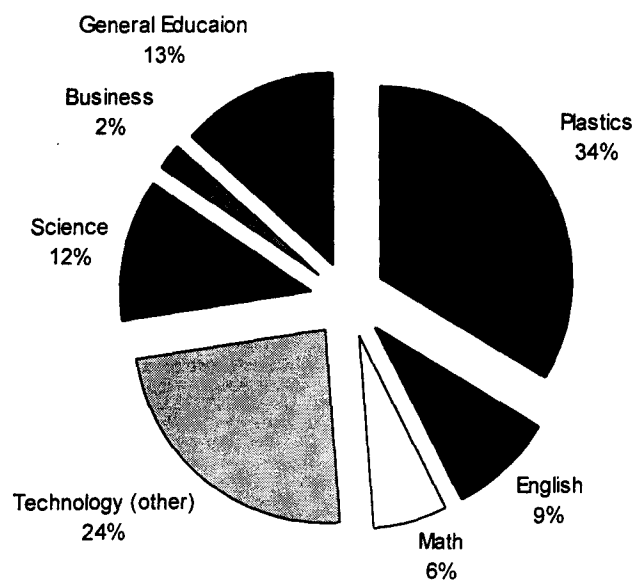
ckst96f\pltc

Plastics Curriculum Analysis

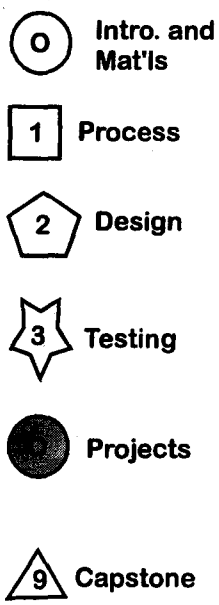
A.A.S Plastics Technology



B.S. Plastics Engineering Technology
Four Years



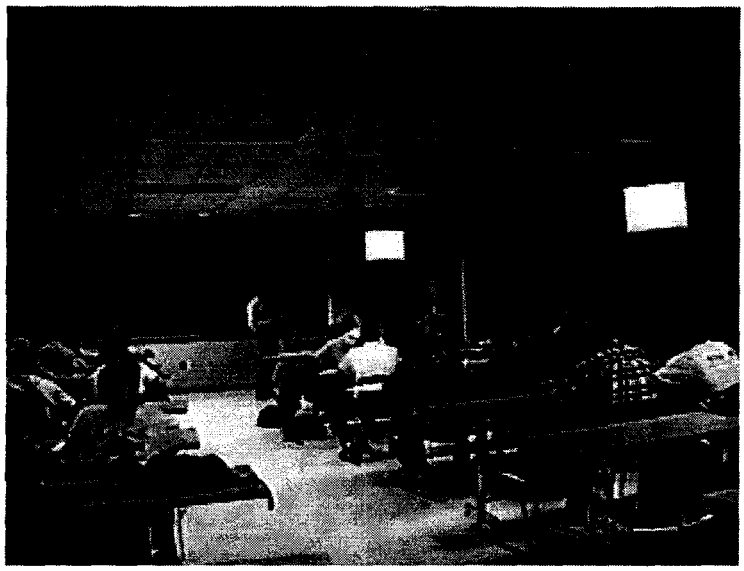
Curriculum Concentration Diagram



Plastics	Fall Semester	Winter Semester
Freshman	0	1
Sophomore	1 2	0 3
Junior	0 2	1
Senior	0 1	0 9

The curriculum concentration diagram, above, illustrates the flow of the major course material within the plastics programs.
The faculty is constantly reviewing the courses and the course content to ensure that the subjects taught are both technically current and technically relevant.
The Ferris State University plastics program faculty seized the opportunity during the 1993 quarter-to-semester conversion to improve the curriculum by making the following changes:

- ***Composite Structures*** which had been a separate course was dismantled and the subject matter re-distributed to other classes in processing, testing, and design.
- A Machine Tooling element was added. This was a key need area and it compliments the plastics mold design class. It should be noted that hands-on tooling classes have been eliminated from most plastics engineering and technology curriculum throughout the United States. The faculty and plastics advisory groups thought this trend unacceptable to industry needs.
- A four credit ***Plastics Materials*** course was added
- A three credit ***Decorating and Assembly of Plastics*** was added
- The ***Organic Chemistry*** course was modified to focus on polymer materials
- An advanced ***Polymer Chemistry*** class was added
- Focus technical support courses such as ***Manufacturing Engineering-related*** and ***Electronics-related*** to utilize plastics manufacturing scenarios as lecture and lab examples



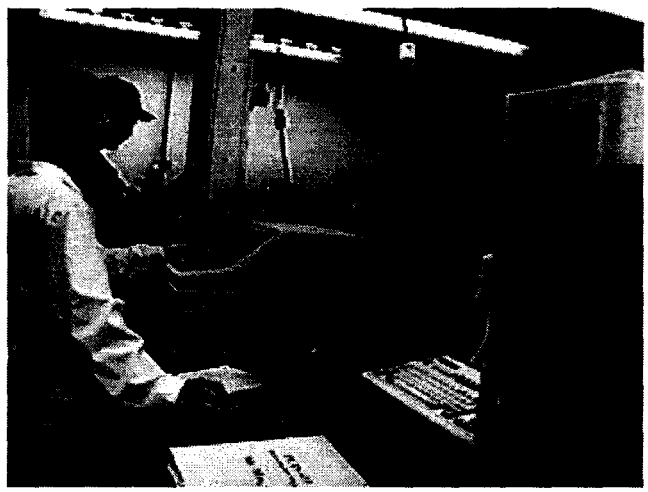
Multimedia based classrooms and lectures allow faculty to clearly explain graphics-intensive materials

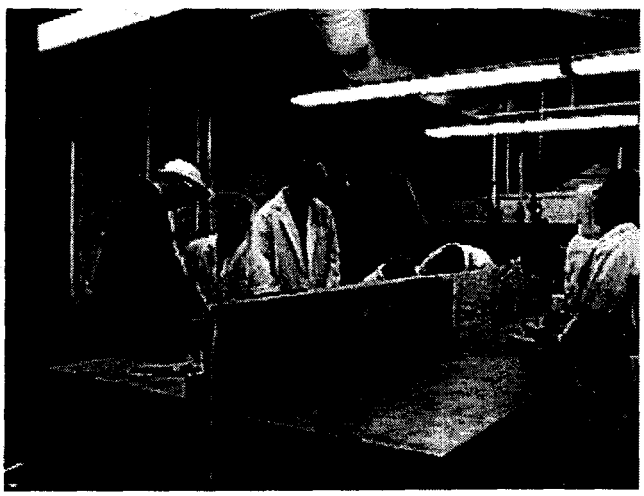
Plastics Classes are taught utilizing a wide variety of teaching techniques, including:

- **Conventional Classroom Mechanics**
- **Demonstration**
- **Role-play**
- **Multimedia**

The Laboratory component of the Plastics Programs curriculum is significant.
There is an average of (3) laboratory hours for every lecture hour

Laboratory sections are taught by the same faculty member that instructs the lecture component of the course.
This ensures consistency and continuity critical to the student understanding the course material and being prepared for industry.





The Lab experience focuses on hands-on application of theoretical principles and concepts learned in the lecture component of the class.
Students are allowed to go beyond the course requirements to explore unique aspects of the class and to be creative in the areas of design, processing, and development.

Plastics Course Taught for *Non-Plastics* Majors

In addition to the Plastics Programs curricula, there are two plastics-related courses offered to other programs.

PLTS-325 *Plastics Technology for Manufacturing Engineers*

This course is an introductory course, similar in content to **PLTS -110** ***Introduction to Plastics.***
The course offers Manufacturing Engineering Technology majors an overview of plastics materials and plastics processing techniques. In addition to lectures, there is an introductory plastics processing lab component.
Feedback from Manufacturing Engineering Technology graduates has consistently noted that this is a valuable course in that manufacturing engineers are actively involved within the plastics industry.

PLTS-342 *Materials Selection: Plastics*

This course is offered exclusively for Plastics Design Engineering Technology majors.
The course highlights the process and methodology for selecting the best plastic material for a specific product design/application.
The course includes an overview of plastic material properties, processing, and unique design issues.
Feedback from Product Design Engineering Technology graduates has consistently noted that this is a valuable course in that design engineers are actively involved within the plastics industry

Plastics Programs
Course Outlines

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES

APPR: [signature]
Date: 1/15/92

COURSE OUTLINE

COURSE TITLE : PLTS-110: INTRODUCTION TO PLASTICS TECHNOLOGY

COURSE DESCRIPTION : THIS IS THE FIRST PLASTICS / RUBBER TECHNOLOGY COURSE IN THE A.A.S./ B.S. PLASTICS ENGINEERING TECHNOLOGY CURRICULUM. THE COURSE ASSUMES THE STUDENT HAS NO PRIOR KNOWLEDGE OF PLASTICS, RUBBER, CHEMISTRY, OR MANUFACTURING. THE COURSE IS DIRECTED TOWARD PROVIDING THE STUDENT WITH AN "AWARENESS" LEVEL OF THESE BASICS :

* TERMINOLOGY OF PLASTICS AND RUBBER
* THE NATURE OF THE PLASTICS AND RUBBER INDUSTRY
* END-USE APPLICATIONS OF PLASTICS AND RUBBER
* THE BASIC CHEMISTRY OF PLASTICS AND RUBBER
* THE BASIC PROCESSING TECHNIQUES USED FOR PLASTICS AND RUBBER
* SAFETY PROCEDURES APPLICABLE TO THE PLASTIC AND RUBBER INDUSTRY

THIS COURSE IS INTENDED TO BE THE TECHNICAL FOUNDATION ON WHICH THE REMAINDER OF THE CURRICULUM IS BUILT.

CREDIT HOURS : 3 SEMESTER HOURS

CONTACT HOURS : LECTURE: 2 HOURS/WEEK
LAB: 3 HOURS/WEEK

PREREQUISITES : ACCEPTANCE INTO THE PLASTICS PROGRAM

TEXTBOOKS REQUIRED :"INDUSTRIAL PLASTICS" ; RICHARDSON

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

		Time Allocation LECTURE	LAB
I.	Course Introduction	1	3
	A. Know an understand the course objectives		
	1. Grading		
	2. Testing		
	3. Labs		
	B. Explain safety rules and emergency procedures	2	3
	C. Describe and use hand tools		
II	Introduction to the Rubber and Plastics Industry	2	-
	A. Name major end-use markets		
	B. Name major material suppliers		
	C. Describe industry demographics		
	D. Recognize differences between captive/custom processors		

9C

		LECTURE	LAB
	E. Demonstrate the measurement of plastic and rubber parts		
	F. Explain how plastics can be recycled		
III.	Introduction to Rubber and Plastic Materials	2	-
	A. Polymer Chemistry Overview		
	1. Name feedstock materials		
	2. Describe polymerization methods		
	B. Definition of Rubber and Plastic	2	3
	1. Define thermosets		
	2. Define thermoplastics		
	3. Define elastomers (thermoplastic)		
	4. Describe rubber materials		
	C. Additives and Modifiers	1	-
	1. Name and characterize the majors plastic/rubber additives and modifiers		
	D. Plastic/Rubber Nomenclature	1	-
	1. List the major polymer names		
	2. List the major material trade names		
IV.	Introduction to Rubber and Plastic Performance	3	3
	A. Overview of Materials Testing		
	Describe and characterize the following:		
	1. Tensile		
	2. Impact		
	3. Compression Set		
	4. CTE		
	5. Shrinkage		
	6. Rheology		
	B. Material Data Resources	1	-
	Demonstrate the ability to use:		
	1. Supplier data		
	2. Published references (Encyclopedias)		
	3. On-line data banks		
	C. Supplier Quality	1	-
	1. Explain the major components of supplier (Material and product) components		
V.	Rubber and Plastic Processing		
	Describe the following processes:		
	A. Injection	2	6
	B. Extrusion	2	6
	1. Profile		
	2. Sheet		
	3. Film		
	C. Compression/Transfer	1	3
	D. Blow Molding/Rotational Molding	1	3
	E. Thermoforming	1	3
	F. Overview of Secondary Operation	1	3
	1. Deflashing		
	2. Parts handling		

		LECTURE	LAB
	G. Material Handling 1. Loading 2. Drying 3. Reprocessing 4. Compounding	2	3
VI.	Rubber and Plastic Products A. Describe the basic elements of product design B. Name the major product markets	2	3
VII.	Rubber and Plastics Tooling Name and describe: A. Molds 1. Nomenclature B. Dies 2. Nomenclature	2	3
VIII.	Cost A. List the major cost components of plastic/rubber products		
	TOTAL >>>>>>	3Ø	45

TOPICAL OUTLINE:

I. Introduction to Course
- A. Safety
- B. Testing and Grading
- C. Lab Procedures

II. Introduction to the Rubber and Plastics Industry
- A. Major Markets
- B. Key Suppliers
- C. Industry Trends
- D. Recycling and the Environment

III. Introduction to Rubber and Plastic Materials
- A. Feedstock Materials
- B. Polymerization Methods
- C. Definition of keg terms
  1. Thermoplastic
  2. Thermoset
  3. Elastomers
  4. Rubber

IV. Introduction to Rubber and Plastic Performance
- A. Overview of Material Testing
  1. Tensile
  2. Impact

3. Compression Set
4. CTE
5. Shrinkage

B. Material Data Resources
1. Supplier Data
2. Published References (encyclopedias)
3. On-line data bases

C. Supplier Quality

V. Plastic and Rubber Processing
A. Injection Molding
B. Extrusion
1. Profile
2. Sheet
3. Film

C. Compression/Transfer Molding
D. Blow Molding/Rotational Molding
E. Thermoforming
F. Secondary Operations
1. Deflashing
2. Parts Handling

G. Material Handling
1. Loading
2. Drying
3. Reprocessing
4. Compounding

VI Rubber and Plastic Products
A. Product Design "Rules"
B. Major Product Markets

VII. Rubber and Plastics Tooling
A. Mold Nomenclature
B. Die Nomenclature

VIII. Cost
A. Cost components of plastic parts

MINIMUM LABORATORY ACTIVITIES

1. Use plastic and rubber reference materials
2. Safely start-up, operate, shut down these processes:
Injection machines
Extruder
Compression molder
Thermoformer
Blow molder
Rotational molder
3. Prepare (dry, mix, color, compound) plastic/rubber for processing
4. Assess quality of plastic/rubber parts
5. Identify product defects and develop corrective actions
6. Regrind and recycle plastic
7. Demonstrate the use of a process set-up sheet
8. Identify the result of process variables on product quality

Appr:_____
Date:_____

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT
Course:PLTS 121 Revised:3/95
COURSE OUTLINE

COURSE TITLE: PLTS 121 Plastics Processing 1

COURSE DESCRIPTION: This course will provide the student with the basic knowledge and awareness of injection molding, thermoforming, blow molding, rotational molding, compression/transfer molding, extruding, and secondary operational equipment.The emphasis will be on experiment data collecting techniques and becoming familiar with the basic plastic processing techniques used in industry today. These experiences will be used to present a written report.

CREDIT HOURS: Three Semester Hours (15 weeks)

CONTACT HOURS: Lecture: 2 hours/week
Laboratory: 3 hours/week

PREREQUISITES: PLT-110 or equivalent

TEXTBOOK: To be determined

UNITS OF INSTRUCTION AND LEARNING GOALS BY UNIT:

	LEC	LAB
I. Introduction, orientation	1	2
A. Orientation		
B. Introduce the Seven Basic Processes		
C. Review Acceptable process nomenclature		
II. Safety	.5	1
A. Process Machinery Operation Safety procedures for each process		
B. Demonstrate knowledge of safe start up procedures of process equipment		
C. Demonstrate handling of process materials in their different forms: pellets, powders, granulated, liquid, molding compounds		
D. Understand how to interpret an MSDS specification sheet		
E. Understand the importance in clean-up of floors and equipment in laboratory		

III. Thermoforming 3 6

A. Memorize the history in Thermoforming
B. Explain the forming methods presently used in Thermoforming
C. List the types of Thermoformers which are used in the industry
D. Be able to list the material parameters which make a material thermoformable
E. Operate T/F equipment to produce a quality part

IV. Injection Molding 6 6

A. Memorize the history behind injection molding
B. Explain the basic systems (CLAMP, MOLD, INJECTION, CONTROL) found on every injection molding machine
C. List the types of injection molding processes used in the industry. RIM, GAS,etc.
D. Be able to identify the different types of injection molding molds available
E. Demonstrate knowledge of commodity materials (TP/TS and rubber)which are injection molded
F. Operate Injection Molding Equipment to produce a quality part.

V. Extrusion 4 6

A. Memorize the history of extrusion
B. Explain the basic zones on an extruder
C. List the different types of extrusion processing for TS & TP
D. Classify extruders by their screw, HP, and output
E. Be able to identify the different types of dies which can be attached to an extruder and the related down stream equipment.
F. Operate Extrusion Equipment to produce a quality part.

VI. Compression/Transfer Molding 3 6

A. Memorize the history of Compression and Transfer molding
B. Classify the different types of C/T Molders
C. List the different mold configurations common to each process

D. Demonstrate knowledge of material properties used in C/T molding
E. Operate C/T Equipment to produce a quality part

VII. Blow Molding 3 6

A. Memorize the history of Blow Molding
B. Classify the different types of Blow molding
C. Demonstrate understanding of Blow molding sequence of operation
D. Demonstrate understanding of tooling used in Blow Molding
E. Name materials commonly used in Blow Molding
F. Operate Blow Molding Equipment to produce a quality part.

VIII. Rotational Molding 1 6

A. Memorize the history of R.M.
B. Demonstrate an understanding of the R.M operational sequence
C. Classify the types of R.M. machines
D. Be able to select the R.M. molds appropriate for a R.M. part
E. Name materials which can be Rotational molded
F. Operate Rotational Molding Equipment to produce a quality part.

IX. FINISHING & ASSEMBLY 3 2

A. Demonstrate an understanding for the importance of secondary finishing and assembly operations
B. Identify/Understand different finishing and different assembly operations to include but not limited to: hot stamping, ultrasonic welding, pad printing spin welding.
C. Setup and use secondary process equipment to produce a quality part.

X. Exams, Quizzes, Tests	5	1
XI. Cleaning	.5	3
	30	45

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
Manufacturing Engineering Technologies Department

COURSE OUTLINE

COURSE TITLE: PLTS-193: Plastics Technology Internship

COURSE DESCRIPTION: Ten weeks of supervised, on-the-job training with a plastics manufacturer, plastic, processor, or related firm.

CREDIT HOURS: Four(4) semester hours (4+0)

CONTACT HOURS: TEN weeks(400 hours, on-the-job)

PREREQUISITES: PLTS 110 or equivalent; approval of Internship Coordinator

UNITS OF INSTRUCTION, STUDENT LEARNING GOALS, AND COURSE REQUIREMENTS:

I. Ten weeks approved, supervised employment at a firm which manufactures, processes, or deals with plastics.
COMPLETE AND RETURN INFORMATION SHEET WITH OR BEFORE FIRST WEEKLY REPORT! NCLUDE LOCATION DIRECTIONS!

II. Ten weekly reports, while on-the-job.
A. At least one page in length, diary or narrative style
B. Cover page showing following:
1. Date submitted
2. Week for which report is written (dates)
3. PLTS 130
4. (Term) (Year)
5. Intern's name
6. Report number
7. Company name and location
8. Shift assignment (days, evenings, nights, and/or hours)

C. Accepted no later than 11 school days after end of week covered by report.

D. To be signed by supervision or responsible company personnel.

III.ON-THE-JOB visit by Intern Coordinator or designee. This visit can not be scheduled without the instructor receiving the INFORMATION SHEET!

IV. Written evaluation by supervisor

V. Final Report
- A. Five pages in length, exclusive of materials not written by the intern and a resource page.
- B. Typed, double spaced
- C. Due the last day of term in which registered
- D. May include company organizational and product line information
- E. For each Weekly Report not completed by the Final Report duee date, two paged are to be added to the Final Report.
- F. For each week report is late past the beginning of the following term, two pages will be added to the length requirements.

VI. Student must be registered in PLTS 130 for the term in which the internship work is done. Student will be dropped from course if no communication is received by the end of the tenth week of the term.

GRADING CRITERIA

	POINTS
Completed information sheet (with directions)	10
Ten weeks of work at 3 points per week	30
Ten weekly reports at 2 points per report	20
Intern Supervisor Evaluation	15
Final Report(5 pages minimum))	25
	[100]

100 points required for Credit(CR).

An incomplete(I) is to be corrected by end of the following term, unless other arrangements are made between the student and the instructor.

Satisfactory completion of course requirements will result in a CREDIT(CR) grade. An INCOMPLETE(I) grade will be issued only if at least 60% of the course requirements have been completed by the final day of the term and a request for an "I" has been received from the student. A NO CREDIT(NC) grade will be given if less than 60% of the course requirements have been met.

WITHDRAWAL(W) GRADES: Any registered intern who has not submitted an information sheet, first report or other communication by the end of the seventh week of the term will be withdrawn(dropped) from the course with a W grade and will not be eligible for a tuition reimbursement.

Submitted by: Eugene Whitmore

August 9, 1995

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT
PLASTICS PROGRAMS

APPR: DT
Date: 3/16/92

COURSE OUTLINE

COURSE TITLE: PLTS 211 Plastics Processing II

COURSE DESCRIPTION: This course will provide the student with knowledge and experience in solving common problems encountered in running plastics production equipment. The course seeks to relate the machine control parameters to their effects on the process and ultimately to the final part quality. The student will set-up processes for production runs. Added emphasis will be placed on primary troubleshooting, process optimization, and the application of standard quality control techniques. The student will also learn to estimate production costs.

CREDIT HOURS: Four Semester Hours (15 weeks)

CONTACT HOURS: Lecture - 2 hours/wk
Lab - 6 hours/wk

PREREQUISITES: Plastics Processing I PLTS121

TEXTBOOKS: To be determined

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Time Allocations Hours Lecture	Lab
I. Introduction, orientation, and safety A. Know and understand the goals of the course, attendance policy, and the grading policy B. Review safe working habits, proper and safe operation of machines, proper dress, and the correct use of basic hand tools C. Review the proper use of these measuring tools: micrometer, calipers, scales, dial indicators	1	2
II. Laboratory Demonstrations A. Receive and review an outline for machine set-up procedures B. Participate with instructor in a tool change and subsequent machine set-up C. Watch, then participate in an application of control charting	Ø	1Ø
III. Injection Molding A. List all major machine controls and describe each control's effect on process variables B. Relate the changing of process variables to final part properties C. List possible solutions to common processing problems D. Show a logical approach to basic trouble-shooting to achieve quality E. Describe techniques for process optimization	5	21

	Lecture	Lab
IV. Extrusion	5	12
A. List all major extrusion machine controls and describe each control's effect on the process		
B. List controls of down-stream equipment and their effect on the final part		
C. List possible solutions to common processing problems		
D. Show a logical approach to basic trouble-shooting to achieve quality products		
V. Thermoforming	2	6
A. List major machine controls and describe their effect on the product		
B. Describe setup for production processing		
C. List possible solutions to common processing problems and recognize quality defects		
D. Automation of thermoforming		
VI. Blow Molding	2	6
A. List major machine controls and describe their effect on the process and product		
B. Describe setup for production processing		
C. List possible solutions to common processing problems		
D. Automation of blow molding		
VII. Compression Molding	1	6
A. List major machine controls as well as variables in material preparation and describe their effects on process and product		
B. List possible solutions to common processing problems to produce quality products		
VIII. Transfer Molding	1	Ø
A. List major machine controls as well as variables in material preparation and describe their effects on process and product		
B. List possible solutions to common processing problems		
IX. Rotational Molding	1	6
A. List major controls and their effect on the final part		
B. List possible solutions to common processing problems		
X. Reaction Injection Molding	1	Ø
A. List major controls and their effect on the process and product		
B. List possible solutions to common processing problems		
XI. Rubber Processing	1	6
A. List the major differences in setup and control of injection/extrusion/compression/transfer molding processes		
B. List possible solutions to common processing problems		

Plastics Technology; Plastics Engineering Technology

APRC 1996-1997

Section 3 of 4

	Lecture	Lab
XII. Auxiliary Equipment	2	3
A. Describe the types, purpose, and basic operation of the following equipment: dryers, mold conditioners, blenders, granulators, and material handling(hoppers, hopper loaders, bulk storage, air movers, pumps, filters, conveying units)		
XIII. Quality Control	3	3
A. Understand the need for quality control		
B. Be able to properly select and accurately measure significant quality characteristics		
C. Know basic vocabulary and ideas in statistics (average, range, standard deviation, variation)		
D. Understand what process capability is and know how to perform a capability study		
E. Understand underlying principle for first and last part inspection, and in-process inspection		
XIV. Part Cost Determination	1	Ø
A. Identify all elements of cost of part production		
B. Calculate the cost of products made using all the machines in lab		
XV. Additional activities	Ø	3
XVI. Student Evaluations	4	6
	3Ø	9Ø

Prepared by Greg Conti
Proposed 3/7/91

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT

COURSE OUTLINE

COURSE TITLE: PLTS 212 Plastic Tool Construction

COURSE DESCRIPTION: This course will provide the student knowledge of plastics tool design as it pertains to successful production tooling. Students will evaluate commercial mold/tool plans (prints), review current tool design strategies, and design and develop tooling prints from product inception. Students will also be instructed on the correct and safe operation of machine tool equipment used in the manufacture of plastics tooling. Tooling material selection for machining time wear and accuracy will also be reviewed.

This course will be provided in two 7.5 week sessions; one on design techniques and the second on machine tool operation.

CREDIT HOURS: 2 Hours

CONTACT HOURS: 1/2 Semester or Lecture - 1 Hours/Week
Lab - 3 Hours/Week

PREREQUISITES: PLTS 121

TEXTBOOK: Moldmaking and Die Cast Dies for Apprentice Training, by John Kluz
"Plastics Mold Engineering", by DuBois, 4th Ed.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Lec/Lab
I. Orientation to the course	
II. Introduction	1
A. Reference tooling use in all plastics fabrication technique	
III. Compression Molds/Transfer Molds	2
A. The student will identify the types of compression molds and the parts which make up the mold	
1. positive	
2. flash molds	
3. semi-positive	
4. landed plunger	

Lec/Lab

B. Definitions associated with compression molds
1. well
2. draft
3. bulk factor
4. shrinkage
5. molding cycle

C. Describe how draft and shrinkage must be allowed for in a mold

D. The student will be able to identify compositions associated with transfer molds

IV. The student will be introduced to Injection Molds 2 8

A. The components of a typical two plate injection mold and their functions

B. The components of typical three plate injection mold and their functions

C. Determine shrinkage allowance to produce a part to specified dimensions for a given type of plastic

D. Calculate projected area and clamp pressure required for a given injection mold

E. The disassembly of molds and component identification in the lab

V. The student will understand Mold Components 1 2

A. Describe how core and cavity blocks are mounted

B. Describe ejectors, mechanisms and application

D. Describe side actions and use

VI. The student will know Heating and Cooling of Molds1

A. Types of heating or cooling used with molds

B. Pattern and placement of heating or cooling channels

VII. Runners and Gates 1

A. Hot runner molds

B. Purpose of runners and gates

C. Acceptable and unacceptable shapes of runners and advantages and disadvantages

D. Purpose of cold slug wells

E. Types of gates used for injection molds

F. Dimensions, functions and types of gates

G. Vents

VII. The student should be familiar with Mold/Tool Life
Steels, Heat Treatment and Polishing of Molds/Tools 1 1
A. Methods of prolonging mold/tool life
B. Types of steels used in molds and the alloying element in them, AISI nomenclature
C. Student will understand the heat treatment 1 1
of steel
1. hardening
2. normalizing
3. annealing
4. stress relieving
5. tempering
6. cyaniding
7. carburizing
8. nitriding
D. Hardness testing
E. Mold Finishes and Plating
F. Tooling Selection as it pertains to tool life
G. Student will understand the types of tool 1 1
steels and alloys used in plastic molds and tools
1. oil harden tool steel
2. cold rolled tool steel
3. air harden tool steel
4. hot rolled steel
5. prehardened steel
6. water hardened steel
7. copper
8. kirksite

IX. The student will draw a Plastics Tool Using Standard Mold Base
A. Article specified by instructor
B. Water linesmust be shown and listed
C. No undercuts in mold unless provision is made for removal of part
D. Shrinkage must be used when figuring dimensions
E. Dimensions must be such that the mold could be sent out for quotes
F. Mold base be selected from catalog, suitable for molding the part
G. Done with detail, showing gate, runners, sprue puller, etc.

X. The students will be introduced to prototype and
Tooling Prints and Reading. 2 23

XI. The student should have knowledge of Hardware and Components Used in Plastic Tooling and Bill of Material		1	3
A. Identify and understand hardware used in components in construction of molds and tooling used in plastics			
1. screws			
2. taps and drills			
3. stripper bolts and shoulder screws			
4. leader pins and bushings			
5. push pins and return pins			
6. dowel pins			
7. sprue bushings-drill bushings			
B. Student will be required to use Bill of Material and relay its information on paper			
XIV. Student Evaluations		1	3
XVII. Clean up			3
	Total	15	45

Submitted By: Dick Brammer
August 9, 1995

FERRIS STATE UNIVERSITY
SCHOOL OF TECHNOLOGY

MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT

COURSE OUTLINE

COURSE TITLE: PLTS 220 Plastics and Elastic Materials and Their Additives

COURSE DESCRIPTION: This survey course will review all the major polymeric material currently commercially available. Their major attributes, manufacturers and applications will be discussed. In addition, typical additives and compounds will be identified and discussed.

CREDIT HOURS: Four Credits

CONTACT HOURS: Four Lecture Hours

PREREQUISITES: CHEM 121, PLTS 110, PLTS 121
Co-Requisite with PLTS 223

TEXT REQUIRED: Modern Plastics Encyclopedia

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Lecture Hrs.
I. Introduction to Plastics Chemistry The students will understand the concepts of polymer morphology, molecular configuration, molecular weight, and its effect on processing conditions and material properties. In addition, time and temperature dependence will be analyzed for its effects on plastics properties.	4
II. General Information Specific to Plastics Industry The learner will be introduced to the physical form(s) the plastics materials are available and typical shipment sizes. Also, the learner will be told the correct materials handling methods including safety aspects, drying, storage, regrinding(reuse), and compounding or blending. Common material quality and qualification procedures will be reviewed and understood.	4

Lecture Hrs.

III. Plastics Material Nomenclature 1.5

Students will be introduced to the economic concepts of commodity, engineering and specialty materials and the estimated costs associated with each. Major manufacturers of plastics and their resin families will also be identified and understood.

IV. Plastics and Elastomer Material Overview

The learner will be presented a historical perspective on each material along with its chemical structure. Significant properties will be identified and understood, and a knowledge of their general mechanical, chemical, and physical properties will be obtained. Primary processing and fabrication techniques for each plastics will be referenced along with the major manufacturers(and trademarks) of these materials. The focus will be on applications of the material with emphasis placed on which property attributes caused this material to be used for this application. Safety concerns will also be identified and typical formulations will be discussed.

1. Olefins (Polyolefins)	2.5
2. Styrenics	2
3. PPO/PPE	.5
4. Thermoplastic Polyesters(PBT & PET)	1
5. Nylon (Polyamides)	1
6. Acetals	1
7. Acrylics, Polyarylate, Polymethypentene	1.5
8. Polycarbonate	1
9. Polysulfone(& Sulfone based polymers)	1
10. Fluoroplastics	.5
11. Ketone Polymers	.5
12. High heat specialty plastics	1
13. Vinyl & Additives	1
14. Cellulose	1
15. Silicone	1
16. Commercial Blends	3
17. Thermoplastic Elastomers	2.5
18. Natural Rubber, EPDM	1
19. SBR & Latex, Polybutadiene	1
20. Isoprene, Butyl Rubbers	.5
21. Fluorocarbon Elastomers	.5
22. Nitrite, Polyacrylic Rubbers	.5

23. Polyurethanes	1
24. Ureas	3
25. Polyesters	2
26. Epoxies	1
27. Polymides	1
28. High heat thermoset plastics	1

Lecture Hrs.

IV. Additives

The learner will be introduced to various types of additives for plastics and rubber and will know their effects. Their function, typical loading levels, and material they are most apt to be added to will also be discussed.

1. Impact modifiers	1
2. Colorants	.5
3. Dyes and Pigments	.5
4. Flame retardants	1
5. Antimicrobials, Antioxidants, Antistats, Lubricants	2
6. Release Agents (internal & external)	.5
7. Glass fibers, Carbon fibers, Metal fiber, Glass microsheres	2
8. Mineral fillers, Glass fillers	2
9. Plasticizers & Processing Aids(Rubber)	1
10. Vulcanizing agents	.5
20. Antidegradents	.5
21. Filler & Reinforcements (Rubber)	1
21. Accelerators & Activators	1

VI. Polymeric Composite Structures 1.5

The learner will be introduced to composite structures, continuous reinforcements and major trends occurring in the discipline. Major composite structures and their applications will also be discussed.

VII. Recycling & Reuse 1.5

Students will be shown the advantages and disadvantages of recycling. Major applications for recycled products will be discussed. Current research will be discussed as new "trends" develop.

Total 60

Submitted by: Bob Speirs
August 9, 1995

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
Manufacturing Engineering Technologies Department

APPR: [illegible]
DATE: 1/15/92

COURSE OUTLINE

COURSE TITLE: PLTS 223: Plastics Testing and Physical Properties

COURSE DESCRIPTION: This course acquaints students with concepts of:

1. Procedures used in evaluating plastics materials
2. Standard testing methods used for evaluation of plastics materials, in particular ASTM
3. Interpretation of testing results with respect to raw materials selection, processing parameters, and part design considerations.
4. Basic quality control.
5. End product testing.

The thirty(30)lectures will be used to instruct the student in the technical and theoretical aspects of the testing of plastics materials properties. The thirty(30)laboratory sessions 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: 4 semester hours

CONTACT HOURS: Lecture: 2 hours/week
Lab: 6 hours/week

PREREQUISITE: PLTS [illegible] PLTS 110 MATH 116

CO-REQUISITE: PLT 220

TEXTBOOKS:

1. "Handbook Of Plastics Testing Technology," Vishu SHAH.
   OR
   "Handbook Of Plastics Test Methods," Roger P. Brown

2. "PLT 131 Physical Properties Of Plastics-Lab Manual" Faculty.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Lecture Hours	lab Hours
I. Introduction; basic concepts, orientation, SAFETY, and peripheral concepts.	6	3

A. Basic concepts
   1. demonstrate specified SAFETY behavior.
   2. memorize the SAFETY requirements for the Plastics Laboratories.

	Lecture Hours	lab Hours
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 Plastics Programs laboratory report and will demonstrate the ability to prepare reports in this manner.		
B. Relate the principles of,		
1. QC/QA		
2. product liabilities		
3. conditioning of specimens		
4. non-destructive testing		
5. supplier specifications		
6. failure analysis		
7. testing foam products		
C. Identify plastics,		
1. professional organizations		
2. terminology and definitions of terms		
D. Measurement equipment		
1. ANALYTICAL BALANCE		
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		
II. Mechanical Properties and testing	5	
A. UNIVERSAL TESTING(tensile)MACHINE(UTM)		12
1. Tensile strength/elongation		
a. demonstrate operation of UTM by determining the TENSILE properties of at least three plastic materials		
b. calculate the required values for reporting TENSILE properties of plastics materials.		
c. prepare a report with specified statistical analysis for the TENSILE properties of plastics materials.		
2. Flexural strength/stress/strain		
a. demonstrate operation of UTM by determining the FLEXURAL properties of at least three plastics materials		
b. calculate the required values for reporting FLEXURAL properties of plastics materials.		

c. prepare a report with specified statistical analysis for the FLEXURAL properties of plastics.

3. Compressive Strength/modulus/yield
   a. demonstrate operation of UTM by determining the COMPRESSION properties of at least three plastics materials.
   b. calculate the required values for reporting COMPRESSION properties of plastics materials.
   c. prepare a report with specified statistical analysis for the COMPRESSION properties of plastics materials.

B. IMPACT — Lab 9

1. Pendulum
   a. IZOD
      i. using the 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

Lab 9

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 pieces) 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 PROPERTIES

Lab 9

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
   a. tensile
   b. flexural

	Lec	Lab
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	2	9
IV. Material Characterization TS & TS Rheology, melt flow index(MFI), viscosity, crystallinity, GPC(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.	3	9
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.	1.5	
	Lec	Lab
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	1.5	9
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.	2	9

PREAMBLE TO VIII. THROUGH XIV.
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	Ø.5	
IX.	Weathering Properties and Environmental Relationships	Ø.5	
X.	Optical Properties	Ø.5	
XI.	Flammability	Ø.5	
XII.	Failure Analysis	Ø.5	
XIII.	Testing Foam Products	Ø.5	
XIV.	Miscellaneous Tests (TS's)	Ø.5	9
XV.	Design Considerations Demonstrate the understanding of the relationships between testing, plastics physical properties, and plastics part design.	Ø.5	
		Lec	
XVI.	Plastics Properties Demonstrate an understanding of the relationships material characterizations, identification of properties, and the selected literature properties have to real world use of plastics properties information. {see IV. & VII}	3	
XVII.	Supplier Specifications Relate the typical plastics suppliers information provided to a plastics processor and how the processor would use this data.	1	
XVIII.	Comprehensive Review The student will be prepared for the COMPREHENSIVE lecture and laboratory FINALS through a question and answer discussion session with student elicited assistance	1	
		Lec	Lab
XX.	Finals(comprehensive)	3	3
	TOTALS	3Ø	9Ø

TOPICAL UNIT OUTLINE OF MAJOR UNITS OF INSTRUCTION:

I. Introduction
   A. Course goals
   B. Classroom policies
      1. SAFETY
      2. attendance, excused/unexcused absences
      3. grading
      4. laboratory practices and reports
      5. projects/research paper(s)
      6. laboratory notebook
      7. tests

II. TESTING AND PROPERTIES OF PLASTICS
   C. MECHANICAL PROPERTIES
   D. THERMAL PROPERTIES
   E. MATERIAL CHARACTERIZATION
   F. CHEMICAL PROPERTIES
   G. ANALYTICAL TESTS
   H. PLASTICS MATERIALS IDENTIFICATION
   I. ELECTRICAL PROPERTIES
   J. WEATHERING PROPERTIES AND ENVIRONMENTAL RELATIONSHIPS
   K. OPTICAL PROPERTIES
   L. FLAMMABILITY
   M. FAILURE ANALYSIS
   N. TESTING FOAM PROPERTIES
   O. DESIGN CONSIDERATIONS
   P. PLASTICS PROPERTIES
   Q. SUPPLIER SPECIFICATIONS

III. COMPREHENSIVE REVIEWS AND TESTS

MINIMUM REQUIRED STUDENT LABORATORY ACTIVITIES DEFINED:

I. During the thirty(30)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.

III. Take and pass a laboratory final which combines pencil/paper testing and hands-on/applications testing.

IV. Maintain a laboratory notebook containing the semesters laboratory work along with the lecture work.

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
Manufacturing Engineering Technologies Department

APPR: [signature] DATE: 1/15/92

COURSE OUTLINE

Course Title: PLTS-300: Plastics Research Project Management

Course: This course allows the student to develop project management skills through the selection of a pertinent project, writing the project proposal and performing research for a project to be completed in PLTS-400. This research will concern some aspect of PLASTICS processing and/or applications, feasible within the constraints of Ferris State University resources. In special cases a student may be allowed to use resources and facilities of a private company or other organization. The proposed research will not receive approval unless it is challenging and productive, allowing the student to use prior knowledge and experience gained from course-work and employment to develop project management skills.

Credit Hours: TWO(2) semester hours

Contact Hours: Lecture - ONE (1) hour
Lab - THREE(3) hours

Prerequisites: B.S. Acceptance ; ENGL - 311;

Textbooks: Texts used in previous PLTS classes needed for reference.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Time Weight Hours Lecture	Lab
I. OBJECTIVES: The student will;		
A. demonstrate improvement in written skills through submission of periodic research proposal progress reports.	3	9
B. demonstrate improvement in ability to make verbal presentations through periodic oral reports on research proposal progress and on selected plastics technology subjects assigned by the instructor.	3	9
C. demonstrate improvement in data gathering, data use, PLASTICS business knowledge ability through verbal and written preparations.	3	9
D. develop and demonstrate the use of project planning skills, by incorporating charts and graphs within reports for communication of planning and progress.	3	9
E. evaluate sources in literature and use this research to support and give direction to the project objectives.	3	9
TOTALS	15	45

TOPICAL UNIT OUTLINE OF MAJOR UNITS OF INSTRUCTION:

I. DATA GATHERING SKILLS
----Use of FSU and other library sources
II. DATA USING SKILLS
----Prepare an introduction to the research report
III. WRITING SKILLS
IV. SPEAKING AND VERBAL SKILLS
V. PLASTICS BUSINESS AWARENESS
VI. PROJECT MANAGEMENT PROCEDURES
A. How to select a project.
B. How to manage a project.
C. How to report a project.
D. How to use various PM and data refining skills
1. pareto and gantt charts
2. write update reports
3. develop a time management plan
4. write reports and present same orally
5. proper and logical presentation and representation of data.
6. analysis of progress and accomplishments
VII. LITERATURE SEARCH GUIDELINES

MINIMUM REQUIRED STUDENT LABORATORY ACTIVITIES DEFINED:

I. Research proposal.
A. write the proposal
B. make a verbal presentation of proposal to class
II. Write three(3) research proposal progress reports.
A. use a Ghatt chart or similar display to show progress toward objectives
III. Present three(3) speeches of selected subjects and/or research progress.
IV. Attend and participate in weekly conferences with instructor and/or class section to describe progress of research and to be counseled.
V. Project proposals may be done individually or in groups of up to three(3) students.

Ferris State University
College of Technology
Manufacturing Engineering Technologies Department

APPR:
Date: 4/15/92

COURSE OUTLINE

COURSE TITLE: PLTS 312 Plastics Product Design

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 Part Drawing
* Plastic Part Design Basics (the "Rules")
* Form, Fit, and Function in the product application
* Part Quality ...when is the design/part acceptable
* Relationship of tool design to part design
* Relationship of process factors to part performance
* Part Costing and Design to Cost
* End-use factors that impact plastic part performance
* Mechanical Design with Plastic

CREDIT HOURS: 4 Semester Hours

CONTACT HOURS: Lecture - 3 hours/week
Lab - 3 hours/week

PREREQUISITES: ~~Introduction to Plastics and Elastomer (PLTS-110)~~
Plastics Processing (PLTS-211)
Introduction to Drafting (EGRG-140)
Introduction to CAD (CADD-143)
Tool Design (PLTS-212)
Plastics Testing (PLTS-223)
Plastic Materials (PLTS-220)

TEXTBOOKS REQUIRED: "Designing with Plastics and Composites"
Rosato/DiMattia/Rosato

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		
A. Know the significant events in the history of plastics product design	3	
B. Know the major importance of plastic product design relative to the manufacturing of plastic products		

	LEC	LAB
3. Definition of Product Requirements	6	6

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.)

4. Selecting a Plastic Material	6	9

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)

5. Plastics Product Design Concepts	8	9

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
4. Part Quality
5. Print Format
6. Part Tolerance Guidelines

	LEC	LAI
6. Process Selection Criteria/Unique Design Features	8	9

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
6. RIM
7. Composite Manufacturing
8. 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.

7. Advanced Part/Mold Design Concepts	8	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, vacuum deflating, 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
2. Analysis of Part Designs (incldg. Computer Analysis)
3. Effect of part design changes on tooling
4. Plastic part design-to-cost analysis
5. Gating/Ejection, Surface Texturing

8. Testing and Evaluation	5	2
TOTAL >>>>>>>	45	45

TOPICAL UNIT OUTLINE

1. Introduction
   - A. Course Goals
   - B. Attendance/Grading
   - C. Plastic Product Design Milestones
   - D. Plastics Product Design and Manufacturability

2. Definition of Product Requirements
   - A. Customer Requirements
   - B. Mechanical and Thermal Loads
   - C. Features Required
   - D. Product Life Expectancy
   - E. Product/Material Recycling
   - F. Agency/Regulatory Issues
   - G. Environmental Resistance

3. Selecting a Plastic Material
   - A. Specific Gravity Issues
   - B. Mechanical Properties
   - C. Processing Concerns
   - D. Balance of Properties
   - E. Effect of Material Change on Product Performance

4. Plastic Product Design Concepts
   - A. Nominal Wall
   - B. Projections
   - C. Depressions
   - D. Part Quality
   - E. Print Format
   - F. Tolerance Guidelines
   - G. Gating/Ejection/Texturing

5. Process Selection Criteria
   - A. Injection Molding
   - B. Extrusion
   - C. Blow Molding
   - D. Thermoforming
   - E. Composites
   - F. Compression/Transfer

6. Advanced Part/Tool Design Concepts
   - A. Prototyping Systems
   - B. Analysis of Part Designs
   - C. Effect of part design changes on tooling
   - D. Plastic part design-to-cost analysis
   - E. Product Analysis (including Computer Modeling)

MINIMUM REQUIRED STUDENT LAB ACTIVITIES DEFINED:

I. Determining the Needs of the Customer vs the Desires of the Designer

A. Students will learn how to determine the "Customer's Requirements" and interpret them into plastic part Designs.

II. Manufacturers Specifications

A. Students will be required to read, interpret, and analyze the various manufacturer publications to understand how and why each material family may have different part design criteria.

III. Mold Design Analysis/Evaluation

A. Students will review existing plastic products to determine parting line, gate, ejection format, and unique features that impact the mold design.

IV. Part Design Evaluation

A. Students will review plastic product prints and identify design flaws and suggest alternate techniques to maintain the customers requirements for FORM, FIT, and Function.

V. Plastic Part Costing

A. Students will learn both empirical and detail methods of product costing, primarily associated with material type, density, regrind, and volume

VI. Plastic Product Development/Design

A. Students will design a plastic product by employing either the New Product, Cost Reduction, or Material Substitution method.

B. Students will fabricate a prototype plastic product that shall meet all the end-use requirements, including, function and within tolerances defined.

Submitted by: Edward Muccio
Revised: 10/16/91

Melanie

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY

MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT

COURSE OUTLINE

COURSE TITLE: PLTS 321 Plastics Processing III

COURSE DESCRIPTION: This course takes a theoretical approach to injection molding and extrusion processing. Plastics processing is examined from a molecular perspective. Various engineering plastics are described in rheological terms of flow response to forces applied. Advanced trouble-shooting and process optimization is dealt with in terms of process monitoring. Process control and its relation to products produced in the labs, to demonstrate the effects of varying process parameters on the mechanical, chemical, thermal, and optical properties of plastics materials.

CREDIT HOURS: Four credits

CONTACT HOURS: Lecture - 2 hours/week
Lab - 6 hours/week

PREREQUISITES: PLTS 211 and PLTS 223

TEXTBOOK: Plastics Injection Molding Handbook by Rosato

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS:

		Lec	Lab
I.	Introduction - attendance policy, grading policy, lab safety, and expectations	1	1
II.	Review of ASTM testing procedures Review proper procedure for machine set-up	0	6
III.	Non-Newtonian behavior A. Temperature and viscosity dependence B. Flow rate and viscosity dependence	2	12
IV.	Molecular Orientation A. Flow rate (fill) relationship to orientation development B. Temperature/pressure relationship to orientation retention (residual stresses) C. Skin formation D. Orientation stresses during post-forming	3	12
V.	Moisture and processing A. Effects of (processing with) moisture on flow and physical properties B. Vented barrel injection molding/extrusion	2	6

		Lec	Lab
VI.	Considerations for injection/extrusion of: A. Filled and reinforced materials B. Foam (all types) C. Thermosets	6	6
VII.	Core sequencing, hot runners, other adv. tooling	1	2
VIII.	Injection/extrusion control systems A. Sensors - temp., position, pressure, rotation, etc. B. Servos C. Recording devices	3	0
IX.	Introduction of cavity pressure as a change-over technique	1	0
X.	Process monitoring and process controlling A. Process monitoring to optimize, trouble-shoot, set-up, and as an input into a management information system B. Open-loop versus closed-loop; various circuit configurations C. Machine set-up for process control	3	12
XI.	Advanced molding techniques and trouble-shooting	3	15
XII.	Screw Design	1	0
XIII.	Evaluations	4	18
XIV.	Laboratory clean-up	0	3
		30	93

Proposed: 10/16/91
Greg Conti

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES

COURSE OUTLINE

COURSE TITLE: PLTS-325 PLASTICS TECHNOLOGY FOR MANUFACTURING ENGINEERS

COURSE DESCRIPTION: THIS COURSE ASSUMES THE STUDENT HAS LITTLE, OR NO PRIOR KNOWLEDGE OF PLASTICS, RUBBER, OR CHEMISTRY. THE COURSE IS DIRECTED TOWARD PROVIDING THE STUDENT WITH AN "AWARENESS" LEVEL OF THE BASICS:

* TERMINOLOGY OF PLASTICS AND ELASTOMERS
* THE NATURE OF THE PLASTICS AND RUBBER INDUSTRY
* END-USE APPLICATIONS OF PLASTICS AND RUBBER
* THE BASIC OPERATIONAL PROCESSING TECHNIQUES USED FOR PLASTICS AND RUBBER
* SAFETY PROCEDURES APPLICABLE TO THE PLASTIC AND RUBBER INDUSTRY

THIS COURSE IS INTENDED TO BE A SURVEY COURSE IN PLASTICS APPLICATIONS FOR MANUFACTURING ENGINEERING B.S. CANDIDATES.

CREDIT HOURS: 2 SEMESTER HOURS
CONTACT HOURS: LECTURE: 1 HOUR/WEEK
LAB: 3 HOURS/WEEK
PREREQUISITES: ACCEPTANCE INTO THE MANUFACTURING ENGINEERING B.S.
TEXTBOOKS REQUIRED: "INDUSTRIAL PLASTICS" ; RICHARDSON

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

		Time Allocation	
		LECTURE	LAB
I.	Course Introduction		
	A. Know and understand the course objectives 1. Grading 2. Testing 3. Laboratory procedure 4. Attendance	1	3
	B. Explain safety rules and emergency procedures	1	1.5
	C. Discuss and use hand tools		
II.	Introduction to the Plastic and Rubber Industry A. Name major end-use markets B. Name major material suppliers C. Describe industry demographics D. Explain how plastics can be recycled	2	-

	LECTURE	LAB
III. Introduction to Rubber and Plastic Materials	1	-
A. Polymer Chemistry Overview		
1. Name feedstock materials		
2. Describe polymerization methods		
B. Definition of Rubber and Plastic	1	1.5
1. Define thermosets		
2. Define thermoplastics		
3. Define elastomers		
4. Describe rubber materials		
C. Additives and Modifiers	0.5	-
1. Name and characterize the major plastic/rubber additives and modifiers		
D. Plastic/Rubber Nomenclature	2	-
1. List the major polymer names		
2. List the major material trade names and manufacturers		
IV. Introduction to Rubber and Plastic Performance	1	3
A. Overview of Materials Testing		
Describe and Characterize the following:		
1. Tensile		
2. Impact		
3. Compression set		
4. CTE		
5. Shrinkage		
6. Rheology		
B. Material Data Resources	1	-
Demonstrate the ability to use:		
1. Supplier data		
2. Published references (Encyclopedias and desk books)		
C. Supplier Quality	0.5	-
1. Explain the major components of supplier (material & product) components		
V. Rubber and Plastic Processing		
Describe the following processes:		
A. Injection	1	6
B. Extrusion	1	6
1. Profile		
2. Sheet		
3. Film		
C. Compression/Transfer	1	3
D. Blow Molding/Rotational Molding	1	3
E. Thermoforming	1	3
F. Overview of Secondary Operations	0.5	3
G. Hand Lay-ups (Liquid TS)		3
H. Material Handling	0.5	3

	LECTURE	LAB
VI. Rubber and Plastic Products A. Describe the basic elements of product design B. Name the major product markets	0.5	3
VII. Rubber and Plastics Tooling	0.5	3

Name and describe:
A. Molds
   1. Nomenclature
B. Dies
   2. Nomenclature

VIII. Cost
A. List the major cost components of plastic/rubber products

TOTAL>>>>> 15 45

TOPICAL OUTLINE:

I. Introduction to Course
   A. Safety
   B. Testing and Grading
   C. Lab Procedures

II. Introduction to the Rubber and Plastics Industry
   A. Major Markets
   B. Key Suppliers
   C. Industry Trends
   D. Recycling and the Environment

III. Introduction to Rubber and Plastics Materials
   A. Feedstock Materials
   B. Polymerization Methods
   C. Definition of keg terms
      1. Thermoplastic
      2. Thermoset
      3. Elastomers
      4. Rubber

IV. Introduction to Rubber and Plastic Performance
   A. Overview of Material Testing
      1. Tensile
      2. Impact
      3. Compression Set
      4. CTE
      5. Shrinkage

B. Material Data Resources
   1. Supplier Data
   2. Published References (encyclopedias)
   3. On-line data bases
C. Supplier Quality

V. Plastic and Rubber Processing
   A. Injection Molding
   B. Extrusion
      1. Profile
      2. Sheet
      3. Film
   C. Compression/Transfer Molding/Hand Lay-ups
   D. Blow Molding/Rotational Molding
   E. Thermoforming
   F. Secondary Operations
      1. Deflashing
      2. Parts Handling
   G. Material Handling
      1. Loading
      2. Drying
      3. Reprocessing
      4. Compounding

VI. Rubber and Plastic Products
   A. Product Design "Rules"
   B. Major Product Markets

VII. Rubber and Plastics Tooling
   A. Mold Nomenclature
   B. Die Nomenclature

VIII. Cost
   A. Cost Components of Plastic Parts

MINIMUM LABORATORY ACTIVITIES

1. Use plastic and rubber reference materials
2. Safely start-up, operate, shut down these processes:
   Injection machines
   Extruder
   Compression molder
   Thermoformer
   Blow molder
   Rotational molder
   Hand Lay-up
3. Prepare (dry, mix, color, compound) plastic/rubber for processing
4. Assess quality of plastic/rubber parts
5. Identify product defects and develop corrective actions
6. Regrind and recycle plastic

7. Demonstrate the use of a PLT Plan sheet for process start up
8. Identify the result of process variables on product quality
9. Prepare a professional laboratory report for each laboratory assignment, according to Plastics Technology Laboratory Report guidelines (attached).

Prepared by: Eugene Whitmore 12-10-92

FORMAT FOR WRITING A PLASTICS TECHNOLOGY LABORATORY REPORT

WHO: Any student enrolled in a Plastics Technology (PLT) class.

WHY: To provide a standard format for use in ALL PLASTICS TECHNOLOGY CLASSES for writing a laboratory report.

WHEN: The laboratory report is due one(a) week after the scheduled completion of the experiment, unless another due date is specified by the instructor.

WHERE: The finished report is to be submitted on or before the due date at the place designated by the instructor.

WRITING STYLE: Third Person, active

WRITING STRUCTURE:

PURPOSE: Why is the experiment being done. what is to be learned from doing this experiment.

SUMMARY: A brief and comprehensive presentation of facts and significant results obtained: An abstract or Precis.

PROCEDURE: A brief outline of the steps followed to perform this experiment. The PLAN SHEET, if required, is to be part of this section.

MATERIAL: Provide a complete description of the materials used during this experiment. Include the following information:

1. Form: pellets, sheet, powder, re-grind, color concentrate, TP or TS.
2. Storage method
3. Generic polymer type and trade name
4. Manufacturer and/or supplier
5. Manufacturer type/grade identification
6. Manufacturer batch number
7. Color added

DATA: Present all information collected during the experiment in this section. Use tabular form, if applicable. Show any calculations using this data in the Results section. Raw data is to be included in original form, and also must be rewritten.

RESULTS: This section should present all of the analyzed data and calculations used to support conclusions. Tabular form should be used, if applicable. This section should be organized in a logical and concise manner, free of misleading, ambiguous, and figurative statements. Numerical results will include units and means(averages) and all averages will have a standard deviation.

DISCUSSION: Analyze and evaluate the results, comparing to known and expected values. Show what was done correctly and incorrectly and the effect each had on the results. Tell what was learned that was not know before.

CONCLUSION: In this section discuss the significance of this exercise or experiment to the writer, the plastics industry, FSU Plastics Division and the resulting learning experience. How will this learning support your progress in the educational process?

MANUFACTURING ENGINEERING TECHNOLOGIES DEPARTMENT
COLLEGE OF TECHNOLOGY APPR:_____
PLASTICS PROGRAMS DATE:_____

COURSE OUTLINE

COURSE TITLE: PLTS 342 Plastics Material Selection for Product Design Students

COURSE DESCRIPTION: This course is designed to demonstrate the procedures one should follow to select a plastic for an application. Major plastic fabrication techniques and the main plastics design "rules of thumb" will be reviewed. Classwork will also cover plastic failure mechanisms and inherent weakness which plastic materials exhibit. Emphasis will be placed on plastics materials, their specifications, economics, and historical application areas.

CREDIT HOURS: Three Semester Hours

CONTACT HOURS: Lecture - 3 hours/week

PREREQUISITES: Junior status in PDET or instructors permission

TEXTBOOK: Modern Plastics Encyclopedia, McGraw Hill

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

The student will:

	Lecture
I. Introduction	1
A. Know course goals/policies	
B. Demonstrate an understanding of basic plastics business	
II. Plastics Material Sciences	3
A. Know effects of Molecular weight	
B. Know basic chemical bonding	
C. Know basic molecular configuration	
D. Describe the difference between thermoplastic and thermoset	
E. Describe and understand the effects of polymer morphology	
III. Plastics Mechanical and Physical Properties	5
A. Know time effects on plastics materials properties	
B. Know temperature effects on plastics materials properties	
C. Know "rate" effects on plastics materials properties	
D. Understand and describe the importance of the following properties: Creep, Impact, Fatigue, Chemical resistance, Thermal stability, and Stress relaxation	

	Lecture
IV. Materials Selection	3
A. Know how to analyze and select appropriate properties	
B. Describe the plastics material selection process	
C. Perform a plastics material selection/screen	
V. Plastics Processing	9
A. Know the difference and advantages between different plastics conversion techniques including: Injection molding, Extrusion, Blow molding, compression/transfer molding, and Thermoforming	
B. Demonstrate a strong understanding of the effects these processes have on end product properties and quality.	
VI. Plastics Product Design	4
A. Demonstrate a knowledge of basic plastics product design rules	
B. Survey typical plastics design mistakes	
C. Demonstrate a knowledge of design techniques which are used to improve the energy management capabilities of a plastics product.	
VII. Plastics Materials	16
A. Know the dominate manufacturers, their trademarks, and explain why they were failures, critical/unique properties of plastics materials as well as "typical" applications and costs	
1. Ethylene	
2. Propylene/butylene	
3. Vinyls	
4. Styrenics	
5. Styrenics (ABS)	
6. Acrylics and PMT	
7. Polycarbonate	
8. Polyesters (PBT and PET)	
9. Acetals	
10. Nylon	
11. Fluoroplastics	
12. Polysulfone	
13. Sulfone Polymers	
14. Ketone Polymers	
15. PPO	
16. Polyurethanes	
17. TPE	
18. Cellulosics	
19. Blends	
20. Polyester (TS)	
21. Phenolics	
22. Alkyds	
23. Allyls	
24. Polyimide	
25. Epoxies	
IX. Testing and Evaluation	4

Prepared by: Robert Speirs,III Revised: 1/92

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
Manufacturing Engineering Technologies Department

APPR: [signature]
DATE: 4/15/92

COURSE OUTLINE

COURSE TITLE: PLTS-400: Senior Plastics Research Projects

COURSE DESCRIPTION: This course allows the student to continue the project proposed and researched in PLTS-300. Completion of the research, preparation of written reports, and presenting of an oral depiction of the research is required.

CREDIT HOURS: Three(3) semester hours

CONTACT HOURS: Lec. - one(1) hour per week
Lab - six(6) hours per week

PREREQUISITES: PLTS - 300;

TEXTBOOKS: None specified: All texts used in first, second, and third year plastics classes may be needed for reference.

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Lecture	Lab
The student will:		
I. demonstrate skills in technical writing through the acceptable preparation of;	5	30
A. research progress reports		
B. final report on research		
C. short reports or papers on student or instructor selected subjects		
II. demonstrate speaking skills though the preparation and presentation of;	5	30
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;	5	30
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. use of support statistical analysis of research findings; through the items in I. and II., plus any special or extra credit assignments.		
TOTALS	15	90

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY
MANUFACTURING ENGINEERING TECHNOLOGIES

COURSE OUTLINE

COURSE TITLE: PLTS-411: PLASTICS DECORATING AND ASSEMBLY

COURSE DESCRIPTION: This course will provide the student with the basic knowledge and awareness of the "Secondary" processes associated with plastic product manufacturing. The student will learn the product design, process, and tooling technology associated with each process. The course is designed to compliment existing courses in plastic product design, plastics, process, and mold design. The course will expand the students processing "portfolio" allowing him/her to understand the complete plastic manufacturing process which includes assembly, decorating, and packaging of plastic parts.

CREDIT HOURS: 3 Semester Hours

CONTACT HOURS: Lecture 2 HOURS/WEEK
Lab - 3 HOURS/WEEK

PREREQUISITES: PLTS-312 Plastics Product Design

TEXTBOOK: To be determined. Initial class will be with lecture notes and handouts

UNITS IF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

		Lec	Lab
I.	Introduction	1	1
	A. Orientation		
	B. Classifying secondary operations		
	C. Demonstrate an understanding of lab safety		
	D. Name equipment suppliers and references		
II.	Materials Review	3	1
	A. Describe the surface of plastics (Cleanliness, Texture, Reflectively)		
	B. Explain the chemical effects on plastic		
	C. List the environmental concerns of secondary operations		
	D. Define the time-temperature/loading issues associated with secondary processes		
	E. Characterize the chemical nature of plastics		

		LEC	LAB
III.	Product Design Review	2	-
	A. Describe the basic design guidelines for plastic parts as related to finishing and assembly		
	B. Determine the optimum design for energy directors and joint areas associated with finishing and assembly		
IV.	Assembly of Plastics	6	13
	A. Explain how different adhesives are used in product assembly		
	1. Compatibility		
	2. Surface Preparation		
	3. Bond Strength Tests		
	Describe these processes:		
	B. Solvent Bonding processes		
	C. Spin welding		
	D. Fusion Bonding		
	E. Vibration Welding		
	F. Ultrasonic Welding		
	G. Dielectric Sealing		
	H. Induction Bonding		
	I. Cold Pressing		
	J. Hot Boss Staking		
	K. Hot Gas Welding		
	L. Riveting		
	M. Mechanical Assembly (screws/clips/hardware)		
	N. Snap-Fit and Press Fit Assembly		
	O. Heat Staking		
V.	Machining of Plastics	2	3
	Describe these processes		
	A. Drilling, milling, turning		
	B. Tapping		
VI.	Printing and Coating	4	6
	Explain how these process are performed:		
	A. Hot Stamping		
	B. Pad Printing		
	C. Subliminal Printing		
	D. Electrocal		
	E. Ink Jet		
	F. Laser Printing and Etching		
	G. Painting (solvent and water based)		
	H. Plating		
	1. Electroplating		
	2. Electroless		
	I. Screen printing		
	J. Vacuum metallizing/sputtering		

VII.	Surface Preparation Compare these processes: A. Corona Discharge B. Flame C. Plasma D. Chemical Etching	2	2
VIII.	Annealing Explain what effect internal stresses have on plastics and how the can be relieved by: A. Conduction B. Convection	1	3
IX.	Deflashing and Cleaning Differentiate between various degrees of product cleanliness and how the following processes can be used: A. Cryogenics B. Vibration C. Media D. Tumbling E. Degreasing F. Ultrasonic Bath G. Manual	2	3
X.	Parts Handling Determine the best process for handling plastic parts by comparing these processes: A. Vibratory Bowls B. Pick and Place C. Robotics D. Separators E. Pickers F. Conveyors	3	6
XI.	Testing Validate the quality of assembled parts by employing these tests: A. Insert Pull B. Bond Strength C. Drop Impact D. Vibration and cyclic loading	3	6
XII.	Cost Develop a cost structure (value added) for several different secondary process steps	1	1
	TOTAL	36	45

TOPICAL OUTLINE :

I. Introduction
- A. Orientation
- B. What are secondary operations
- C. Safety
- D. Equipment Suppliers and References

II. Materials Review
- A. The surface of plastics
- B. Chemical Effects on plastic
- C. Environmental Concerns
- D. Time/Loading Issues

III. Product Design Review
- A. Design Guidelines
- B. Joint Designs

IV. Assembly of Plastics
- A. Adhesives
- B. Solvent Bonding
- C. Spin Welding
- D. Fusion Bonding
- E. Vibration Welding
- F. Ultrasonic Welding
- G. Dielectric Sealing
- H. Induction Bonding
- I. Cold Pressing
- J. Hot Boss Staking
- K. Hot Gas Welding
- L. Riveting

V. Machining of Plastics
- A. Drilling, Milling, Lathe work
- B. Tapping
- C. Ultrasonic Inserts
- D. Heat Staking

VI. Printing and Coating
- A. Hot Stamping
- B. Tamp Printing
- C. Subliminal Printing
- D. Electrocal
- E. Ink Jet
- F. Laser
- G. Painting
- H. Plating
  1. Electroplating
  2. Electroless
- I. Vacuum metallizing

VII. Surface Preparation
- A. Corona Discharge
- B. Flame
- C. Plasma

VIII. Annealing
- A. Conduction
- B. Convection

IX. Deflashing and Cleaning
- A. Cryogenics
- B. Vibration
- C. Media
- D. Tumbling
- E. Degreasing
- F. U/S Bath

X. Parts Handling
- A. Vibratory Bowls
- B. Pick and Place
- C. Robotics
- D. Separators
- E. Pickers

XI. Testing
- A. Insert Pull
- B. Bond Strength

XII. Cost

MINIMUM STUDENT LAB ACTIVITIES

1. Safely set-up and operate this equipment/process:
   - A. Hot Gas Welder
   - B. Ultrasonic Welder
   - C. Tampo Printer
   - D. Hot Stamper
   - E. Riveter
   - F. Dielectric Sealer
   - G. Parts Conveyor/Separator
   - H. Robotic Picker
   - I. Solvent/Adhesive Bonding
   - J. Drilling/Tapping of plastics
   - K. Parts cleaner/degreaser
2. Conduct these analytical tests:
   - A. Bond Strength
   - B. Thread Strength
   - C. Particulate Count (Cleanliness)
   - D. Polarimeter/Stress analyzer
   - E. Paint/Plating peel test
3. Design and/or modify a design that illustrates DFMA (Design for Manufacturing and Assembly)

4. Design a fixture to hold a plastic part to be hot stamped or printed.
5. Design a modification to the fixture in #4 the shows a comprehension of SMED (Single Minute Exchange of Die)

Submitted by: Edward Muccio

August 9, 1995

FERRIS STATE UNIVERSITY
COLLEGE OF TECHNOLOGY Revised 11/94
Manufacturing Engineering Technologies Department

COURSE OUTLINE

Course Title: PLTS-499: Plastics Senior Seminar

Course Description: This course will consist of a series of special presentations, designed to prepare the prospective Plastics Engineering Technology graduate for entry into the Plastics Industry work force. Verbal and written communications, interviewing and job search techniques, social interaction, industry structure, professional organizations, peer relationships, and supervisor relations, supported through discussion, role playing, and case studies are examples of some of the subjects which will be addressed.

Credit Hours: one semester hour
Contact Hours: Lecture: 1 hours/week
Prerequisite: GRADUATING senior
Textbook: Texts used in previous PLTS courses

UNITS OF INSTRUCTION AND STUDENT LEARNING GOALS FOR EACH UNIT:

	Time Weight Lecture Hours
I. Introduction and presentation of course objectives	1
II. The student will demonstrate Verbal and written communications through satisfactory completion of instructor verbal and written assignments	1
III. The student will demonstrate through role playing, class discussions, case studies, and research knowledge of the following;	
A. Job search techniques, including job situation negotiations: How to learn about company structure, such as private versus public ownership.	1
B. Suggested types of activities of Social interaction, including interpersonal relationships and communications	2

C. Plastics Industry structure, including working with suppliers, vendors and customers, with ethical relationships being highlighted. 2
   1. Global versus national organization
   2. Family, Foreign, or Shareholder owned
   3. Major competition efforts,i.e.JAPAN
   4. Marketing versus Production considerations

D. Plastics and Professional organizations 1
   1. "the GOOD, the BAD, and the UGLY!"
   2. Benefits, drawbacks, obligations, and perks

E. Problems and opportunities in Peer relationships 2

F. Supervisor relations 2

G. Financial management 2
   1. Personal
   2. Corporate/Company
   3. "ETHICS"

H. Self evaluations 1

15

IV. Course Objectives will be added and deleted relative to student population needs.

TOPICAL UNIT OUTLINE OF MAJOR UNITS OF INSTRUCTION:

I. Verbal and written communications

II. Use role playing, class discussions, case studies, and research knowledge of the following;

A. Job search techniques

B. Social interaction, including interpersonal relationships and communications

C. Plastics Industry structure.
   1. Global versus national organization
   2. Family, Foreign, or Shareholder owned
   3. Major competition efforts,i.e.JAPAN
   4. Marketing versus Production considerations

III. Plastics and Professional organizations

IV. Problems and opportunities in Peer relationships

V. Supervisor relations

VI. Financial management
   1. Personal
   2. Corporate/Company
   3. "ETHICS"

VII. Self evaluations

MINIMUM REQUIRED STUDENT LABORATORY ACTIVITIES DEFINED:

Presentation of the topical outline materials through;

A. Discussion
B. Role playing
C. Case studies
D. Seminar attendance
E. Presentations
   i.e., Placement interview presentations

FERRIS STATE UNIVERSITY TEXTBOOK LIST

COURSE TITLE AND NUMBER	TERM OFFERED	TEXTBOOK REQUIRED
PLTS 110 Intro. to Plastics	Fall	Industrial Plastics Theory, 2nd Ed. by Richardson, Delmar Pub.
PLTS 121 Plastics Processing 1	Winter	Plastics Engineering Handbook of SPI, 5th Ed., by Berins, Vannostrand Reinhold Pub.
PLTS 193 Industrial Internship 1	All	No Text
PLTS 211 Plastics Processing 2	Fall	Plastics Engineering Handbook of SPI, 5th Ed., by Berins, Vannostrand Reinhold Pub.
PLTS 212 Plastics Tool Construction	Fall	Moldmaking and Diecast Dies for Apprentice Training, by Kluz, National Tool, Die & Precision Machining Association
PLTS 220 Plastics & Elastimer Material	Winter	Polymeric Material System Properties and Performance by Ferris Faculty, FSU Copy Center Pub.
PLTS223 Plastics Testing & Properties	Winter	Handbook of Plastics Testing Technology, by Shah, Wiley & Sons Pub.
PLTS 300 Plastics Project Management	Fall, Winter	Project Management: A System Approach to Planning, Scheduling, and Controlling, by Kerzner, Vannostrand Reinhold Pub.
PLTS 312 Plastics Product Design	Fall	Designing with Plastics and Composites, by Rosato, Vannostrand Reinhold Pub.
PLTS 321 Plastics Processing 3	Winter	Injection Molding Handbook, by Rosato, Routledge Pub., 2nd Ed.
PLTS 325 Plastics Technology for Manufacturing Engineering Technology Students	Winter	Industrial Plastics Theory, 2nd Ed., by Richardson, Delmar Pub.
PLTS 342 Plastics Material Selection for Product Design Students	Winter	Plastic Part Technology by E.A. Muccio, ASM Publication, 1991
PLTS 393 Industrial Internship 2	All	No text
PLTS 400 Plastics Projects	Fall, Winter	All previous Plastics texts for References
PLTS 411 Plastics Decorating & Assembly	Fall, Winter	Plastics Engineering Handbook of SPI, 5th Ed., by Berins, Vannostrand Reinhold Pub.
PLTS 499 Capstone Project	Fall, Winter	All previous Plastics texts for References

RECOMMENDED REFERENCE TEXTS

Plastics Part Technology by E. Muccio, 1991, ASM Publication, ISBN 087170-432-3

Plastics Processing Technology by E. Muccio, 1994, ASM Publication, ISBN 0-87170-494-3

Plastics Technology and Plastics Engineering Technology Faculty

Richard Brammer: **ASSOCIATE PROFESSOR 1977**
25 years PLASTICS Industrial experience with MOLD/prototype shops in Illinois; Journeyman Tool-maker. AAS in PLASTICS; Elgin CC, Elgin, IL BS in Education; Ferris State University, SPE MOLD Makers and Designers Division Board, Grand Rapids CC PLASTICS Program Advisory Board member.

Gregory Conti: **ASSISTANT PROFESSOR 1988**
2 years of PLASTICS Industrial experience with ITT Baylock, and Keeler Brass, in Michigan. AAS in PLASTICS Technology, BS in PLASTICS Engineering Technology and Applied Mathematics, Ferris State University

Edward Muccio: **ASSOCIATE PROFESSOR 1989**
16 years of plastics industrial experience with Texas Instruments. BS and MS in Plastics Engineering; University of Massachusetts/Lowell. Author of Plastics books on part technology, processing technology and materials handling. Areas of expertise: plastics product and process development.

Robert Pierce: **Instructor (Temporary) 1996**
27 years with the DOW CHEMICAL CO. in plant engineering, process engineering, quality control management, plastic production management, and plastics technical service. BS in Mechanical Engineering from MSU and a MBA from Central Michigan University. Registered professional engineer.

Larry Schult: **ASSISTANT PROFESSOR 1994**
16 years of PLASTICS Industrial experience with AMP Industries, Grand Traverse PLASTICS, and Northwood Industries in Michigan. 5 years secondary school teaching; including plastics classes and occupational education. BS in Industrial Education, Eastern Michigan U, Ypsilanti, MI, MA in Occupational Education, U of Michigan, Ann Arbor, MI

Robert Speirs: **ASSOCIATE PROFESSOR 1987**
7 years of PLASTICS Industrial experience with Baxter Travenol in Illinois, Dow Chemical in Michigan, and US Army Materials Research. BS and MS in PLASTICS Engineering; U of Mass. at Lowell, MA., SPE Student Chapter advisor; INJECTION MOLDING Seminar lecturer.

Eugene Whitmore: **PROGRAM COORDINATOR & ASSOCIATE PROFESSOR 1986**
19 years of PLASTICS Industrial experience with Dow Chemical Texas Division POLYETHYLENE Research and Production. BS in Chemical Engineering; U of Iowa, Iowa City, IA. MS in Occupational Education; Ferris State University. Professional Engineer: Texas 1986-1992.

Stephen: Wolfer **ASSISTANT PROFESSOR and INTERNSHIP COORDINATOR 1992**
6 years of PLASTICS industrial experience with General Dynamics in Texas, Square D in Missouri, and Rubbermaid in Wooster, OH BS and MS in Industrial Engineering with PLASTICS Emphasis Pittsburg State U, Pittsburg, KS., Author of INJECTION MOLDING trouble shooting guide.

Henry Tschappat: **PROFESSOR EMERITUS 1982--1993**

Instructional Quality, Capacity, and Productivity

Quality

The quality of the instruction received by the students in the Plastics Programs and reflected in the statistics:

- Virtually *100% employment* upon graduation
- Plastics graduates receive some of the *highest* initial salary offers within the College of Technology and the University.
- Industry demand for graduates of the Plastics Programs *exceeds* supply

Capacity

As indicated in the following demographic reports, the student enrollment model of 180 students (60 freshmen, 60 sophomores, 30 juniors, 30 seniors) was exceeded prior to 1989. The plastics programs continually have had over 100 students above the original model.

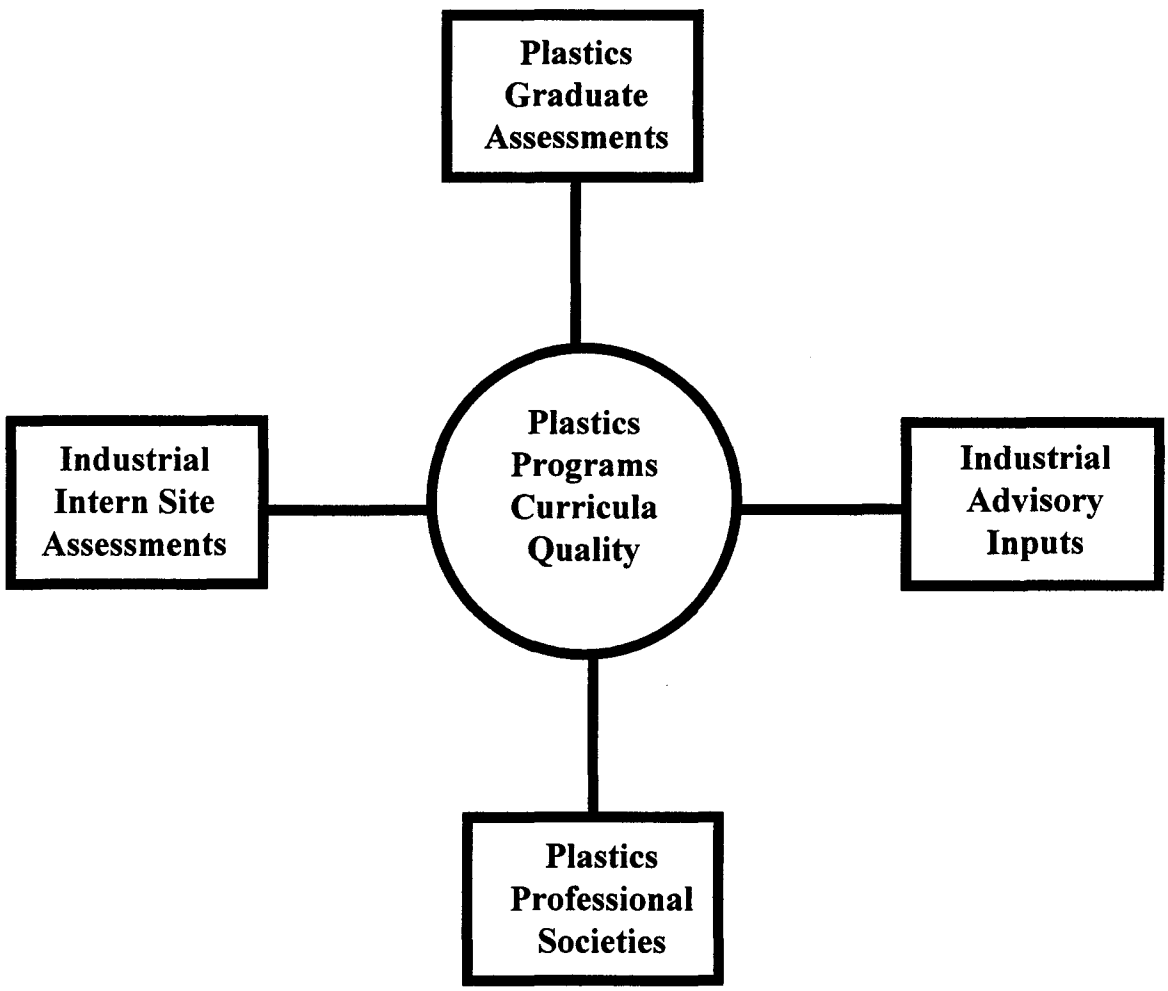
Productivity

The 100+ additional students enrolled in the plastics programs has been accomplished directly through the diligence of the Plastics Programs' faculty without additional space, without significant increases in funding, and without proportional increases in capital equipment.

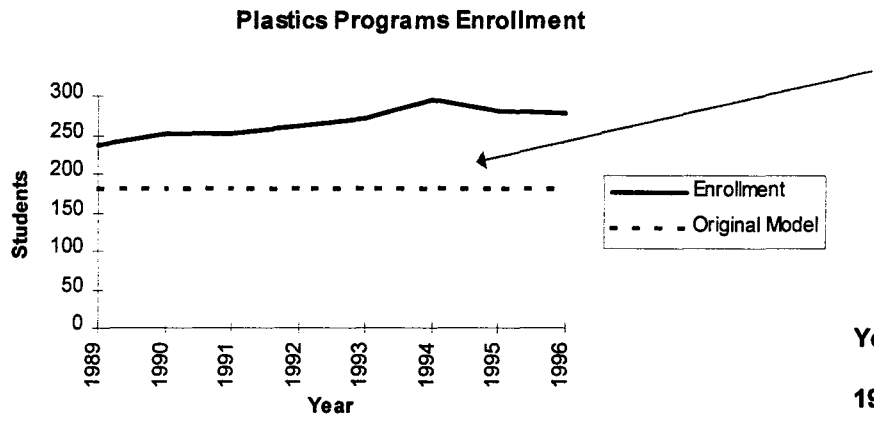
The major concern, regarding the continuing quality of the Plastics Programs, is that student growth/enrollment continues to increase without a respective increase in capital equipment, space, and faculty

Plastics Programs and Continuous Improvement

The curricula of the Plastics Programs is kept technical current and industrially relevant because the faculty work together and with the plastics industry to constantly assess the needed of industry and deploy these needs throughout the plastics courses and program structure.



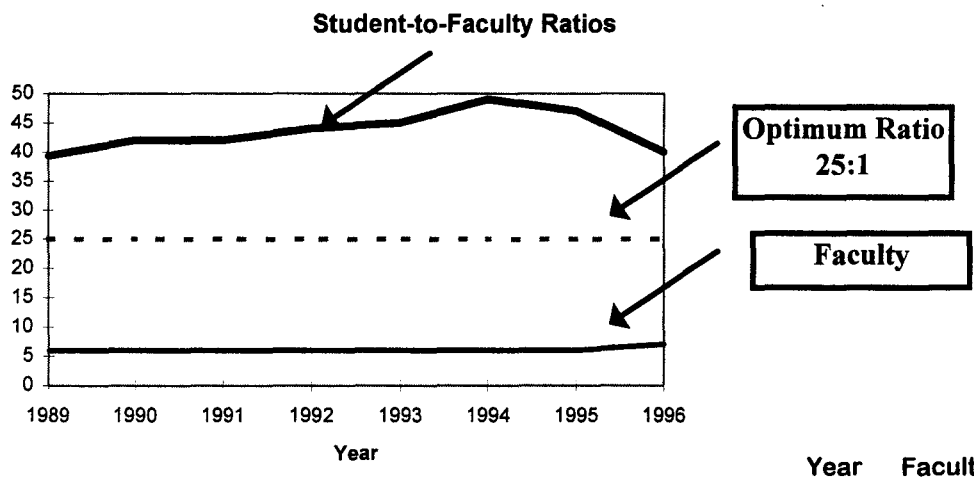
Plastics Programs Enrollment Statistics



The *original* program model was based on:

- **60 Freshmen**
- **60 Sophomores**
- **30 Juniors**
- **30 Seniors**

Year	Enrollment	Original Model
1989	236	180
1990	251	180
1991	252	180
1992	262	180
1993	270	180
1994	296	180
1995	281	180
1996	278	180

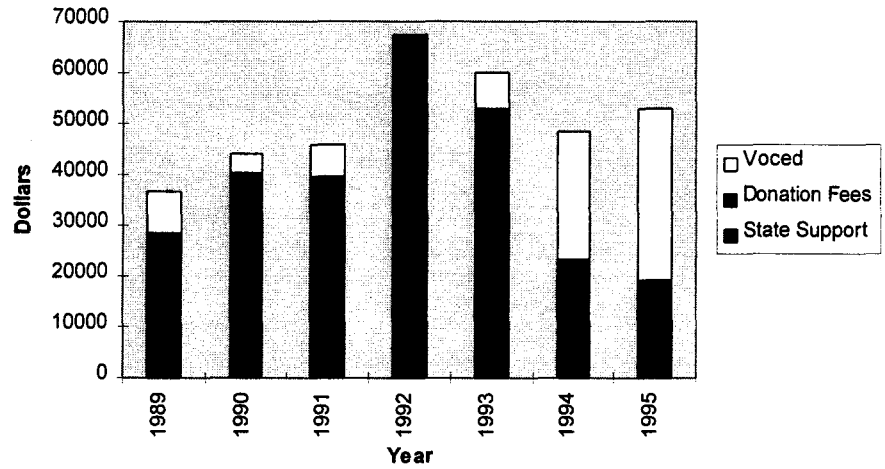


Plastics faculty currently advise over 40 students per faculty member. This includes pre-tech's (students yet to take plastics classes), A.A.S. students, B.S. students as well as transfer students.

Year	Faculty-to-Student	Ideal F/S Ratio	Faculty
1989	39	25	6
1990	42	25	6
1991	42	25	6
1992	44	25	6
1993	45	25	6
1994	49	25	6
1995	47	25	6
1996	40	25	7

Plastics Programs Funding Sources and Analysis

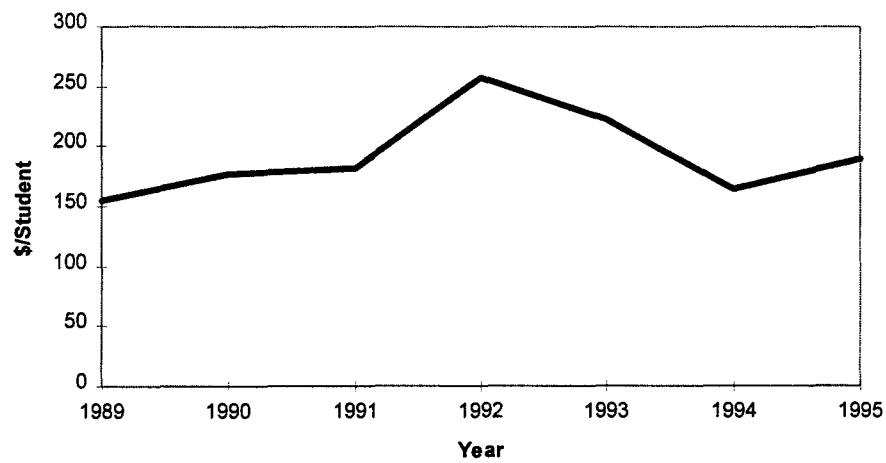
Plastics Programs Funding Sources



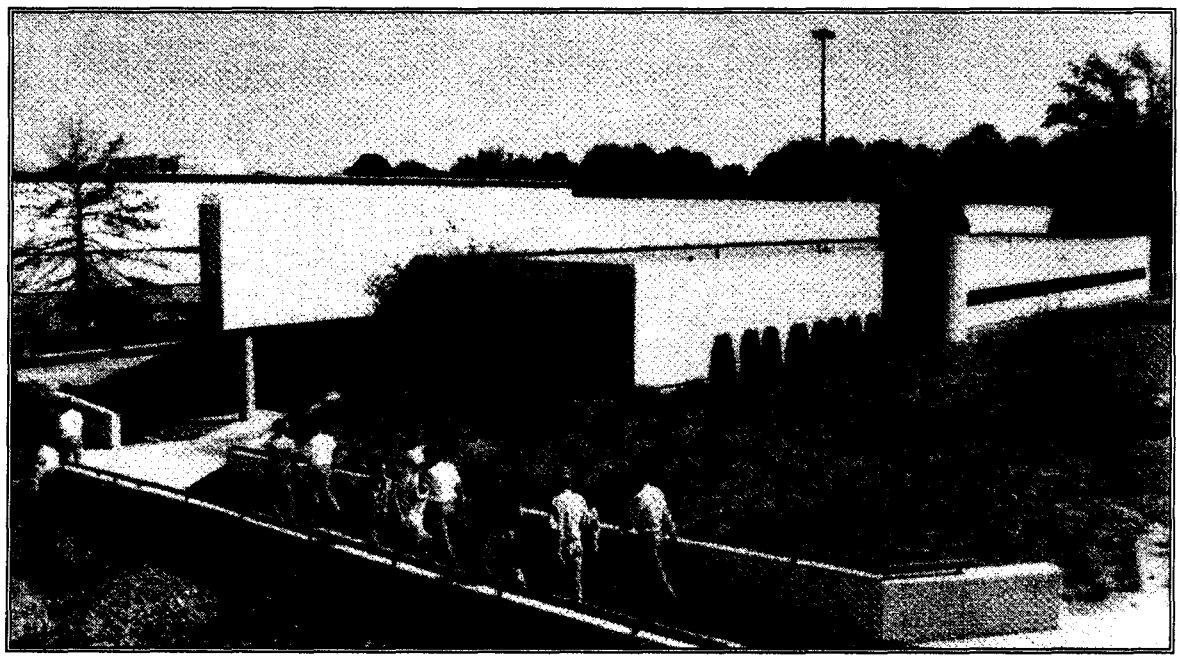
	State Support $	Donation Fees $	Voc-Ed $	Total $	Students	Total $ per Student
1989	18824	9578	8261	36663	236	155
1990	26295	13932	4000	44227	251	176
1991	24473	15105	6182	45760	252	182
1992	23941	43612	0	67553	262	258
1993	17411	35580	7190	60181	270	223
1994	10996	12431	25000	48427	296	164
1995	19227		33898	53125	281	189

Data Source: EMW 10/96

Funding Dollars Per Student



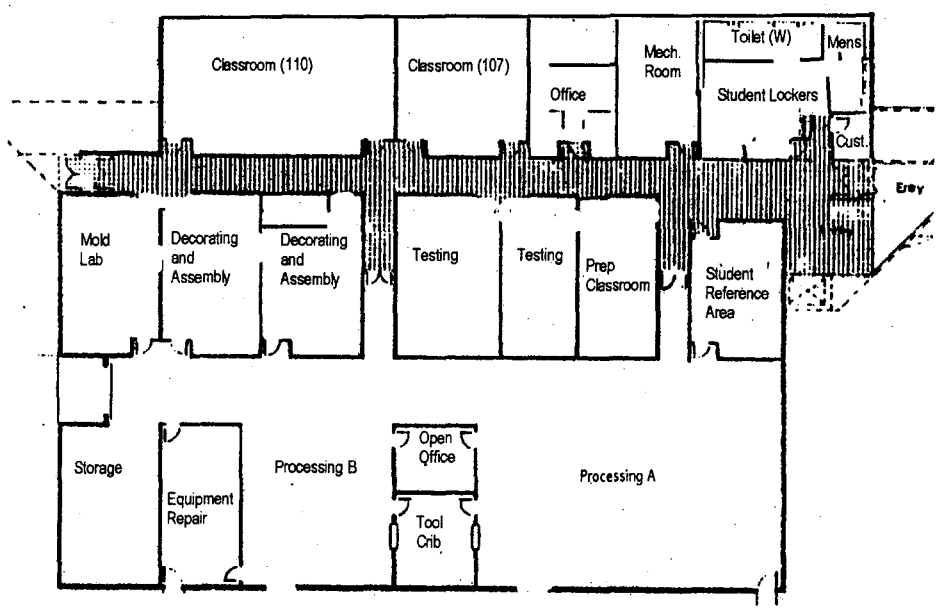
Plastics Engineering Technology Center



The Plastics Engineering Technology Center located at Ferris State University in Big Rapids, Michigan was constructed in 1987.

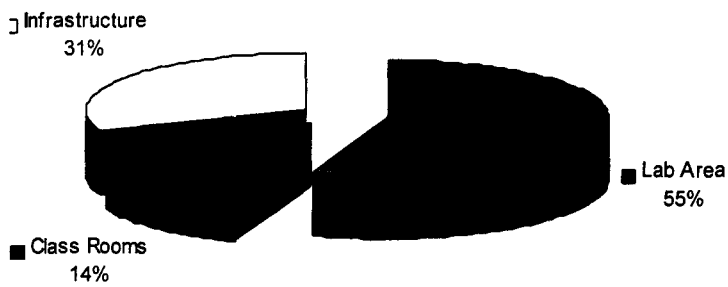
The building is over 18,000 square feet in size and represents one of the first buildings dedicated to the study of Plastics Engineering Technology in the World

Plastics Engineering Technology Center



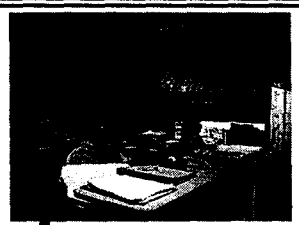
The Lab-Intensive Plastics Programs require the Plastics Engineering Technology building to accommodate specialized equipment and rapid installation and movement of this equipment

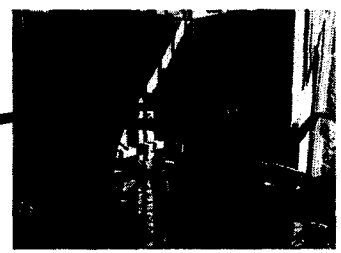
Plastics Engineering Technology Building

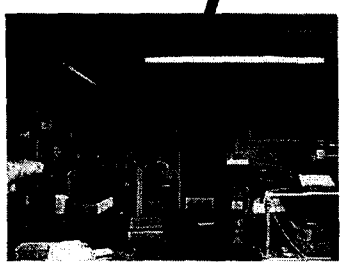


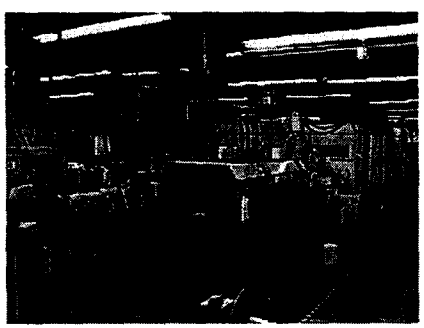
Building FT³	**18000**
Lab Area	**10000**
Class Rooms	**2430**
Infrastructure	**5570**

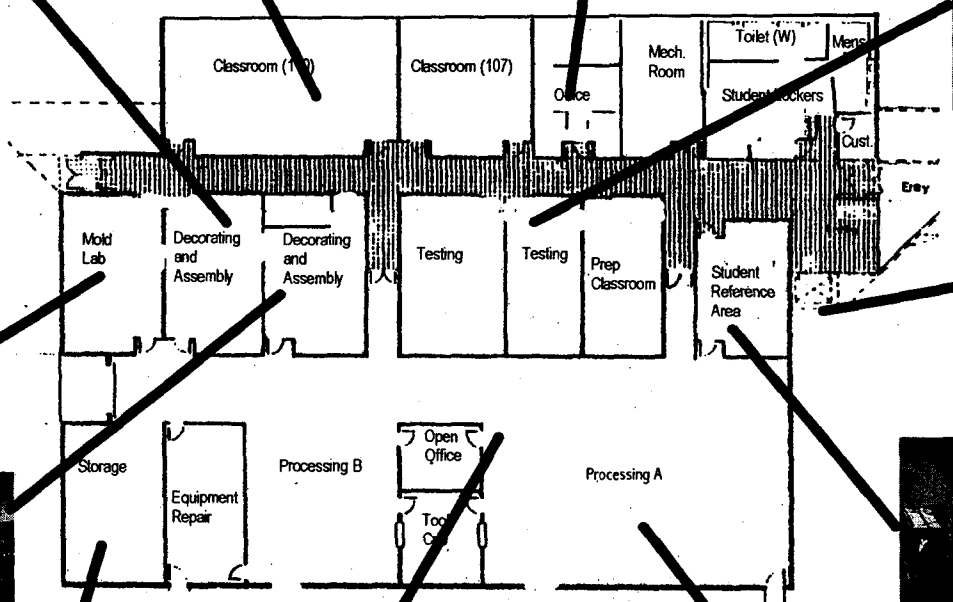
VIRTUAL
Plastics Engineering Technology Building











FSU PLASTICS BUILDING
EQUIPMENT LIST

revised 9-27-96
E.M.Whitmore

1.	VanDorn(consigned)	170 Ton(12/96)	Inj. Molding Machine
2.	VanDorn(consigned)	85 Ton(12/96)	Inj. Molding Machine
3.	Reed	150 Ton	Inj. Molding Machine
4.	Krauss Maffei	135 Ton	Inj. Molding Machine
5.	Krauss Maffei(cons.)	65 Ton	Inj. Molding Machine
6.	Cincinnati Milacron	75 Ton	Inj. Molding Machine
7.	Newbury	30 Ton	Inj. Molding Machine
8.	Newbury(not operational)	12 Ton	Inj. Molding Machine
9.	Pilot(consignment pending)	28 Ton	Inj. Molding Machine
10.	Battenfeld(consignment pending)		Inj. Molding Machine
11.	Bekum	H-1215	Blow Molder
12.	Rosade	R-2	Blow Molder
13.	FSP	M-20	Rotational Molder
13.	Lyle Hydro-Trim(cons.)	HM-3889	ThermoFormer
14.	3 each Comet	Cadet	ThermoFormer
15.	AL-BE	1 inch	Extruder
16.	Killion	3/4 inch	Extruder
17.	Rainville	2 inch	Extruder
18.	Lung-Meng	1 inch	Blow Film Extruder
19.	Pilot(consignment pending)	1 inch	Extruder
20.	Dake (automatic)	50 Ton	Compression Molder
21.	Dake (manual)	50 Ton	Compression Molder
22.	Walbash (automatic)	30 Ton	Compression Molder

23. DoALL Band Saw
24. Drill press
25. Belt/Disc Sander
26. Blue M Friction-Aire Oven

27. Instron (old) Model TTC Tester(not operational)
28. Instron (new) Model 4301 Automatic(consigned)
29. Melt Flow Indexer Model 7050 Kayeness
30. Tinius Olsen Vicat/Heat Deflection tester
31. Tinius Olsen Stiffness Tester

32. Gardner Drop Weight Tester
33. TMI Pendulum Impact tester
34. TMI Notcher for IZOD impact
35. Tinius Olsen Melt Indexer Model DS-5 Extrusion Plastometer
36. Brookfield Viscometer RUT
37. Fisher Scientific Edu. weight scales Model 410 1ea..
38. Mettler scales Model 10mg (2ea.)
39. Rockwell Hardness Tester(not operational)

FSU PLASTICS BUILDING
EQUIPMENT LIST

revised 9-27-96
E.M.Whitmore

40. USI Hot Stamping Machine
41. Franklin Hot Stamping Machine
42. Kayeness Drop Tester Model D20
43. Kayeness Ultra-violet Tester
44. Tinius Olsen Stiffness Tester

45. KLN MECASONIC Sonic Welder
46. BRANSON Sonifier Sonic Welder
47. DuKane (new) Model 2000 Auto-Trac
48. BRANSON Model 490 Sonic Welder
49. DuKane Model 5111

50. Tampo pad printer TT 80/31

51. Model E-110 parts washer (automatic)

52. QUV Weather Tester

53. Mark I moisture Analyzer Denver INST. Co.
54. Max-50 moisture Computrac Denver INST. Co.

55.	Steal-Tronic	M-2	Mold Conditioner
56.	Steal-Tronic 2ea.	Dual Zone Sterlco	Mold Conditioner
57.	Logic Devices, Inc.		Mold Conditioner
58.	Matsui	MC-III	Mold Conditioner
59.	Application Engineering	Refrigerate Unit	Mold Conditioner
60.	Matsui(consigned)	Jet Loader	Auto.Hopper Loader
61.	Novatec	VL-1	Auto.Hopper Loader
62.	WhitLock		Auto.Hopper Loader
63	Conair Franklin	D-957507	Auto.Hopper Loader
64.	Cactus	10	Auto.Hopper Loader Mat.Dryer
65.	Conair Franklin	CD-30	Material Dryer
66.	Matsui(consigned)	DM2-40	Material Dryer
67.	Thoreson McCosh	D-121	Material Dryer
68.	UNA-Dyn	50	Material Dryer
69.	Bry-Air	DH-2	Material Dryer
70.	Despatch	V-23	Material Oven Dryer
71.	LR Systems	SG-100	Material Grinder
72.	IMS	2144-SP	Material Grinder
73.	Nelmor	66-M1	Material Grinder
74.	Killion		Material Pelletizer
75.	Tennsmith	Shear	Material Cutter
76.	Allis-Chalmers	3000	Fork-Lift
77.	NISSUI	S	Materials grinder
78.	Hand held Hardness instruments		
79.	Pyrometers		
80.	Arburg(not operational)	28 Ton	Inj.Molding machine

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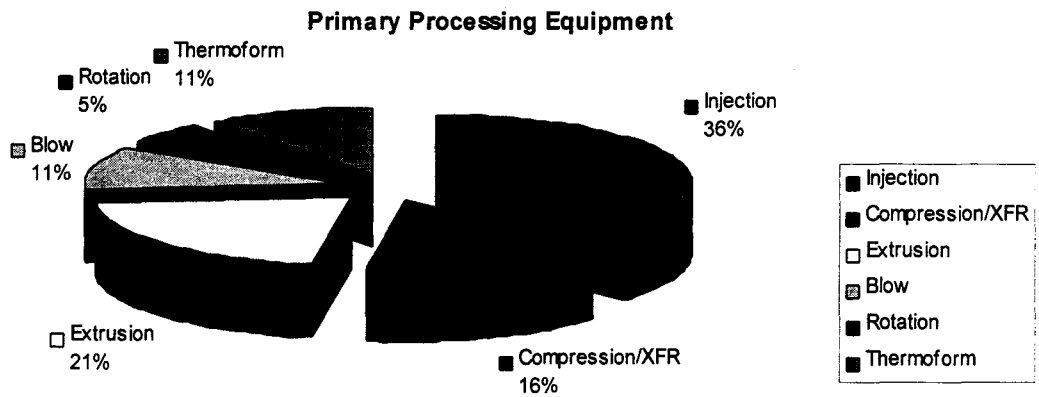
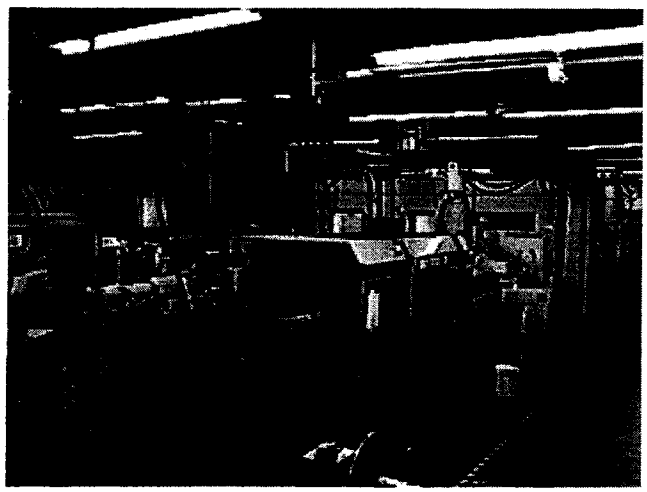
Primary Process Equipment

Students in the Plastics Programs learn on the latest, state-of-the art processing equipment

- **The Primary Processing Equipment available to the students in the Plastics Engineering Technology programs represents a microcosm of the equipment utilized within the plastics industry.**
- **Plastics faculty focus on both the theoretical and practical aspects of plastics processing.**
- **The Plastics programs enjoy a close working relationship with the plastics equipment manufacturers. This ensures maintenance of technical currency for both faculty and students**



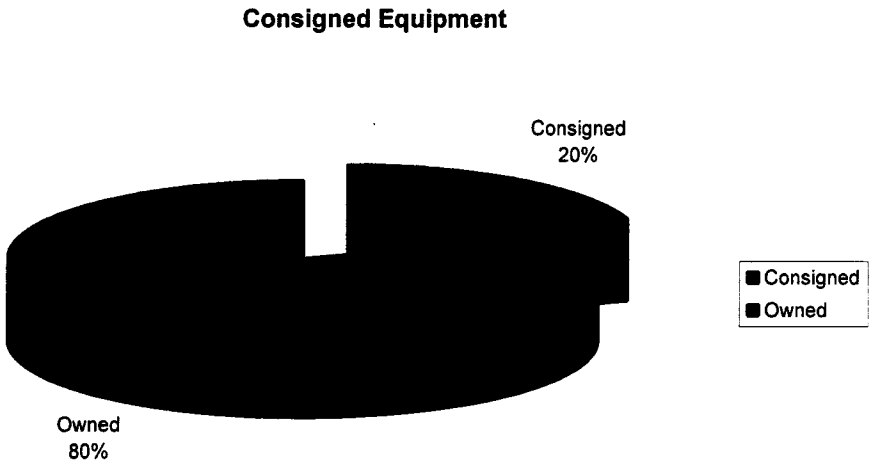
Consigned Process Equipment



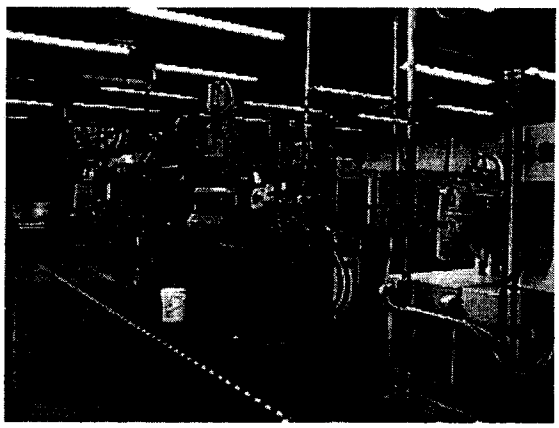
Plastics Equipment Manufacturers are encouraged to consignee high value equipment.
On the average, 20% of the plastics processing equipment is consigned

Consigned equipment remains in the plastics processing labs from 1-5 years.

Graduates of the plastics programs tend to purchase equipment from manufacturers that have consigned equipment to the plastics programs. This is a subtle, yet powerful sales tool.



Equipment Utilization



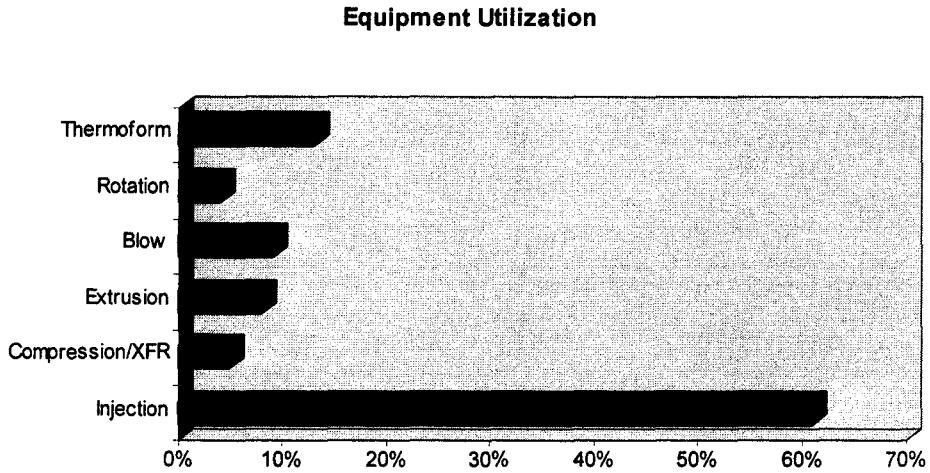
Utilization of Primary Processing Equipment Focuses on Injection Molding. Over 50% of the processing lab time involves students working with the injection molding process in the areas of:

- **Operation**
- **Set-Up**
- **Troubleshooting**
- **Material Handling**

The remaining lab time is divided between the other primary processes:

- **Compression and Transfer Molding**
- **Extrusion**
- **Thermoforming**
- **Blow Molding**
- **Rotational Molding**

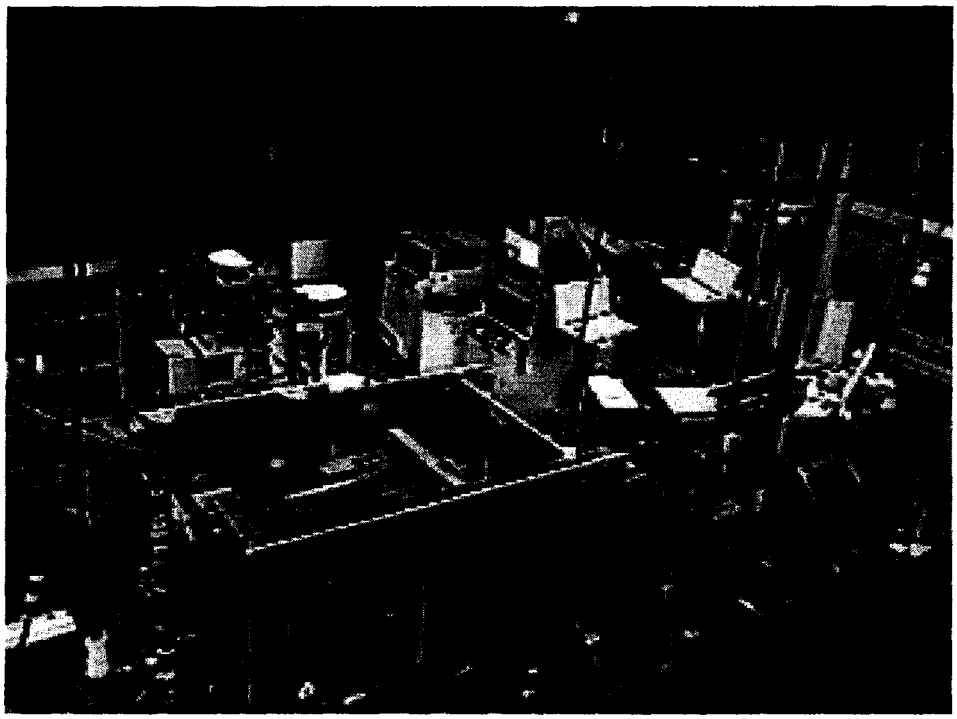
To optimize safety, teaching, and learning the faculty stresses that the ratio of 2 students (maximum) per piece of equipment be maintained



Plastics Laboratory Environment

Rapid expansion of the Plastics Programs, the constant flux of moving equipment to maintain technical currency, and expanding student population has created a crowded environment.

The need to maintain a controlled teaching environment and a safe and meaningful learning experience for our students demands a proper balance between class size, equipment type, and floor space/layout.



ENROLLMENT TRENDS

The official enrollment by year for each degreed program and pre-tech status is presented below in the following table:

Year (Fall)	BS	AAS	Pre-Tech	Total Enrollment
1990	107	(144)*	N/A*	251
1991	100	(152)*	N/A*	252
1992	91	(189)*	N/A*	280
1993	77	(144)*	N/A*	252
1994	91	142	70	303
1995	104	122	70	296
1996	90	123	65	278

*Prior to 1994 data on Pre-Techs were not separated from AAS enrollment and is therefore Not Available. Approximate numbers from estimates put pre-techs at 60-90.

When the current plastics building was being designed, the enrollment model used to determine floor space, classroom needs, laboratory and equipment needs, faculty requirement, etc. was set at: 60 Freshmen admitted to the AAS program each fall and 30 Juniors admitted into the BS program each year. As you can see actual enrollment has greatly exceeded these original quotas. (This has actually been the case since 1987, the year the current facility was completed.) It should be noted that the total enrollment levelling off at 260 to 290 every year is not just a coincidence. This is due to the uniform number of backlog (applicants awaiting entry into the technical portion of the program). Most students who enter the program after being a pre-tech for one year, usually finish the four year program in 3 to 3.5 years. Several years ago in an attempt to relieve this backlog, all these pre-techs were admitted into the program. Surprisingly the backlog quickly fill right back up to the same level. (There is always a backlog of approximately 60-100 by Nov. - Feb.). This happens to be close to the numbers we admit every year into

the program. Therefore subsequent reasoning goes like this: **Most applicants are willing to wait one year to gain entry into the plastics program but most are not willing to wait two.** In other words, we have no idea what the limit of the total enrollment would be if the model for the plastics programs were infinitely expanded.

Plastics Technology; Plastics Engineering Technology

APRC 1996-1997

Section 4 of 4

PROGRAM PRODUCTIVITY AND COST

The data tables supplied here were developed by the Office of Institutional Studies at Ferris. The data is in teaching cost per student credit hour, which is basically derived by multiplying the number of course credits by the number of students taking the course and dividing this number into the instructor's semester salary plus fringe. Thus the factors that affect this number negatively are: 1)Laboratory which count for fewer credits per hour than lectures 2)Small lecture and lab sections. At first glance, this seems simple enough. To increase productivity and reduce costs, just reduce lab hours or completely eliminate labs altogether, increase the number of students in any remaining labs and combine more lab sections with each lecture. However, if this were done the quality of the educational experience would be affected negatively. 1)Less *hands-on* time, which is a major selling point of the program; 2)More equipment down-time and more safety related issues by having three or more students per machine; 3)Less personalized teaching methods would have to be adopted. The absolute necessity of the *hands-on* experience of the labs is stated again and again in the graduate survey, advisory board perceptions, student survey, and faculty perceptions. The overall value of the program would be greatly diminished by using this type of data exclusively to judge a program's overall productivity. With all that said, the program teaching cost per student credit hour for the Plastics Technology AAS program is $134.35, which gives it a ranking of 51 out of 134 programs at Ferris. This means that 38% of the programs at Ferris are more expensive to teach. The Plastics Engineering Technology BS program ranks 76 at $121.09 per credit hour. Thus, 57% of the programs at Ferris are more expensive. When weighted against the quality of student produced, this would appear, indeed, to be a bargain.

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Pharmacy/Add-on Pharm.D (Yrs 6 & 7)	71	$56,003.64	$788.78
Pharmacy/Track-in Pharm.D (Yrs 3,4,5 & 6)	149	$64,967.08	$437.49
Technical Education BS (Yrs 3 & 4)	103	$34,265.52	$332.67
Allied Health Education BS (Yrs 3 & 4)	104	$34,265.52	$329.48
Optometry OD (Yrs 3,4,5 & 6)	163	$53,652.49	$329.16
Info Systems Mgt/Information Systems Emphasis MS	31	$9,773.83	$315.28
Business Education/Secretarial Science BS	142	$43,882.03	$309.03
Wage Earning Home Economics Education BS	135	$38,680.16	$286.52
Indust & Environ Hlth Mgt (Gen Env Hlth option) BS	134	$37,611.75	$280.68
Business Education/General Business BS	142	$37,974.28	$267.42
Business Education/Accounting BS	142	$37,684.49	$265.38
Opticianry AAS	68	$18,004.38	$264.77
Business Education/Marketing/Distributive Edu BS	142	$37,196.19	$261.95
Printing Technology AAS	65	$15,535.43	$239.01
Info Systems Mgt/Quality Improvement Emphasis MS	31	$7,339.88	$236.77
Vision Science BS (Yrs 3 & 4)	82	$18,662.37	$227.59
Automotive Service Technology AAS	68	$14,613.47	$214.90
Career and Tech Educ/Postsecondary Admin MS	32	$6,619.31	$206.85
Manufacturing Tooling Technology AAS	68	$13,900.29	$204.42
Welding Engineering Technology BS (Yrs 3&4)	71	$13,904.75	$195.84
Medical Technology (Career Mobility) BS (Yrs 3&4)	72	$14,043.27	$195.05
Info Systems Mgt/Accounting Emphasis MS	31	$5,974.38	$192.72

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rsl

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Electrical/Electronics Engr Technology BS (Yrs 3 & 4)	70	$12,335.40	$176.22
International Business Certificate	12	$2,111.53	$175.96
Technical Drafting and Tool Design AAS	67	$11,275.86	$168.30
Heavy Equipment Service Eng Tech/Mfg Opt BS(Yrs 3&4)	65	$10,624.84	$163.46
Heavy Equipment Technology AAS	67	$10,876.11	$162.33
HVACR Technology AAS	68	$10,955.29	$161.11
Career and Tech Educ/Administrative Cert MS	32	$5,142.52	$160.70
Architectural Technology AAS	66	$10,446.74	$158.28
Heavy Equipment Service Eng Tech/Maint Opt BS(Yrs 3&4)	66	$10,412.30	$157.76
Industrial Electronics Technology AAS	66	$10,383.91	$157.33
Training in Business and Industry BS (Yrs 3 & 4)	100	$15,597.70	$155.98
Actuarial Science BS	120	$18,694.23	$155.79
Printing Management BS (Yrs 3 & 4)	64	$9,889.89	$154.53
Career and Tech Educ/Career & Tech Instr MS	32	$4,844.52	$151.39
Career and Tech Educ/Human Resource Dev MS	31	$4,680.41	$150.98
Manufacturing Engineering Technology BS (Yrs 3&4)	79	$11,784.23	$149.17
Mechanical Engineering Technology AAS	68	$10,091.29	$148.40
Visual Communication BS	130	$19,206.08	$147.74
Legal Assistant AAS	64	$9,413.36	$147.08
Automotive Body AAS	63	$9,189.41	$145.86
Nursing AAS	72	$10,495.87	$145.78
Facilities Management BS (Yrs 3 & 4)	67	$9,679.08	$144.46

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rnl

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Technical and Professional Communication BS	124	$17,393.56	$140.27
Civil Engineering Technology AAS	66	$9,188.15	$139.21
Surveying Engineering BS	138	$19,031.75	$137.91
Biotechnology BS	131	$17,765.67	$135.62
Welding Technology AAS	67	$9,063.44	$135.28
Computer Information Systems/Management BS	153	$20,575.53	$134.48
→ Plastics Technology AAS	70	$9,404.37	$134.35
Public Relations BS	127	$17,037.27	$134.15
Medical Laboratory Technology AAS	70	$9,339.39	$133.42
Building Construction Technology AAS	63	$8,404.99	$133.41
Accountancy/Finance BS	137	$18,224.84	$133.03
Real Estate Certificate	30	$3,984.57	$132.82
Computer Information Systems/Marketing BS	142	$18,656.14	$131.38
International Business BS	127	$16,648.42	$131.09
Human Resource Management BS	123	$16,102.23	$130.91
Applied Mathematics BS	120	$15,695.06	$130.79
HVACR Engineering Technology BS (Yrs 3 & 4)	65	$8,484.37	$130.53
Ornamental Horticulture Technology AAS	60	$7,815.17	$130.25
Computer Information Systems BS	127	$16,359.97	$128.82
Surveying Technology AAS	61	$7,810.24	$128.04
Accountancy/Computer Information Systems BS	128	$16,387.74	$128.03
Dental Technology AAS	61	$7,808.80	$128.01

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rsl

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Pharmacy BS (Yrs 3,4 & 5)	94	$11,910.73	$127.39
Television Production BS	129	$16,256.29	$126.02
Visual Communication AAS	66	$8,250.76	$125.01
Advertising BS	125	$15,539.53	$124.32
Indust & Environ Hlth Mgt (Indust Safety option) BS	121	$15,038.81	$124.29
Marketing/Sales BS	127	$15,742.44	$123.96
Mathematics Education BS	142	$17,586.63	$123.85
Automotive and Heavy Equipment Mgt BS (Yrs 3&4)	67	$8,256.15	$123.23
Product Design Engineering Technology BS (Yrs 3&4)	69	$8,470.57	$122.76
→ Plastics Engineering Technology BS (Yrs 3 & 4)	64	$7,749.78	$121.09
Construction Management BS	130	$15,581.29	$119.86
Finance BS	125	$14,881.61	$119.05
Accountancy (Public Accounting Track) BS	124	$14,755.44	$119.00
Quantitative Business BS	125	$14,831.79	$118.65
Dental Hygiene AAS	77	$9,088.61	$118.03
Industrial Chemistry Technology AAS	63	$7,423.71	$117.84
Accountancy (Professionally Directed Track) BS	123	$14,466.05	$117.61
Indust & Environ Hlth Mgt (Haz Waste option) BS	130	$15,281.41	$117.55
Health Information Technology AAS	63	$7,404.53	$117.53
Retailing BS	127	$14,906.13	$117.37
Indust & Environ Hlth Mgt (Indust Hyg option) BS	127	$14,875.92	$117.13
Medical Technology (Integrated) BS	136	$15,913.82	$117.01

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rpt

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Accountancy (Cost/Managerial Track) BS	124	$14,486.76	$116.83
Social Work BSW	128	$14,930.54	$116.64
Real Estate AAS	62	$7,187.89	$115.93
Food Service Management AAS	65	$7,513.17	$115.59
Health Information Management BS	123	$13,948.00	$113.40
Child Development AAS	70	$7,918.31	$113.12
Insurance BS	124	$14,018.60	$113.05
Insurance/Real Estate BS	124	$14,005.63	$112.95
Marketing BS	127	$14,334.87	$112.87
Music Industry Management BS	127	$14,298.93	$112.59
Management BS	123	$13,841.22	$112.53
Biology Education BS	120	$13,343.85	$111.20
Retailing AAS	67	$7,382.76	$110.19
Operations Management BS	124	$13,584.54	$109.55
Nuclear Medicine Technology BS	128	$13,882.03	$108.45
Professional Golf Management BS	126	$13,551.42	$107.55
Nursing BSN (Yrs 3 & 4)	60	$6,418.87	$106.98
Business Administration BS	124	$13,146.47	$106.02
Hospitality Management BS (Yrs 3 & 4)	69	$7,311.78	$105.97
Professional Tennis Management BS	129	$13,558.52	$105.10
Recreation Leadership & Mgt/Leisure Service Track BS	128	$13,452.26	$105.10
Recreation Leadership & Mgt/Aquatic Track BS	128	$13,413.15	$104.79

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rsl

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Small Business Management BS	123	$12,746.44	$103.63
Health Care Systems Administration BS	128	$13,234.58	$103.40
Recreation Leadership & Mgt/Outdoor-Adv Edu Track BS	128	$13,224.60	$103.32
Pre-Teaching (Elementary or Secondary) AA	65	$6,559.11	$100.91
CJ/Law Enforcement Specialist BS (Yrs 3 & 4)	67	$6,572.08	$98.09
Recreation Leadership & Mgt/Corp Fitness-Well Track BS	128	$12,486.58	$97.55
Chemistry Education BS	126	$12,209.71	$96.90
Nuclear Medicine Technology AAS	66	$6,258.48	$94.83
Applied Biology BS	120	$11,297.28	$94.14
General Business AAS	63	$5,911.54	$93.83
Pre-Law AA	60	$5,528.71	$92.15
Pre-Social Work AA	60	$5,528.71	$92.15
Liberal Arts AA	60	$5,499.74	$91.66
Pre-Mortuary Science AS	60	$5,455.38	$90.92
Pre-Optometry AS	60	$5,455.38	$90.92
Pre-Veterinary Medicine AS	60	$5,448.79	$90.81
Pre-Dentistry AS	60	$5,426.42	$90.44
Pre-Engineering AS	60	$5,426.42	$90.44
Pre-Medicine AS	60	$5,426.42	$90.44
Pre-Pharmacy AS	60	$5,426.42	$90.44
Pre-Criminal Justice AA	64	$5,783.19	$90.36
CJ/Generalist-Corrections BS (Yrs 3 & 4)	65	$5,565.97	$85.63

Source: Office of Institutional Studies, g:\...\progcost\9596\rankprg.rsl

Table II

Program Teaching Costs per Student Credit Hours Ranked High to Low
1995-1996 Data
(Teaching Costs Include Fringes)

Program Name and Degree	Credit Hours	Total Teaching Cost	Total Teaching Cost / Cr Hrs
Respiratory Care AAS	69	$5,820.13	$84.35
Radiography AAS	78	$4,529.46	$58.07

Source: Office of Institutional Studies, g:\..\progcost\9596\rankprg.rnl

Ferris State University

Program Teaching Cost 1995 - 1996 (Summer, Fall, and Winter)

Program Name: Plastics Technology AAS

College : Technology

Department : Manufacturing Engineering Technology

Total Program Teaching Cost (Assumes a student will complete program in one year) **$9,404.37**

Cost per SCH (Average for program) **$134.35**

Program Credits Required (Total credits to graduate) **70**

Course ID	Level	FSU's Teaching Cost	FSU's Student Credit Hours (SCH) Produced	Teaching Cost/SCH	Credits Required	Program Teaching Cost
ANTH122	L	$44,896.77	591.00	$75.97	3.00	$227.90
CADD143	N	$11,276,502.01	85,528.42	$131.85	2.00	$263.69
CHEM121	L	$134,459.40	2,175.00	$61.82	5.00	$309.10
CHEM211	L	$40,485.12	260.00	$155.71	4.00	$622.85
COMM121	L	$230,660.44	2,607.00	$88.48	3.00	$265.43
CULTELE	E	$1,723,377.04	17,035.00	$101.17	3.00	$303.50
EEET227	L	$14,280.19	96.00	$148.75	2.00	$297.50
EGRG140	N	$11,276,502.01	85,528.42	$131.85	2.00	$263.69
ENGL150	L	$691,277.61	6,243.00	$110.73	3.00	$332.19
ENGL250	L	$526,858.51	4,272.00	$123.33	3.00	$369.98
MATH116	L	$185,666.97	1,720.00	$107.95	4.00	$431.78
MATH126	L	$106,051.66	1,156.00	$91.74	4.00	$366.96
MECH250	L	$17,473.72	124.00	$140.92	2.00	$281.83
MFGT150	L	$58,797.43	276.00	$213.03	2.00	$426.07
PHYS211	L	$119,374.03	1,572.00	$75.94	4.00	$303.75
PLTS110	L	$20,180.73	189.00	$106.78	3.00	$320.33
PLTS121	L	$41,848.30	171.00	$244.73	3.00	$734.18
PLTS193	L	$33,668.48	196.00	$171.78	4.00	$687.11
PLTS211	L	$59,030.27	236.00	$250.13	4.00	$1,000.51
PLTS212	L	$26,991.35	84.00	$321.33	2.00	$642.65
PLTS220	L	$11,260.95	240.00	$46.92	4.00	$187.68
PLTS223	L	$45,940.07	240.00	$191.42	4.00	$765.67

Table III

Teaching Cost per Student Credit Hour by Course - Alpha by Course 1995-1996 Data

(Teaching Costs Include Fringes)

Course ID	Level	Course Description	Teaching Cost Per Credit Hour
PHOT201	N	Photography	$131.85
PHPR301	U	Pharmacy Practice	$0.00
PHPR510	G	Pharmacy Practice	$238.45
PHPR520	G	Pharmacy Practice	$352.52
PHPR530	G	Pharmacy Practice	$15.90
PHPR531	G	Pharmacy Practice	$211.23
PHPR532	G	Pharmacy Practice	$133.50
PHPR540	G	Pharmacy Practice	$398.25
PHPR541	G	Pharmacy Practice	$42.85
PHPR542	G	Pharmacy Practice	$54.77
PHPR561	G	Pharmacy Practice	$223.24
PHPR562	N	Pharmacy Practice	$131.85
PHRMELE	E	Elective	$266.25
PHSC120	L	Physical Science	$137.76
PHYS130	L	Physics	$60.70
PHYS211	L	Physics	$75.94
PHYS212	L	Physics	$92.20
PHYS241	L	Physics	$122.33
PHYS242	L	Physics	$150.72
PHYS311	N	Physics	$131.85
PLSC121	L	Political Science	$66.00
PLSC225	N	Political Science	$131.85
PLSC311	U	Political Science	$79.40
PLTS110	L	Plastics Engineering Technology	$106.78
PLTS121	L	Plastics Engineering Technology	$244.73
PLTS193	L	Plastics Engineering Technology	$171.78
PLTS211	L	Plastics Engineering Technology	$250.13
PLTS212	L	Plastics Engineering Technology	$321.33
PLTS220	L	Plastics Engineering Technology	$46.92

Source: Office of Institutional Studies, g:\...\progcost\9596\alphapre

Table III

Teaching Cost per Student Credit Hour by Course - Alpha by Course 1995-1996 Data

(Teaching Costs Include Fringes)

Course ID	Level	Course Description	Teaching Cost Per Credit Hour
PLTS223	L	Plastics Engineering Technology	$191.42
PLTS300	U	Plastics Engineering Technology	$161.29
PLTS312	U	Plastics Engineering Technology	$122.65
PLTS321	U	Plastics Engineering Technology	$179.42
PLTS325	U	Plastics Engineering Technology	$0.00
PLTS342	U	Plastics Engineering Technology	$110.15
PLTS393	U	Plastics Engineering Technology	$167.44
PLTS400	U	Plastics Engineering Technology	$89.04
PLTS411	U	Plastics Engineering Technology	$213.11
PLTS499	U	Plastics Engineering Technology	$83.10
PMGT351	U	Printing Management	$138.01
PMGT361	U	Printing Management	$253.52
PMGT362	U	Printing Management	$113.14
PMGT383	U	Printing Management	$216.29
PMGT393	U	Printing Management	$280.24
PMGT432	U	Printing Management	$352.11
PMGT499	U	Printing Management	$278.09
PREL340	U	Public Relations	$134.21
PREL341	U	Public Relations	$80.30
PREL342	U	Public Relations	$72.27
PREL440	U	Public Relations	$382.21
PREL455	U	Public Relations	$277.97
PREL491	U	Public Relations	$336.92
PSYC150	L	Psychology	$74.03
PSYC226	L	Psychology	$82.99
PSYC231	L	Psychology	$99.18
PSYC241	L	Psychology	$108.93
PSYC310	U	Psychology	$96.64
PSYC325	U	Psychology	$111.50

Source: Office of Institutional Studies, g:\...\progcost\9596\alphapre

Plastics Program Review

Key areas of assessment as defined by the Academic Program Review Committee

I. Centrality to FSU Mission

The Plastics programs are focused to meet the objectives defined by the FSU Mission Statement and the College of Technology Mission Statement. The achievement of high academic goals by the plastics students and high professionalism and technical skills of the faculty are reflected by the fact that 100% of the plastics graduates obtain meaningful positions, they are offered high starting salaries, and there is a one year waiting list of students who want to be admitted into the Plastics Programs.

II. Uniqueness and Visibility

The field of Plastic Engineering Technology is unique. University-level education in this field is limited to less than 15 colleges/universities within the United States. The Ferris Plastics programs are unique in that of these universities only three have committed to develop a true presence by constructing a dedicated facility. The Ferris program has true national visibility and is on the threshold of being recognized world-wide as the leader in plastics engineering technology education.

III. Service to State and Nation

In addition to the nurturing and cultivation of plastics graduates, the Plastics Programs and faculty initiatives have been actively involved in support of local programs such as the (MOISD) Mecosta-Osceola Independent School District technology programs, state-wide essay contests for middle school students on plastics and the environment, activities involving the State of Michigan economic development councils and the (MMTC) Michigan Manufacturing Technology Center.

On a national basis, the Plastics programs and its faculty were key in developing protocols for the (SPI) Society of the Plastics Industry and supporting the (NEC) National Elastomer Center being developed at Ferris.

One of the proudest moments in the history of the Plastics Programs was the international recognition of Professor Henry Tschappat (retired program director) in 1992 as the (SPE) Society of Plastics Engineers Educator of the Year.

IV. **Demand for Students**

The Plastics Programs sustain a constant six month to one year backlog of students waiting to be admitted into the program. High school students are encouraged to apply in their junior year to ensure direct entrance into the freshman class and first year of the program. The uniqueness of the program as well as the outstanding career skills offered the students is also highlighted by the fact that several presidents and key managers of plastics companies send their children to FSU for their plastics education.

V. **Quality of Instruction**

It is understood that the continued commitment to preserving and improving the quality of instruction within the Plastics programs is key to maintaining the outstanding performance statistics of the program.

The quality of instruction is reflected in the surveys and comments of the Plastics Programs' graduates and their employers. The diversity of the industry-experienced faculty allows the students to have an educational experience that accurately emulate what they will need to know upon graduation.

The quality of instruction is further enhanced by the fact that the faculty maintain their technical currency by being actively involved with the plastics industry throughout the nation, and they are committed to securing state-of-the-art equipment through these contacts.

Plastics faculty members have embraced new teaching methods and technology and are pioneers in the use of multimedia instruction in the classroom.

Active involvement and management of the Plastics Programs Internships provides the student with relevant industrial experience.

VI. **Demand for Graduates**

As stated previously, the demand for the graduates of the FSU Plastics Programs has resulted in virtually a 100% placement record over the past 6 years. Demographics show that the plastics industry's growth and the upcoming retirement of baby-boomers will keep the demand for Ferris Plastics graduates at a high level well in to the next century.

VII. **Service to Non-Majors**

The Plastics Programs offer classes to both the Manufacturing Engineering Technology and Product Design Engineering Technology students. These non-major offerings have been very well received and there have been several requests to increase the number of non-major offerings. In addition to required course offerings, the plastics faculty provides a variety of lectures to the Welding Engineering Technology and Automotive Technology programs.

VIII. **Facilities and Equipment**

As noted in the separate section on Facilities and Equipment, the original model for the current Plastics Engineering Technology building was 180 students. This model was surpassed the day the new building opened 9 years ago.

The rapid growth of the program along with the fact that the plastics curriculum is capital-intensive has created an over-crowded condition that is impeding program growth. The dynamics of moving consigned equipment to maintain technical currency and relevance compounds the over-crowding.

The maintenance effort for the capital-intensive laboratories is inadequate. The maintenance staff is one and has not been augmented in the past decade. The technical level of the current maintenance is limited and is reactive based as opposed to proactive. There is a need to develop and use a viable preventive program.

IX. **Library Informational Services**

The Plastics Programs utilize three key referencing areas:

1. The University Library
2. The Plastics Programs Reference Room
3. On-line information via the World Wide Web

Conventional resource centers are currently inadequate to meet the current needs of the students and faculty, Plastics Engineering Technology is dynamic. Conventionally published books are excellent for source texts, but are usually 1 to 3 years behind the latest technological advances.

The Plastics Engineering Technology Center has a small reference room that offers students several publications for reference. Unfortunately, there are few subscriptions and the majority of this material is supplied by industry several months after the date of publication.

As the technology to access information advances the Plastics programs are trending toward a (POI)Point of Instruction need for reference information. The World Wide Web has the potential to meet this need.

The conventional paradigm of students going to the library building to do research work is outdated. The library needs to come to the students. This is clearly demonstrated by the fact that the plastics students and faculty have gravitated to the *information superhighway.* This activity now adds to an already congested situation where there are insufficient computers for students.

X. **Cost**

Cost is an area that is very difficult to quantify. One way program cost can be approached is in teaching cost per student credit hour as seen in Section 11-Productivity and Cost. However, there are many more expense factors involved in the education of a student than just the professor's wages plus fringe. There are utilities, supplies, equipment and tooling costs, maintenance costs, administrative support costs, etc., all of which can be sizable in the case of operating a manufacturing lab facility. Therefore, a better alternative method to capturing program cost might be to tally up all the funding sources (see Facilities and Equipment Evaluation) for the program in addition to faculty and staff salaries plus fringe. But even this understates a program's cost because this assumes that the program is being adequately funded when in fact this may not be the case at all. As in the case of our plastics program, we often have equipment down for long periods of time because of inadequate funds being available for parts. Often equipment is simply not use because material is not available due to the lack of funds. Equipment needs calibration, filters, hydraulic fluid, etc. When this type of maintenance cannot be performed in a timely fashion due to funding short-falls, we usually experience equipment failure or sub-par performance. So as you can see the cost of a program can be quite elusive. Even if the actual true cost of the Plastics programs could be captured, there isn't comparable cost data existing for other programs to be used as a basis for comparison. It is important to realize that there are less than 15 schools in the nation that do what we do, and that the Ferris State Plastics Program has a strong reputation for producing high-quality graduates who are ready to go to work. Looking at the cost data that does exist, leads one to believe that the state, the student, and industry are all getting a bargain.

XI. **Faculty Professional and Scholarly Activities**

The faculty within the Plastics Programs maintain a high degree of Professional and Scholarly activity.

On a state and national level several faculty are active in such organizations as the Society of Plastics Engineers, the Society of the Plastics Industry, the Society of Manufacturing Engineers, and the ASM International. In addition to

membership in these organizations many faculty are members of directing boards.

Several plastics faculty have written books on such diverse subject as Plastics Product Design, Plastics Processing, Equipment Set-up, and Plastics Materials.

Plastics faculty are active in the presentation of technical papers which they have written as well as working with interested students to cultivate their participation in the presentation of technical papers. The faculty is also active in supporting industry through consulting, seminars, and training and field trips.

XII. **Placement rates and salary levels**

Placement rates for plastics graduates are consistently very high (better than 90%) before actual graduation and virtually 100% within three months after graduation. This high rate of placement is driven by the plastics industry's growth and insatiable desire for plastics professionals (see Labor Market Analysis) and by the reputation of the Ferris State Plastics Program which highlights "hands-on" experience (see Graduate and Employer Surveys).

Plastics average starting salaries are near the highest both in the College of Technology and in the University. This is not a recent trend but rather goes back to the early 80's. The average BS starting salary in 1995 was $35,000, as opposed to $30,800 for the College of Technology and $28,700 for the University. Unfortunately, there are not enough AAS graduates that leave the program and go right to work (as opposed to pursuing a Bachelor Degree) to make any salary data significant. What data does exist shows high starting salaries for AAS graduates with or without a related bachelor degree.

XIII. PLASTICS PROGRAM SELF-EVALUATION - ADMINISTRATIVE EFFECTIVENESS

The Plastics Program has been historically managed by a Program Director. In reviewing the directorship over the past 5 years, there have been 2 existing Program Directors. This, however, is due to change within the next month or so, as the management of the program will reside with a new administrator/person (The Director of the Elastomer Center) - to be hired shortly. As we anticipate the near future, let's review the program administrative effectiveness over the last 5 years.

Prior to the 1993/94 school year, Henry Tschappat served as director. Henry saw to the construction of the current dedicated building and built the program up to a level of prominent recognition during his tenure. In the latter couple of years of his term, Henry developed medical problems which led to curtailed duties and diminished time dedicated to the program. As such, the early 1990 years were much less administratively effective than what they had been.

In the 1993/94 school year Eugene Whitmore assumed the directorship of the program. In the wake of the declining emphasis and direction left from Henry, Gene needed to devote 150% of all his efforts on the management of the program and the leading of the faculty. However, the growth of the program and the need for additional (initial requests were denied) faculty left Gene with the increasing load of both administrative and instructional duties. Without prior administrative experience, and a latter realization that this position and its duties were not a good personal fit for him, Gene has petitioned for and been granted a return to faculty status.

In summary of the tenure of Gene, again a lack of the needed administrative strength has fallen short of its' mark. Health problems also plague Gene and it is hoped that he will have a successful return to faculty. Meanwhile, the program now is in *desperate* need of a successful leader. The identification of those duties which would earmark a shift towards positive leadership and successful management include:

- Definition of and building a program "model" with goals/objectives/procedures for all pertinent issues (equipment, class sizes, maintenance, scheduling).
- Leadership of the Advisory Committee and its' functions.
- Heading up program structure and curriculum changes.
- Re-affirming student relations and academic affairs to re-position the prominent recognition of the program.

- Supporting faculty positions to negative administrative initiatives to assure the continued developed integrity of the program.
- Leading the recruiting and "image" efforts of the program.
- Building and maintaining the industry relationships which assure continuous support of state-of-the-art equipment and supplies for our lab activities and program in general.
- Establish a proper program priority level within the College of Technology which reflects the program's success and assures things like scheduling priorities with our students.
- Leads the efforts of the faculty group in a unified, cohesive direction.

As such, one can surmise that the administrative effectiveness of the program has "not been" in recent history. But a willing staff is in place to help a successful leader carry the program into the future - a very long and successful future.

ADMINISTRATIVE PROGRAM REVIEW

Program/Department: Pre-Plastics/Plastics Technology/Plastics Engineering Technology/MFGE

Date Submitted: November 27, 1995 Dean: L. Keys

Please provide the following information:

Enrollment/Personnel

	Fall 1992	Fall 1993	Fall 1994	Fall 1995	Fall 1996
Tenure Track FTE		7.37	6.65		
Overload/Supplemental FTEF					
Adjunct/Clinical FTEF (unpaid)					
Enrollment on-campus Total*	0/189/91	31/144/77	70/142/91	70/122/104	
Freshman	0/70/0	31/87/0	41/60/0	33/63/0	
Sophomore	0/119/0	0/57/0	2/82/0	1/59/0	
Junior	0/0/20	0/0/51	12/0/53	14/0/54	
Senior	0/0/71	0/0/26	15/0/38	22/0/50	
Masters					
Doctoral					
Enrollment off-campus*		8	9	9	

*Use official count (7-day count for semesters, 5-day count for quarters).

Financial

Expenditures	FY91	FY92	FY93	FY94	FY95
Supply & Expense	$23,000	$21,000	$16,000	$11,000	$20,000
Equipment					
Gifts & Grants	$173,000	$131,000	$63,000	$72.000	$17,000

*Use end of fiscal year expenditures.

Other

	AY 90-91	AY 91-92	AY 92-93	AY 93-94	AY 94-95
Number of Graduates * - Total	//42/42	//47/52	//21/49	//49/61	44
- On campus	//44/42	//47/52	//21/49	//49/61	44
-Off campus					
Placement of Graduates	//42/33	//45/55	//21/42	//44/52	
Average Salary	$31,000	$31,000	$31,000	$33,000	
Productivity-Academic Year Average				301	371
-Summer					
Summer Enrollment	0/39/79	0/36/91	N/A	6/44/56	14/41/53

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

TABLE XI
Beginning Annual Salaries for
ALL BS and AAS Graduates
For the Year 1994-95

College/Degree Level	Number Reporting	Average Salary 1994-95	Average Salary 1993-94	% Change
ALLIED HEALTH				
Baccalaureate	39	$ 25,655	$ 24,912	+ 3.0
Associates	61	25,901	25,825	+ .2
ARTS & SCIENCES				
Baccalaureate	16	22,049	22,101	- .2
Associates	9	19,940	19,411	+ 2.7
BUSINESS				
Baccalaureate	178	23,477	22,733	+ 3.2
Associates	7	16,486	N/A	N/A
EDUCATION				
Baccalaureate	51	23,327	21,158	+ 10.3
Associates	N/A	N/A	N/A	N/A
OPTOMETRY				
Baccalaureate	N/A	N/A	N/A	N/A
Associates	11	17,452	N/A	N/A
PHARMACY				
Baccalaureate	63	46,844	45,067	+ 3.9
TECHNOLOGY				
Baccalaureate	165	30,825	29,367	+ 4.9
Associate	33	21,388	19,968	+ 7.1

NOTE: The above compilations were made from all reported salaries in respective fields (including those programs where less than 5 salaries were recorded.)

TABLE IX
Beginning Annual Salaries for
BACCALAUREATE Graduates
For the Year 1994 - 95

College/Curriculum	Number Reporting	Average Salary	Range High	Low
ALLIED HEALTH				
Health Information Management	5	$ 25,802	$ 37,000	14,560
Indus. & Envir Health Mgt.	15	24,842	30,000	16,640
Medical Technology	13	26,133	31,260	19,760
ARTS & SCIENCES				
Social Work	13	19,599	25,000	11,440
BUSINESS				
Accounting	17	26,377	35,000	17,680
Advertising	6	20,173	25,000	14,040
Business Administration	34	24,984	50,000	11,960
Computer Info Systems	20	29,995	36,000	20,800
Finance	5	27,180	34,500	14,400
Hospitality Management	11	23,085	33,000	14,040
Human Resource Management	5	22,720	29,000	15,600
Management	7	23,057	25,500	20,000
Marketing	5	18,056	24,000	14,400
Marketing/Pro Golf Mgt	25	18,129	36,000	12,000
Marketing/Retail	4	23,100	25,000	21,000
Marketing/Sales	10	25,676	40,000	18,000
Small Business Management	5	25,100	41,600	15,600
Visual Communications	7	18,769	30,000	15,000
EDUCATION				
Criminal Justice	38	22,912	32,500	10,560
OPTOMETRY	N/A	N/A	N/A	
PHARMACY				
Pharmacy				
Registered	53	49,600	56,680	25,000
Intern	10	32,246	42,000	20,800
TECHNOLOGY				
Auto & Heavy Equip Mgt.	16	31,958	40,000	20,800
Construction Management	16	28,633	38,000	23,400
Elec/Eltr Engr Tech	9	29,319	42,250	15,000
HVACR Engineering Tech	11	32,345	35,000	27,000
Manufacturing Engr Tech	13	34,031	42,000	26,000
Plastics Engr Tech	26	34,988	45,000	21,320
Printing Management	17	23,746	30,000	19,448
Product Design Engr Tech	19	31,270	53,000	17,680
Surveying	15	26,971	32,000	20,800
Welding Engineering Tech	15	37,068	47,840	25,560

NOTE: The above table includes only those curriculums where salary information was received from five or more students employed in positions related to their major.

TABLE XII
PERCENTAGE OF JOB SEEKING GRADUATES WHO REMAIN IN MICHIGAN
1994 - 1995

COLLEGE/DEGREE LEVEL	GRADUATES WORKING OR LOOKING FOR EMPLOYMENT		
	# OUT-OF-STATE	# IN STATE	% IN- STATE *
ALLIED HEALTH			
Baccalaureate	11	119	91.5
Associate	5	149	96.8
ARTS & SCIENCES			
Baccalaureate	5	49	90.7
Associate	1	22	95.7
BUSINESS			
Masters	1	5	83.3
Baccalaureate	128	354	73.4
Associate	N/A	27	100
EDUCATION			
Masters	2	16	88.9
Baccalaureate	20	171	89.5
Associate	2	6	7.50
OPTOMETRY			
Doctorate	8	13	61.9
Baccalaureate	N/A	N/A	N/A
Associate	2	18	90.0
PHARMACY			
Doctorate	2	6	7.50
Baccalaureate	5	72	93.5
TECHNOLOGY			
Baccalaureate	48	191	79.9
Associate	11	62	84.9
TOTAL (GRADUATE DEGREES)	13	40	74.1
TOTAL (BACHELOR DEGREES)	217	956	81.5
TOTAL (ASSOCIATES DEGREES)	21	284	93.1
TOTAL ALL GRADUATES	251	1280	83.6 **

* Percentage based on all respondents reported as employed or still seeking employment.

** Compares to 84.3 in 1993-94

TABLE VIII CONTINUED
Placement Profile for Graduates
in the College of TECHNOLOGY
1994-95

CURRICULUM	Employed		Continuing Education				Not Seeking Employment	Seeking Employment	Unknown	TOTAL
			Ferris State		Other Instit.					
	Major Field	Not Related	Under-grad.	Grad.	Under-grad.	Grad.				
ASSOCIATE DEGREES										
Architectural Tech	2	1	6	0	1	0	0	0	2	12
Automotive Body	1	0	3	0	0	0	0	0	4	8
Automotive Eng Machine Tech	1	1	3	0	1	0	0	0	3	9
Automotive Service	13	2	13	0	0	0	0	1	12	41
Building Const Tech	5	0	14	0	0	0	0	1	4	24
Civil Engineering Tech	1	1	3	0	0	0	0	0	1	6
Heavy Equipment Service	5	0	1	0	0	0	0	0	4	10
HVACR Technology	5	0	11	0	0	0	0	0	3	19
Industrial Eltr Tech	0	0	7	0	0	0	0	0	4	11
Manufacturing Tooling Tech	6	1	4	0	0	0	0	0	1	12
Mechanical Engr Tech	0	0	5	0	0	0	0	0	2	7
Plastics Technology	5	2	50	0	0	0	0	1	2	60
Printing	6	1	19	0	0	0	0	1	3	30
Surveying Technology	0	1	4	0	0	0	0	0	3	8
Tech Dftg & Tool Design	3	0	14	0	0	0	0	1	5	23
Technical Illustration	2	0	2	0	1	0	0	0	0	5
Welding Technology	2	1	12	0	0	0	0	0	1	16
TOTALS:	57	11	171	0	3	0	0	5	54	301

TABLE VIII
Placement Profile for Graduates
in the College of TECHNOLOGY
1994-95

CURRICULUM	Employed		Continuing Education				Not Seeking Employment	Seeking Employment	Unknown	TOTAL
			Ferris State		Other Instit.					
	Major Field	Not Related	Under-grad.	Grad.	Under-grad.	Grad.				
B.S. DEGREES										
Auto & Heavy Equip Mgt	23	1	0	0	0	0	0	0	13	37
Construction Management	19	0	0	0	0	0	0	1	6	26
Elec/Eltr Engr Tech	22	0	0	0	0	0	0	0	4	26
Facilities Management	10	0	0	0	0	1	0	1	2	14
Heavy Equip Serv Eng Tech	2	0	0	0	0	0	0	0	4	6
HVACR Engineering Tech	15	0	0	0	0	0	0	0	1	16
Manufacturing Engr Tech	25	2	0	0	0	0	0	1	3	31
Plastics Engr Tech	34	1	0	0	0	1	0	0	16	52
Printing Management	19	5	0	0	0	1	0	0	1	26
Product Design Engr Tech	21	0	0	0	0	0	0	1	7	29
Surveying	18	0	0	0	0	0	0	0	9	27
Welding Engineering Tech	18	0	0	0	0	0	0	0	1	19
TOTALS:	226	9	0	0	0	3	0	4	67	309

RECOMMENDATIONS

In reviewing the conclusions, it is apparent that the Plastics programs are viable and strong for a large number of reasons. One of the cornerstones of this success is the *hands-on* approach the programs take towards teaching saleable skills. The laboratory component of the plastics courses is vital in giving our students a practical understanding of many basic principles of manufacturing and their applications. This, in turn, also gives them a degree of confidence that allows our graduates to become productive workers much sooner than those programs that are solely lecture-based. All areas surveyed agree that the labs should not be eliminated, diminished, or diluted in form or content. Therefore, it is our recommendation that to maintain the quality level of education as well as the safety of the learning environment, the laboratory components of classes and their format should remain intact.

Internships also go along with the theme of *hands-on* learning. Internships provide a proving ground for newly acquired skills and knowledge as well as providing a forgiving introduction into the industry. Often, these internships lead to first job opportunities and can represent an excellent interface with industry that often performs the function of *selling* the program. The surveys tell us there is an overwhelming consensus that maintaining and perhaps even expanding the internship program is the course to be taken.

The methods used in teaching are another link to the *hands-on* learning experience. Whenever possible, individual instructors try to *tie* specific lecture material to the next immediate lab experience to drive home points of theory or to provide a chance to apply a principle just freshly presented. This sequence of events has proved to be quite successful in application. However, since instructors are not interchangeable, this method of

teaching relies on the same instructor teaching both lecture and lab components. Thus, if we are to maintain the degree of excellence in teaching, as noted in the surveys, it is recommended that the instructor teaching the lecture should also be the one instructing the laboratories.

Little, by way of active recruitment, has be done in the past 10-plus years. Because of the popularity of these programs (as noted by the ever-present backlog), recruitment has not been viewed as necessary. It is believed that by maintaining the high quality of our graduates, this ensures the continuation of near 100% placement rates and high starting salaries. This in turn is what's believed to be the driving force behind the high enrollments statistics.

The Plastics program has strong ties to industry. This is evident in a number of ways. Industry support is largely responsible for the current facilities, equipment, and supplies we use to teach. This shows the plastics industry's strong commitment to the program and Ferris. However, this is an on-going effort on the part of all involved including the faculty, past graduates, the advisory board, and industry contacts. Faculty and staff must be recognized for their effort in building new relationships with industry and maintaining old ones as well. There must be time and funds allocated for such activities.

Lack of leadership has left the program with some current deficiencies:
A financial and physical model for the future (encompassing numbers and type of equipment, laboratory layouts and space, ideal student-to-faculty ratios, etc.) needs to be developed if we are to remain a dynamic program with the flexibility required in this area of fast changing technology. And, of course, a model is vital if a growth mode is ever going to be assumed in the future.

Scheduling is a challenge, for both students and faculty alike. This problem needs to be addressed to optimize the learning experience and to allow students to graduate on time. One possibility is to eliminate the large backlog of students. These students typically take so many support courses while waiting that they go through the program in 3 to 3.5 years. This, combined with a large number of transfers students, make it very difficult to predict the number of courses to offer. However, this would require a model to determine the requirements necessary to expand the program without sacrificing the quality of instruction.

An assessment instrument needs to be developed to quickly, accurately, and fairly determine the deficiencies of transfer students from the community colleges and other universities. Such a tool would in turn also aid in scheduling.

Currently, the programs are undergoing a curricula revision. This is tentatively scheduled to be effective the Fall semester of '98. From the survey it was found that more of our graduates are going into mold/part design related fields and many of our past graduates have suggested more in-depth course coverage in these areas. The current mold and part design classes should be assessed for improvement and/or expansion. Per graduate suggestions, the inclusion of automotive topics either as a technical elective or an addition to existing class(es) needs to be studied.

The reference library needs to have a budget for subscriptions to trade magazines and more reference texts for student use.

Better access to computers, as cited by our current students, is necessary. A computer room with at least 12 stations within the plastics building will give students greater access

5. Use of Information on Labor Market

Average Score 3

5	4	3	2	1

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

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

6. Use of Profession/Industry Standards

Average Score 3.8

5	4	3	2	1

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

1: 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 3.6

5	4	3	2	1

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

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

8. Relevance of Supportive Courses

Average Score 2.2

5	4	3	2	1

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

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

9. Qualifications of Administrators and Supervisors Average Score 1.8

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 3.4

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

11. Facilities Average Score 3.4

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 2.2

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 program are significantly under-or-over-scheduled

13. Equipment Average Score 2.8

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 4.2

5	4	3	2	1

Instruction in all courses required for this program recognizes and responds to individ- 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 not consider individual student differences

15. Adequate and Availability of Instructional Materials and Supplies

Average Score 2.6

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

Appendix
I

PROGRAM REVIEW PANEL EVALUATION FORM

Program PLASTICS (ENG) TECHNOLOGY AAS/BS

Instructions: Circle the number which most closely describes the 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 forced to find positions of their field

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

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 program 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 individ- 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 not 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

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Program PLASTICS (ENG) TECHNOLOGY AAS/BS

Instructions: Circle the number which most closely describes the 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 forced to find positions of their field

5. Use of Information on Labor Market

Average Score ____

5	4	3	2	1

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

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

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 program 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 individ- 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 not 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

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PROGRAM REVIEW PANEL EVALUATION FORM

Program PLASTICS (ENG) TECHNOLOGY AAS/BS

Instructions: Circle the number which most closely describes the 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 forced to find positions of their field

5. Use of Information on Labor Market

Average Score ____

5	4	(3)	2	1

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

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

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 program 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 individ- 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 not 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

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Program PLASTICS (ENG) TECHNOLOGY AAS/BS

Instructions: Circle the number which most closely describes the 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

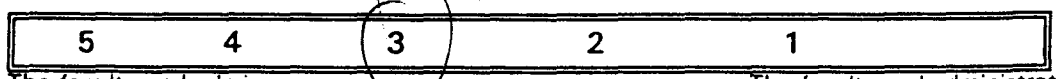
3. Advisory Committee Perceptions of Program — Average Score ____

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 forced to find positions of their field

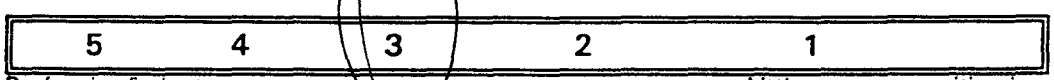
5. Use of Information on Labor Market — Average Score ____



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

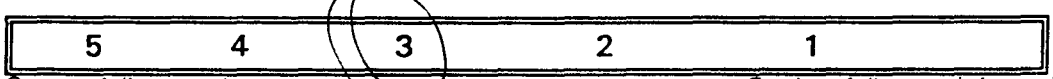
6. Use of Profession/Industry Standards — Average Score ____



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

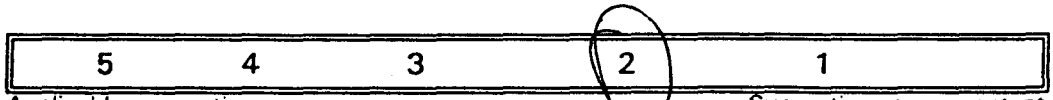
7. Use of Student Follow-up Information — Average Score ____



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 ___

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

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 program 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 individ- 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 not 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

Appendix
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PROGRAM REVIEW PANEL EVALUATION FORM

Program PLASTICS (ENG) TECHNOLOGY AAS/BS

Instructions: Circle the number which most closely describes the 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 forced to find positions of their field

5. Use of Information on Labor Market

Average Score ____

5	4	3	2	1

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

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

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 program 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 individ- 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 not 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