Outline for 2007-2008 Self-Study Report

Criterion

1. Brief program profile –no longer than one page and include the following:

a Name of academic program.

Mechanical and Manufacturing Engineering Technology

b Brief Description –

Mechanical Engineering Technology focuses on the relationship between design and performance of parts and products, where
Manufacturing Engineering Technology focuses on different manufacturing methods and practices vital in the production of high quality devices.

The mechanical and manufacturing engineering technology graduates will be prepared to create efficient solutions to problems in design, material applications, process analysis, computer applications, quality assurance, quality control, product testing and analysis, automated fabrication and assembling, and the management of production.

This program is designed to provide students with the knowledge and skills needed to succeed in today's industrialized society. Modern industrial societies are centered on the successful production, distribution, and utilization of mechanized devices and techniques. Robust design methods are pivotal in the manufacturability, performance and economic feasibility of these devices. Together with study of the basic engineering principles, design is the corner stone of the Mechanical and Manufacturing Engineering Technology program.

c Name of person responsible for administering the program?
Professor Charles E. Hawkins

Position of person responsible for administering the program?

Chairman

If there is a special coordinator for this program, identify the current coordinator.
Morteza Sadat-Hossieny

d Department committees charged with monitoring the program and description of their function with regard to the program.

- MMET was evaluated by the [Technology] Accreditation Commission of ABET in fall 2007. "ABET will provide world leadership in assuring quality and in stimulating innovation in applied science, computing, engineering, and technology education".
- Industrial Advisory Committee
- Department Curriculum Committee
- Engineering Technology Faculty Group

2. Relationship to Institutional Mission– this section should delineate the ways in which the program's mission and goals align with those established by the broader university.

a. Provide program mission

The MMET Program will prepare graduates with technical knowledge, problem solving ability, managerial and hands-on skills to enter careers in process and system design, manufacturing operations, technical sales or service functions, maintenance, testing and evaluation of mechanical systems.

These graduates will:

1. Obtain a working knowledge of engineering materials, manufacturing processes, dynamics, applied mechanics, applied fluids, applied thermal services, electricity, computer aided design, automated manufacturing and mechanical systems.
2. Demonstrate an ability to communicate effectively in oral, written or visual forms.
3. Demonstrate an ability to work effectively in teams.
4. Have ability to use their knowledge to solve mechanical and manufacturing problems.
5. Demonstrate an ability to design, analyze, develop, document, implement and oversee mechanical systems.
6. Demonstrate an awareness of ethical, professional and social issues.
7. Demonstrate the recognition of the need for and possess the abilities to pursue lifelong learning.

b. Describe the ways in which the program's mission and goals align with the university's mission, core values and strategic plan.

Mechanical Engineering Technology program objectives are in line with the mission of the university in every aspect. MMET plays its part in satisfying the need of the region for qualified engineering technologist. The Greater Cincinnati area is home to a number of large multinational companies such as GE, Proctor and Gamble, Toyota Management facility. There are also a large

number of second tier manufacturing facilities in the area. As the graduate records show Engineering Technology programs have supplied productive individuals who have excelled as professional citizens.

Program Objectives 6 and 7, listed above, are very specific in addressing the NKU mission. Objective 7 helps provide graduates interested in life-long learning opportunities. Objective 6 helps the institution provide graduates who have ethical, professional and social skills vital in fostering academic and personal freedoms.

Northern Kentucky University is committed to:

- Learner-centered teaching –
  - This mission is promoted in all EGT courses. MMET is very much student-focused. Small classes and hands on activities highlight this quality.
- Excellence –
  - Every attempt is made to provide MMET students with excellence in Education by providing knowledgeable faculty and staff and state of the art equipment and facilities. Accreditation of the program is another effort supporting excellence in education at NKU.
- Access with the opportunity to succeed –
  - This is provided by providing students a working knowledge of engineering materials, manufacturing processes, dynamics, applied mechanics, applied fluids, applied thermal services, electricity, computer aided design, automated manufacturing and mechanical systems.
- Public engagement –
  - There are several venues provided for public engagement – the most significant one is coop. Students are required to work at least one semester in industry. Another program requirement is the senior project. Often students pick projects that are community based. The Problem Solving and Project Management courses promote students tackling community-based projects. The Industrial Advisory Committee is asked each year to provide MMET students with industry-based projects to work on.
- Intellectual freedom –
  - Intellectual freedom is addressed in project designs, term papers, class presentations, and the ability to communicate effectively in oral, written or visual forms.
- Multiculturalism
  - Multiculturalism is experienced by students through the program by a team of faculty who are from different cultures and backgrounds. The Department of Physics and Geology group picture alone indicates a department consisting of a group with varied backgrounds, ethnicities, and cultures.

Innovation and creativity –

Being innovative is a key component in projects in the program. Projects assigned in EGT320 - Robotics course, in EGT465 - Automation course, and the senior project all emphasize the innovation and creativity aspects of successful projects.

Collegiality and collaboration –

One important requirement in the MMET program is to work effectively as a member of a team.

MMET students participate in the Celebration of Student Research and Creativity. This allows students to fulfill one of the program requirements, complete their senior project, and also participate in a university wide event. The Celebration of Student Research encourages students to conceive and build better projects since they are allowed to display their scholarship and creativity through posters, oral presentations, and interactive demonstrations.

3. Program Goals – this section should list and describe the program's goals. Include goals in each of the following areas:

a Describe the process of generating the following goals.

Program goals/objectives are generated in response to: 1). Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) requirements for Mechanical and Manufacturing program 2) Industrial Advisory Committee recommendations 3) the NKU mission 4) college and department requirements.

b. Instruction

i. Identify program goals for past academic year.

- Implement curricular changes recommended by the Industrial Advisory Committee
- Combine and offer courses necessary to bring the program in line with TAC-ABET criteria for Mechanical and Manufacturing Engineering programs.
- Finalize changes necessary due to organizational changes (prefix changes, etc.)
- Prepare and implement assessment/outcome criteria mandated by ABET
- Provide opportunities for cooperative education for all the students in the program

ii. Identify program outcomes of goals of past academic year.

- Course changes were successfully submitted and passed by the university Curriculum committee.
- Several courses were combined. Examples are:
- IET362 & IET365 combined into EGT365
- IET311 & IET321 combined into EGT321
- IET317 & IET417 combined into EGT417

- EGT courses are now assessed based on ABET criteria, each course has objectives and outcomes in line with the program objectives and outcomes.
- Students are referred to industries with coop positions in Engineering Technology fields.
- Self study reports were prepared for the TAC-ABET visit, and submitted to ABET headquarters by July 1st

iii. Identify program goals for current academic year.

- Prepare and go through TAC-ABET accreditation visit.
- Work on a dual admission agreement with Sinclair Community College and articulation agreements with other local Community Colleges.
- Complete the articulation agreement with Sinclair Community College.

c. Scholarship

i. Identify program goals for past academic year.

- To increase student participation in experimental research.
- To encourage and support students in presenting their research results via NKU's Celebration of Student Research and Creativity, ASEE, and SME publications.
- To support and encourage scholarship in non-traditional areas, including the scholarship of teaching and the scholarship of service.
- To work with CINSAM, in developing summer Engineering and Engineering Technology camps.

ii. Identify program outcomes of goals of past academic year.

- Faculty and students in the program conducted research in different fields. Results were published in Society of Mechanical Engineering and American Society of Engineering Education conferences.
- Students' senior project results were entered into NKU's Celebration of Student Research and Creativity.
- Two summer Engineering Camp workshops were conducted in July.

iii. Identify program goals for current academic year.

- Continue engaging in experimental research
- Help and support students in their senior project research.
- Work with CINSAM, in development of engineering camps.

d. Civic Engagement

i. Identify program goals for past academic year.

- Offer courses at industrial sites, such as Mazak.
  Consult with local industry and help individuals in the community to design and build new products

ii. Identify program outcomes of goals of past academic year.

- Articulation agreements were pursued with Sinclair Community College and Cincinnati State College.

  The program continues to offer the opportunity for the region's two-year community college students to build upon their two year degree and acquire a baccalaureate degree in as little as two years.
- Civic Engagement - New product was developed for a local inventor – this project involved the NKU Small Business Center.

  Active learning – Students worked with local industry (Diversified Design Dynamics) to complete their senior project and also develop prototypes of new products.

iii. Identify program goals for current academic year.

Continue to offer courses at industrial sites (Mazak) and increase University-industry cooperation.

e. Other – list any goals in other areas

i. Identify program goals for past academic year.

- Prepare graduates for careers in Mechanical and/or Manufacturing industries.

  Increase enrollment through articulation and recruiting

ii. Identify program outcomes of goals of past academic year.

- Graduates from this program were successfully hired into engineering/technology jobs.

  New articulation agreement is in works with Sinclair.

iii. Identify program goals for current academic year.

- Continue to develop new articulations

  Find innovative ways to attract students into science and Engineering fields, working with professional organizations such as SME and ispace.

4. Instructional Effectiveness – this section should provide evidence that the program is effectively meeting the instructional goals defined above, in section 2.

a. Curriculum –

i. Courses taught by the program designed to fulfill the goals described in section 3?

EGT 116 Intro. to Industrial Materials & Processes
EGT 161 Industrial Electricity & Electronics
EGT 211 Quality Control
EGT 212 Computer Aided Drafting & Design
EGT 261 Engineering Materials
EGT 265 Manufacturing Processes & Operations
EGT 300 Statics & Strength of Material
EGT 301 Cooperative Education in Eng. Technology
EGT 310 Project Management & Problem Solving
EGT 318 Introduction to Nano-Technology
EGT 320 Robotic Systems & Material Handling
EGT 340 Applied Dynamics
EGT 361 Fluid Power
EGT 365 Tool Design & Computer Numerical Control
EGT 380 Machine Design

EGT 417 Senior Research & Design in Eng. Technology
[May be repeated up to three times]
EGT 423 Planning & Design of Industrial Facilities
EGT 450 Thermodynamics & Heat Transfer
EGT 465 Automated Manufacturing Systems

Support Requirements
CHE 120 & 120L General Chemistry
INF 120 Elementary Programming OR [IFN 110 - Business Programming]
MAT 119 Pre-Calculus
MAT 128 Calculus A
MAT 227 Calculus B
PHY 211 General Physics with Lab I
PHY 213 General Physics with Lab II
STA 205 Introduction to Statistical Methods

Students select one of the following three pairs of courses:
Metrology
EGT 386 Electro-Mech. Instrumentation & Control
EGT 405 Metrology and Geometric Tolerancing
Design
EGT 412 Advanced CADD
EGT 462 Applied Finite Element Modeling
Quality
EGT 321 Productivity Management, Scheduling, & Planning
EGT 341 Integrated Resource Management

ii. Identify specific strengths in the current curriculum.

Mechanical and Manufacturing Engineering Technology (MMET) program at Northern Kentucky University provides both general and a well focused technical educational emphases for every student.

MMET students have to complete 131 credit hours for this program in order to graduate. The 131 hours consist of 36 credit hours of General Education courses, 57 credit hours of Core requirements, 6 credit hours of focused technical courses, and 32 credit hours of support requirements. Support requirements consist of Chemistry, Computer, Mathematics, Physics, and Statistics. Some of these courses also satisfy General Education requirements.

The communication requirement is addressed by some of the courses in the core as well as the General Education courses. EGT 320, 412, 423, and 465, require term papers. EGT 417 requires a comprehensive report on the senior project. These classes also require students to work in teams. These teams plan, organize, prepare and deliver reports in written and oral formats at the end of the semester.

This allows students communication skills to develop as their technical skills are developed.

Mathematics requirements are met by taking MAT119, MAT121, MAT122, and STA205. This allows students to engage in mathematical problem solving, solve technical problems appropriate for taking courses such as statics, dynamics, fluids and other analytical based courses.

Physical and Natural Sciences – MMET students are required to take CHE120 & CHE120L – General Chemistry and Lab, PHY211 – General Physics with Lab I, PHY213 – General Physics with Lab II. These courses include laboratory experiences geared to develop student expertise in experimentation, observation, measurement and documentation.

A professional experience is gained with the (core) sequence of classes that are required of every MMET graduate. These courses, dealing with materials, mechanics, heat transfer, thermodynamics, machine design, and fluid power, provide the MMET students with knowledge that is often required in developing industrial and consumer products and manufacturing processes.

The focused technical educational options (Metrology, Design, or Quality) apply to the specific technical courses in the program that constitute the technical specialties of this degree. This sequence introduces a student to a complete range of mechanical and/or manufacturing courses that prepare him/her for jobs in industry. Each one of these courses, however concentrates on the education component, making sure that the student understands the underlying principles: each course is not designed to be so narrow that the student learns a specific tool or skills without also understanding the broad implications.

The strengths of the curriculum include the fact that it is TAC-ABET accredited and representative of other similar programs around the country. The program enjoys small size classes.

iii. Identify specific weaknesses in the current curriculum. How does the department address the weaknesses, if any?

The latest TAC-ABET visit resulted in the following recommendations:

1) Provide evidence that MMET program emphasizes and assess lifelong learning and creativity
2) Provide evidence of coursework and assessment of diversity and professional, societal and global issues
3) Provide evidence that the results of assessments of Program objectives and outcomes are used to further develop the program (Continuous improvement plan)
4) Demonstrate that capstone project draws together diverse elements of curriculum and develops students' competence in technical and non-technical skills
5) Conduct Seniors survey; Survey must measure program outcomes

Faculty have been meeting every week to find the best ways to implement the above recommendations. Some of the corrections have already been made.

iv. Describe the role of technology in the delivery of the program's curriculum.

Technology is an integral part of the program. Computer Aided Design, Computer Aided Manufacturing, Robotics, Computer Integrated Manufacturing, Computer Aided Engineering, Computer Numerical Control, and Programmable Logic Controls are some of the technology dependent aspects of the program. All courses are offered in classes or labs that are "smart" and faculty take full advantage of this.

Recently simulation packages have been purchased to provide students with hands-on simulation work in Statics, Dynamics, and Hydraulics. Also, a data base package for material selection has been acquired and used for the Engineering Materials course.

v. Does the program offer any web-based or web-enhanced courses? If so, list and describe.

Courses in the program are almost all web-enhanced and faculty use Blackboard to provide course materials including assignments, tests, surveys, and assessments.
At this time one course is web-based and more online courses are being developed.

EGT211 – Quality Control is a web-based course - it is designed to present the fundamentals of quality control. It is structured to represent the basic concepts and applications of the areas making up production and inventory control and quality assurance. Emphasis is placed upon quality control as an element of modern management. Production personnel are viewed as part of the management decision making process within this context.

vi. Describe use of cooperative education and internships as part of the program's preparation of its students.

MMET program requires at least 3 credit hours of coop. The Cooperative Education Program has been very successful at finding co-op experiences for MMET students. The co-op experience becomes part-time work for many of the students during their college years and quite often turns into full-time employment after graduation. Because NKU is on a semester schedule, many students prefer a "parallel" work experience for co-op that is typically twenty hours per week. Many of the employers who participate in the cooperative education prefer having a long-term association with a student as opposed to the

"rotating" method that is used in many other schools. This gives these companies work continuity and eliminate the retraining and re-orientation necessary in many rotational assignments.

b. General Education

i. Does the program provide service courses for the general education program?

Yes, EGT110 has been submitted for approval as a general education course in the natural sciences.

ii. If so, identify the courses and describe how they relate to the general education category goals.

EGT110 - Introduction to Engineering/Technology is a General Education course, open to all students. It is offered in Fall 2008.

Catalog course description - Provides the computational skills needed to solve design problems. The course introduces concepts from intro to computer graphics and parametric design, basic electronics, basic mechanics, engineering calculations; technology computer applications; and spreadsheets for engineering calculations.

This course is a general education course, and as such will meet the following general education learning outcomes:

Quantitative Skills and Scientific Understanding: Students will apply quantitative skills and scientific understanding toward resolving a range of issues and solving problems commonly encountered across the curriculum.

Critical Thinking and Problem Solving Skills: Students will develop critical thinking and problem solving skills in the scientific, mathematical, and personal domains discussed in the course.

Collaboration with Others: Students will work effectively and responsibly in teams.

iii. Is there a schedule as to when the courses are offered regularly and at appropriate times to meet the identified needs of students?
EGT110 - is offered for the first time next fall as a regular semester course, meeting once a week.

iv. Identify the frequency.
Further offering of the course will be based on student demand.

iv. How was the frequency determined?
Frequency will be determined based on students' demand.

vi. Was student input solicited?
Student input will be solicited during the first offering.

vii. If not, explain why?
This is the first time it is offered.

viii. How was the student input solicited?
It will be through class surveys.

c. Service Courses

i Does the program offer service courses for other degree programs? Yes

ii If so, identify the courses and the program or programs for which they are offered.

Course	EGT110	General Education course open to all programs
Course	EGT212*	Program Electronics Engineering Technology & Pre-Engineering Students
Course	EGT261	Program Electronics Engineering Technology
Course	EGT300	Program Electronics Engineering Technology
Course	EGT310	Program Electronics Engineering Technology
Course	EGT318*	Program Electronics Engineering Technology
Course	EGT340*	Program Electronics Engineering Technology
Course	EGT 316**	Program Construction Management
Course	EGT361*	Program Electronics Engineering Technology
Course	EGT417	Program Electronics Engineering Technology
Course	EGT450*	Program Electronics Engineering Technology

* Optional courses for Electronics Engineering Technology.
** Optional course for Construction Management.

iii. Is there a schedule as to when the courses are offered regularly and at appropriate times to meet the identified needs of students?

Yes, courses are offered as indicated below:

Course	EGT110	Fall & Spring
Course	EGT212	Fall & Spring
Course	EGT261	Spring
Course	EGT300	Spring
Course	EGT310	Fall & Spring
Course	EGT316	Fall- Every other year
Course	EGT318	Fall
Course	EGT340	Fall
Course	EGT361	Fall
Course	EGT417	Fall & Spring
Course	EGT450	Spring

iv. Identify the frequency.
These courses are offered once each semester mentioned above.

v. How was the frequency determined?
The frequency was determined by the history of course offerings and the number of students enrolled in each course. Course schedule is adjusted based on student input.

i. Was student input solicited?
Yes, Student input is solicited through the classes and also by conducting surveys on blackboard.

ii. How was the student input solicited?
Student representatives are part of the program advisory committee. Surveys conducted annually indicate the students' needs.

ix. Was input from the other programs solicited?
Yes, students from EET program were solicited and solicitation from further programs is underway.

d. Enrollment – comment on enrollment data provided by Institutional Research and Curriculum, Accreditation, and Assessment. What trends or patterns are significant? Using the data provided:

1a. Number of declared majors for the past three years.

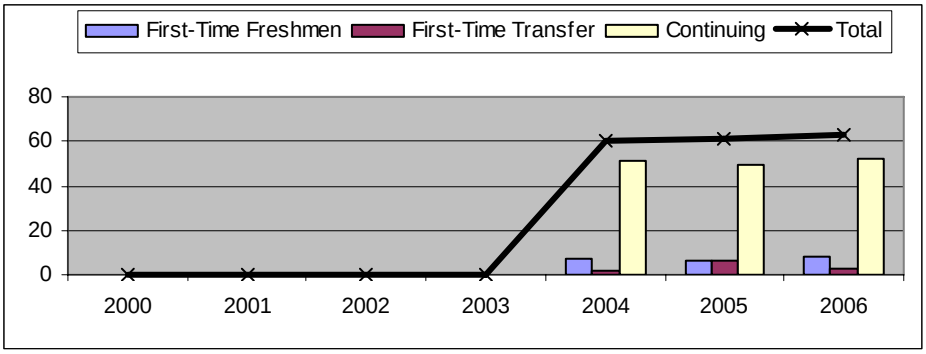
Current Year	61
Last Year	48
Five years ago	30

Mechanical and Manufacturing Engineering Technology Enrollment and Degree Data – data gathered from by department based on the Institutional Research data.

Engineering Technology Program	Enrollment by Year in Engineering Technology												Degrees Conferred (Previous Academic Year)		
	Current				One Year Ago				Five Years Ago						
	1st Year	2nd Year	3rd Year	4th Year	1st Year	2nd Year	3rd Year	4th Year	1st Year	2nd Year	3rd Year	4th Year	Associate	Bachelor	Other (Explain)

MET	0	2	0	4	0	1	3	8	6	5	4	15		X	
MMET	17	11	5	22	15	6	9	17	0	0	0	0		X	
Total, Engineering Technology Unit	17	13	5	26	15	7	12	15	6	5	4	15			

TABLE 1: Enrollment by Year in Engineering Technology



1b. Projected number of declared majors for the next three years. A three percent growth would be considered.

Year 1 63
Year 2 65
Year 3 67

1c. Comment on the past and projected number of declared majors. Identify how the projections were generated.

It is evident from the enrolment data that there is a steady increase in the number of students enrolled in the MMET program. The projection of enrollment number for the next three years was based on a three percent annual increase. This projection is consistent with the Highlights of Institutional Progress 1997 – 2006 that shows 24.3% increase in the student population over eight years.

2a. Number of graduates for the past three years.

The number of graduates in the past academic year (2006-2007) in Mechanical and Manufacturing Engineering Technology related fields was six. In the preceding year (2005-2006) this number was five. In the year prior to that (2004-2005) this number was slightly higher totaling eight. Names of the graduates of these years are attached in the appendix.

2b. Projected number of anticipated graduates for the next three years.

The number of graduates of the program is anticipated to be twelve for the next year, eleven for the following year, and thirteen for the year after that.

2c. Comment on the past and projected number of students who graduated from the program for the past three years and the next 3 years. Identify how the projections were generated.

The MMET program, in its new form, has shown a steady increase in its enrollment. Based on the data from the last four years it is anticipated that this trend continues. Since the MMET degree is relatively new, the number of graduates has not reached its full capacity. There are many students who have completed the program or are near to completion but have not applied for graduation. The main reason is the fact that due to the nature of the program most of these students have already secured well paid jobs. These students need to be contacted and persuaded for completion of their Capstone project and the remaining requirements.

Based on the results of the last three years the anticipated number of graduates was provided for the next three years. This was accomplished by relating number of graduates to the number of seniors in the past year. In the past the ratio of graduated to seniors was about 40%. Based on this ratio, number of graduated for the next year was calculated to be ten. Considering number of students who have nearly completed their degree but not counted as seniors (about six students) it is expected that two of them will graduate next year. This will raise the anticipated number of graduates to twelve by the next year.

Considering the trend in the number of graduates of this program in the last three years, it is expected that the number of graduates show a similar trend. This translates into about 3% increase leading to 13 graduates for the year following next year and 14 graduates three years from now.

A large number of students transfer in from the area community colleges. With a new articulation agreement with Sinclair Community College, this number is expected to grow.

3. Provide an estimate of the program's growth or decline in enrollment for the next three years. Explain reasons for growth or decline. What effect will growth or decline have on the program's resources, both instructional and operating?

Estimating continuation of the increase in majors that has occurred since 2003 implies that the number of MMET majors would be in the low 70s by 2008-09. It is anticipated that enrollment would increase faster if university provides more visibility for the Engineering Technology programs.

The growth is probably due to several factors: stability in the MMET faculty, increasingly good publicity for NKU and the engineering related programs in particular, also outreach activities sponsored by CINSAM and other NKU organizations.

Continued growth at this level would not strain resources in the near future; we could accommodate increases of 5-10 students in most upper level classes.

4. Program's enrollment capacity for majors 100 FT students

Two third of the EGT students are non-traditional and take part time course load. In addition to part time students and based on the current number of faculty, lab-space, equipment and educational resources, the program can accommodate up to 100 full time students.

4. Comment on the program's enrollment capacity. Is the program at capacity?

Program is not at capacity and can grow fifty percent with the current resources at hand.

5. Describe the program's recruitment strategies.

Recruitment has been the center of the efforts of the faculty in maintaining the vitality of the MMET program. One MMET faculty is a member of the Retention and Recruitment Committee of the Department of Physics and Geology which holds regular meetings on ways and means to educate high school students about the opportunities present at NKU in the field of Engineering Technology. As a result of this committee's work, various efforts have been underway to reach potential students. These include three separate processes that were initationed and executed to boost the enrollment of the students in the program:

1) Writing proposals and obtaining funds to conduct workshops:
Dr. Allameh has been successful in securing funds from SEM (Strategic enrollment management) for two consecutive years leading to several workshops (for minorities and non-minorities) in the areas of engineering technology. Tours of MMET facilities, sample classrooms and lab activities were offered to students. Feedback from the students indicated increased interest in attending NKU.

2) Collaboration with CINSAM in offering Engineering Technology Training:
Two faculty members of the program have proposed and obtained approval of CINSAM to conduct workshops and summer camps. For the past two years these camps have been conducted successfully. The success of the first camp has led to a second engineering camp dedicated to women in Engineering and sciences which was conducted last year. The activity has grown now to several camps including the two summer engineering camps as well as two camps on new and emerging technologies.

In addition to these camps, Eng. Technology faculty have participated in CINSAM's Engineering Day Fair which attracts a large student body from high schools. Other activities like SPIN night poster sessions are also attended to reach out to high school teachers and counselors for recruitment purposes.

3) Active participation in the University-lead recruitment efforts. These include several major/minor fair events, and Black and Gold Day events. Usually two MMET faculty participate in the events, talking to students and their parents. Follow-up on these events, has been contacting the prospective students and sending them further information about the program.

Other strategies adopted in the area of recruitment include the formation of articulations with local and non-local colleges including Gateway and Sinclair. Transfer students from two-year institutions help populate some of our upper level courses. Therefore one strategy has been to renew and/or establish new articulation agreements with local Community Colleges. As an example, a dual admission articulation is nearly completed with Sinclair Community College, which allows the enrollment of the students in two colleges at the same time. Last but not the least is our new effort at reaching our alumni for a reunion with the hopes that they will send us potential students. Another recent recruitment strategy has been the collaboration with professional societies such as Society of Manufacturing Engineers on a variety of projects, such as science fairs, robotic competitions, and Engineers day. The MMET students recently started a local student chapter of SME which is hoped to help with the recruitment and retention of the students. The Department in cooperation with Admissions is preparing to do a mailing to all students who have identified engineering or technology as a potential major. The mailing will clarify the differences between the two areas, potential careers in them, and programs available at NKU.

6. Identify any admission standards that apply to the program.

The program requires standards identical to those required for NKU general admission to undergraduate programs.

e. Faculty – describe the faculty assigned to the program.

1. Number of full-time faculty members currently teaching in the program

We have equivalent of 2 and ½ full time faculty in the program.

2. Number of full-time faculty members at each of the various faculty ranks (include lecturers).

Full professor	0
Associate professor	2
Assistant professor	1
Lecturer	0

3. Percentage of program's courses that have been taught by full-time faculty members.
During Fall 2007, ten out of the twelve courses offered were taught by full time faculty and two were taught by part time faculty. This is equal to _83_%

4. Percentage of permanent faculty that have appropriate terminal degrees? _100_%

5. Number of part-time faculty members currently teaching in the program. _4__

6. Percentage of program's courses that have been taught by part-time faculty during the prior year.
Of a total of 27 courses that were offered, six were taught by part time faculty. That is about _22_%

7. Comment on the appropriateness of the full-time verses part-time faculty ratio.
These figures seem appropriate; part-time faculty are used to teach classes that full time faculty can't teach due to their maximum teaching load or when full time faculty have reassigned time. In addition, most of the part-time faculty are employed in local industries and bring a "real world" aspect to their classes.

8. If the percentage is a problem, identify steps planned to correct this imbalance.
The ratio is not a problem.

9. What changes have occurred in the program's faculty over the past five years?
The total number of faculty teaching in MMET or MET disciplines has not changed and remains the same as it was five years ago.

10. Has the size of the faculty increased or decreased?
The size of Faculty has remained the same.

11. Explain factors leading to the increase or decrease.
N/A

12. Are there specific recurring issues surrounding retention and recruitment of faculty in the program?

In the early part of this decade, retention was an issue. A tenured faculty member left the university at the end of the 1999 academic year, a second faculty member resigned to take another position the same year. A faculty who was hired in 2000, left after two years. Another faculty who did not receive tenure left in 2003. These positions since have been refilled.

Turnover has decreased dramatically since then; current faculty are full participants in the program and appear to be satisfied with their roles. All have been with the department for two years or more.

13. Project the program's need for full-time and part-time faculty for the next three years in relation to the projected program enrollment growth or decline as indicted above.

    With the addition of a proposed General Education course (EGT110) and the expected growth in the number of students within the next three years there will be a need for another full time faculty.

f. Learning outcomes/goals for students –Each degree program should have an established set of specific learning outcomes for its majors. The learning outcomes should specify exactly what knowledge and skills students are expected to have when they complete the program.

1. List the learning outcomes established for students in the program.

   By the time of graduation, students in the MMET program will be able to:

   A. Apply concepts of manufacturing processes, mechanical design, computer aided engineering graphics, engineering materials, applied mechanics, fluids, thermodynamics and electromechanical controls to the analysis, development, implementation and oversight of mechanical systems as well as mechanical and manufacturing processes.

   B. Understand fundamentals of engineering materials, statics, dynamics, fluid power, thermodynamics and electronics.

   C. Understand and produce drawings and related electronic data files in the areas of mechanical design, tool design and machine design.

   D. Understand fundamentals of mechanical and manufacturing processes, planning, optimization and automation.

   E. Understand fundamentals of facilities planning, materials handling and robotics.

   F. Apply principles of mathematics and sciences as well as technologies of materials, manufacturing processes, tooling, automation, production operations, maintenance quality, industrial organization, management and statistics to solve mechanical and manufacturing problems.

   G. Demonstrate awareness of ethical, professional and social issues.

   H. Communicate effectively in oral, written or visual forms.

   I. Work effectively as a member of a team.

   J. Lifelong Leaning.

   K. Demonstrate understanding of quality, timeliness, and continuous improvements.

2. Explain how the learning outcomes shape the requirements and electives of the program's curriculum.

Learning outcomes have driven the creation of new courses. Charts attached indicate how each outcome is met by different courses and electives. The MMET program is TAC - ABET accredited and hence conforms to the program outcomes set by this accreditation body. Program outcomes were produced by determining the units of knowledge and skills students were expected to acquire from the program. The units of knowledge were listed with the help of the Industrial Advisory Committee, graduates, and faculty. Program Criteria for Manufacturing Engineering Technology and Mechanical Engineering Technology were closely studied to extract outcomes that would satisfy both Mechanical and Manufacturing requirements.

The program curriculum has been continuously modified. Referring to the University Curriculum Committees' website illustrates this gradual alignment of the curriculum. In doing so, several courses were combined, new courses were added, and courses were improved to satisfy 1) ABET program requirements for both Mechanical and Manufacturing fields 2) the Industrial Advisory Committee recommendations 3) the community and student recommendations.

3. Describe the measures used to assess whether or not students are meeting the learning outcomes of the program's curriculum.

The processes used to establish and review the program objectives and outcomes, to evaluate assessment data, and to decide changes necessary for program improvement are discussed below.

The assessment part of the continuous improvement plan (please refer to Fig. 1) includes:

- Black-board Senior Survey is conducted Fall and Spring Semester for students enrolled in the Senior project course. This survey also serves as the Exit survey for students in the Engineering Technology Programs.

  The result of this survey indicates that 63% of the student finished their degrees in more than 4 years. The data indicates that 36% of students were between 23 to 25 years of age and 36% were in the 30 to 38 years of age at the time of graduation. Thirty six percent rated the interest and commitment of the faculty as high and forty five percent rated it moderate. For a copy of this survey and related data please refer to Appendix B.

- Students are also required to take an exit survey as part of the graduation process. This exit survey is conducted and monitored by the NKU Institutional Research office. For other related information please refer to the Institutional Research link: http://www.nku.edu/~oir/Senior_Survey/senior_survey.htm

  http://www.nku.edu/~registrar/Information%20Checklist.htm

  The result of the survey administered shows the areas that graduates were not prepared satisfactorily: Project management, Problem solving, and machine assembly.

- Alumni Survey: The alumni survey is planned to be distributed annually during July. This survey is designed to include specific program objectives and outcomes. Data collected to-date indicate that sixty percent of graduates pursued certificates and forty percent received their Masters degree. Forty percent of the respondents made $40K and above, and about twenty nine percent made $60k and above. Eighty eight percent of the respondents worked in jobs related to their major.
- Employer Survey: This survey is taken around February and March each year. It is designed to initiate input from employers directly related to the program outcomes and objectives. The survey is conducted utilizing "Survey Monkey" on the web for ease of access and data tabulation. The survey asks specific question related to the graduates competencies in relation to different program outcomes.
- Advisory Committee: The Advisory Committee meeting has been held in May or June, with the exception of last year meeting that occurred in August. The goals of this meeting include both information presentation and gathering: The Committee is informed of the recent activities in the program, curriculum changes, program needs and other related topics. The Committee is queried about any concerns and/or suggestions for program improvement. The Committee was asked to take the Industrial Advisory Committee Survey designed to tabulate their response related to the program Objectives and Outcomes.
- Coop Evaluations: Each semester students are evaluated on their coop job and the resulting experiences. The evaluation is by filling out multiple forms, submitting weekly and one end of the term report. There is also a supervisor evaluation that is handed out during the job site visit. The course designated instructor will make a job visit and speak with the industrial supervisor. At the end of the visit the supervisor is given an evaluation sheet.
- Course assessment: The ongoing evaluation of the assessment data for program objectives and outcomes, summarization of the results from this periodic evaluation, and the results are tabulated. The results are being used to improve the effectiveness of the program. Statistical results for fundamental, application, or design questions are used to indicate level of knowledge may not be acceptable, and corrective action can be taken.

  Tests and quizzes are standard assessment tools – Test statistical results are used to measure the accomplishment of course outcomes. Assessment Surveys are used in MMT courses to measure team work. This is proved to be an effective method to strengthen student involvement in projects.
  Class Lab Reports are used to measure writing skills and understanding.
  Class presentations are used to improve communication skills and teach students technical presentation skills.

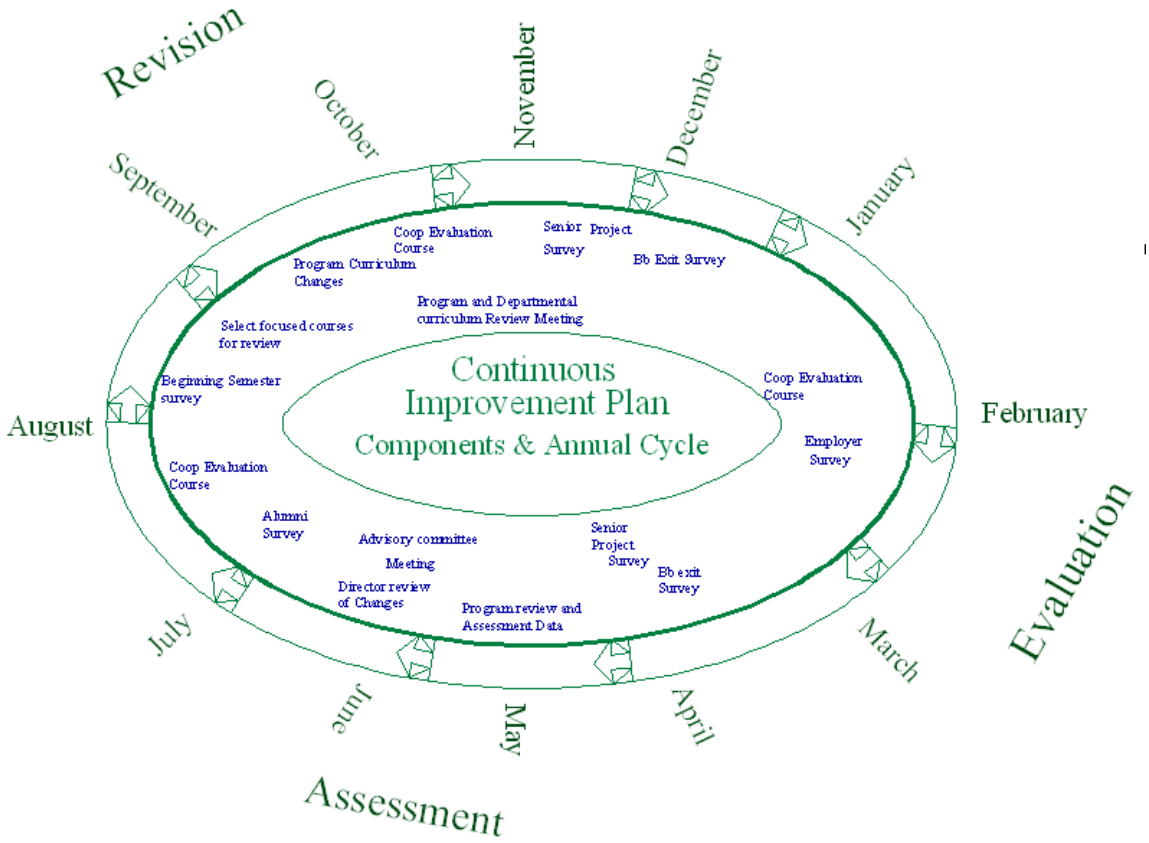
4. Describe how the program communicates the learning outcomes/goals to students.

Learning outcomes are communicated to students through program brochures, catalog, Blackboard and program web-pages. ABET mandated listing program leaning outcomes on different mediums.

5. Discuss the ways the program uses the information gathered through the assessment process to improve and/or maintain the quality of the program?

   Course outcomes are listed on the syllabi and measured in order to establish continuous improvement plans. Different set of courses are assessed each semester to determine how well established outcomes are satisfied and to find ways of correcting any shortcomings based on the assessment results from courses in the program.

   The figure shown below is the MMET continuous improvement plan and related documentation.



Description of the Continuous Improvement Plan Chart

The CIP - continuous improvement plan takes place throughout the calendar year, and begins at the start of the academic year in August. Focused courses, called CIP year courses, are selected for review. Over several years all courses will be cycled through the CIP process. In the following, the term “processed” means the activity

is considered for impact on the CIP year course, and for other changes to the program and the courses in the program.

In August the beginning semester survey sets out the timetable for the CIP cycle year.

In September, program curriculum changes are processed relative to CIP year courses.

In October, the EGT301 Co-op course evaluations are processed. The program curriculum is reviewed and aligned, with any new courses and old courses considered.

In November, the EGT417 Senior Project surveys are processed for course changes.

In December, the Exit (graduation) surveys are taken for all graduating students.

In January, the beginning semester, the EGT301 Co-op course evaluations are processed.

In February, the employer survey is posted, taken, and processed.

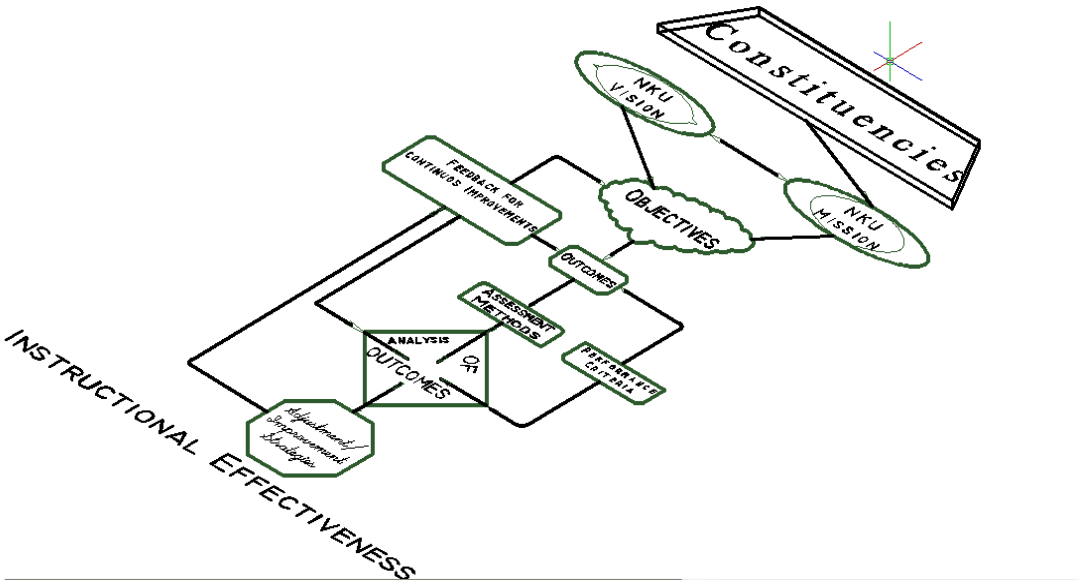
In April, the Exit (graduation) surveys are taken for all graduating students.
The EGT417 Senior Project surveys are processed.

In May, the overall programs are reviewed and data is correlated and assessed.

In June, the Program Director reviews changes and aligns CIP cycle course changes
The advisory committees meet; their meeting input and surveys are processed.

In July, the alumni survey is posted, taken, and processed.
The EGT301 Co-op course evaluations are processed

Please refer to Figure below showing the MMET Program Instructional Effectiveness Plan.



5. Scholarship –evidence that the program is achieving its goals in the area of scholarly activity;

Program faculty have conducted research involving undergraduate students, published papers, conducted summer engineering camps, and participated in science and engineering technology fairs. The followings are recent papers published by the program faculty. For further details please refer to the faculty WebPages listed below for a list of recent papers published.

Seyed Allameh: http://www.nku.edu/~allamehs1/publication.html
Morteza Sadat: http://www.nku.edu/~sadathossien/

Seyed Allameh

1. S.M. Allameh, O. Akogwu, M. Collinson, J. Thomas and W.O. Soboyejo, "Piezoelectric Generators for Biomedical and Dental Applications: Effects of Cyclic Loading, J. Mater Sci: Mater Med, **18**, pp. 39-45, 2007.
2. Y. Yang, B.I. Imasogie, S.M. Allameh, B. Boyce, K. Lian, J. Lou, and W. O. Soboyejo, "Mechanisms of Fatigue in LIGA Ni MEMS Thin Films," J. Mat. Sci. & Eng. A, **444**, pp. 39-50, 2007
3. S. M. Allameh, Z. Suo and W Soboyejo, "Creep of Al Underlayer Determined by Channel Cracking of Topical Si_3N_4 Film," J. Materials and Manufacturing Processes, Special Issue, In Press, T 689, 2007
4. J. Lou, P. Shrotriya, S. Allameh, T. Buchheit and W.O. Soboyejo, "Strain gradient plasticity length scale parameters for LIGA Ni MEMs thin films," J. Mat. Sci & Eng. A, 441, pp. 299-307, (2006)
5. Y. Cao, S. M. Allameh, D. Nankivil, S. Sethiaraj, T. Otiti and W. Soboyejo, "Nanoindentation Measurements of the Mechanical Properties of Polycrystalline Au and Ag Thin Films on Silicon Substrates: Effects of Grain Size and Film Thickness," Journal of Materials Science and Engineering, A 427, pp. 232-240, 2006

Morteza Sadat

1. Sadat-Hossieny, M. (2007) – Challenges Facing Global Engineering Education Considering Current U.S. Policies. ASEE Proceedings, paper presented at the ASEE Annual Conference June 2007.

2. Allameh, S., Cooper, P., Sadat-Hossieny, M. (2006). Instrumentation of RV-M1 Robots for Developing Biologically Inspired Materials. ASEE Proceedings, paper presented at the ASEE Annual Conference June 2006.

3. Sadat-Hossieny, M., & Shahrestani, H. (2006). Use of Parametric Modeling Software in the Vertical Integration of Projects and Courses in a Mechanical Engineering Technology Curriculum. Proceedings of the 9th International Conference on Engineering Education in San Juan, PR, July 23 – 28, 2006.

4. Wiebe H., Allameh, S., Rajai, M., Sadat-Hossieny M. (2006). Engineering Technology Programs at the Crossroads: Curriculum Revisions to Meet Emerging Needs. Proceedings of the 2006 IJME Conference, October 2006.

a. Faculty Profile Forms

Name	Rank	FT or PT	Degrees Earned Degree, Year, & Institution	Years of Experience			Professional Registration (Indicate State)	Level of Activity (high, med, low, none)* in:		
				Govt./Industry Eng/ET	Teaching Eng/ET	This Institution		Professional Development	Professional Society	Work in Industry
Morteza Sadat-Hossieny	Associate.	FT	PhD 1989, Iowa S.U. MS. 1986, Murray S.U BS. 1983, Oklahoma SU.	Industry 5 yrs. +	14 yrs. +	8 yrs.		(High)	ASEE SME (Low)	5 yrs. + (Med)
Seyed M. Allameh	Assistant	FT .75 in the program	Ph.D. 1998, Ohio S.U. MS. 1993, Wayne S.U. BS. 1978, Sharif U of Technology	6	5	2		High	ASME ASEE High	Medium
Harold Wiebe	Associate	FT .125 in MMET	MS. 1966, Univ. of Cin. BS. 1964, Univ. of Cin.	32	15	11	Professional Engineer Ohio	Medium	IEEE ASEE (Medium)	Medium
Mark Rajai	Associate	FT .75 in the program	Ph.D. 1996, U of L MS. 1996, U of L BS. 1983, UT	10	14	4		High	High	Medium
Dave Robers		PT	BS 199? NKU							High
Amy Matricia		PT	BS 2005 NKU							High
Dee Wright		PT	Certified Machinist	13	6	1				High
Ralph Draper	Lecturer	PT	BSIE 1983 MED 1993	5	14	6				

Seyed Allameh

- Worked for one year in a copper extraction plant (as metallurgist).
- Established his own machine shop and worked for 6 years with about 15 tool and die making machinists. Work included fabrication of dies (plastic blow and injection dies), machine tools (Lathe, planning machine, table drills, and circular saws), plastic injection and extrusion machines, industrial and automotive parts (e.g. auxiliary gearbox shell and thermostat casing of Mercedes Benz trucks), etc.
- An example of Dr. Allameh's expertise is the development of a robot that can see things and follow them. It also can communicate with the GPS and corrects its motion direction to follow a predetermined path.

Mark Rajai

- Worked as Mechanical Engineering manger in different capacities from 1984 to 1998.
- Degreed in Mechanical, Industrial and Engineering Management.
- Taught at different institutions in Mechanical, Manufacturing fields at undergradate and Graduate levels between 1991 – Present.

Morteza Sadat

- Degreed in Mechanical and Manufacturing Engineering Technology
- Taught for over 15 years in the related fields
- Developed and prepared an associate Manufacturing Engineering Technology Program for ABET accreditation. Worked as the coordinator of Engineering Technology at NKU since 2003.
- Worked for several years as Manufacturing Engineer – Joined the Technology Center of Marshall University (RCBI) in 1990.
- Performed feasibility study of all different advanced machineries and Computer Aided Design/Computer Aided Manufacturing software that was purchased and installed in the center.
- Rgularly evaluated and made recommendations on different engineering related software essential to the operation of the center (RCBI).
- Developed and delivered specialized classes for local industry.
- Designed and manufactured parts in the case a company that did not have the resources necessary to finish the job according to the specifications provided.

b. Brief section summarizing the program faculty's work in this area and highlighting some of its most significant accomplishments. Indicate how the program defines scholarship.

Program definition of scholarship is based on the faculty promotion and tenure handbook. Faculty are expected to publish in their areas of expertise and in the fields closely related to the program. Some of the faculty's accomplishments are as followed:

Professional Development

Faculty of EGT program regularly participate in conferences, workshops and other professional development events that reinforces their knowledge and skills, their research activities, and their teaching effectiveness. Examples are participation of faculty of MMET in the following workshops:

- Workshop on Blackboard,(6 h), Highland Heights, KY
- Workshop on ABET Technical Education Initiative, (24 h), Manhattan Beach, CA
- Workshop on Rapid Prototyping (40h), Sinclair Community College, Dayton, OH
- Workshop on Collaborative Design (40h), Sinclair Community College, Dayton, OH
- Workshop on Dynamics Analysis for Improved Design (24h), Mott/Sinclair Coll., Dayton, OH
- Workshop on Rigorous Research in Education (24h), Sinclair College, Ashley, NC

Numerous other workshops dealing with the use of Blackboard, use of Microsoft office and web enhancement tools also evidence a efforts to help continuous improvement of faculty's teaching effectiveness.

Other evidences of scholarship is the participation of faculty in activities related to teaching methods, undergraduate research, globally related academic issues etc. Drs. Sadat and Allameh have presented and published over 8 papers including the following:

6. S. M. Allameh, T. Ogonek and Paul Cooper, "Instrumentation of a GPS-Navigated Autonomous Ground Vehicle for Robotic Construction," submitted to Proceedings of 2007 ASEE, Hawaii.
7. H. Wiebe, S. Allameh, M. Rajai and M. Sadat Hossieny, "Engineering Technology Programs at crossroads: Curriculum Revisions to Meet Emerging Needs," Proceedings of The 2006 IJME-INTERTECH Conference.
8. S.M. Allameh, M. Sadat-Hossieny and P. Cooper, "INSTRUMENTATION OF RV-M1 ROBOTS FOR DEVELOPING BIOLOGICALLY INSPIRED MATERIALS," Proceedings of 2006 ASEE Annual Conference and Exposition, Chicago, IL June 19-21 2006.
9. M. Sadat Hossieny, S. M. Allameh, and M. H. Shahre. "Use of Parametric Modeling Software in the Vertical Integration of Projects and Courses in a Mechanical Engineering Technology Curriculum," Proceedings of 2006 ASEE Annual Conference and Exposition, Chicago, IL June 19-21 2006.

6. Civic Engagement - evidence that program is meeting its goals in the area of civic engagement. A more thorough description of the program's involvement in civic engagement should be included in this section.

Program has established several certificate programs to help local industry in their human resource development. As part of these certificates, MMET offers several courses at industrial sites, such as Mazak. Faculty consult for local industry and help individuals in the community to design and build new products.

Articulation agreements are pursued with Sinclair Community College and Cincinnati State College. The articulation agreement with Sinclair is finalized. We are currently working on a dual admission initiative, utilizing online courses to allow student to enroll at NKU, while working on their associate degree at Sinclair Community College.

Civic Engagement - New product was developed for a local inventor – this project involved the NKU Small Business Center.

For the past three years, program faculty have worked with CINSAM and Society of Manufacturing Engineers (SME) in conducting robotic competitions and Engineering day.

Active learning – Students worked with local industry (Diversified Design Dynamics) to complete their senior project and also develop prototypes of new products.

a. List any special initiatives currently underway with public audiences. What is the scope of such initiatives and who are their audiences?

Some of the initiatives underway with the cooperation of CINSAM – Center for Integrated Sciences and Mathematics, are to:

- Conduct Engineers day on NKU campus.
- Work with high schools to promote science and engineering
- Faculty participate in the NACKES and Fair filed high school science fairs.

The scope is regional. It includes students attending the Greater Cincinnati area schools.

Every year Engineering Technology participates in events such as Black and Gold day to attract students from area high schools. The Black and Gold day events are attended by prospective students and their parents. Events' participants attend presentations or sample lectures to learn about different academic programs at NKU.

Individuals that stop by the EGT table/booth are asked to write down their contact information. The combined number of interested individuals was above 100 during the 2007-2008 academic year. Consequently, Engineering Technology Unit uses the contact information to follow up with the attendees and mail them brochures and other programs' related information.

b. What are the outcomes of these initiatives (e.g. special events)?

The outcomes are multifaceted:

- Help the members of community to development new products.
- Help design products for inventors who don't have the knowhow of designing what they have in mind.

- Help local small manufacturers to use the resources at NKU and improve their productivity and success rate.
- Increase awareness of Science and Engineering in the region.
- Help foster interest in middle school students to major Engineering/Technology.

7. Student Involvement and Satisfaction – this section should describe the program's involvement with students and discuss the students; satisfaction with the program. Answer and provide detail for the following:

A. Does the program have a website that contains information about program requirements?

Yes, program maintains a website and is in the process of updating the material as soon as the new webpage format is made available to the departments at NKU. Program webpage is accessed at: http://physics.nku.edu/MMET/index.htm

List of materials on the website:

- MMET course list
- Eight semester course sequence
- MMET curriculum chart
- Information and careers available with the MMET degree
- Certificates programs available to students under the MMET program

Also, an Engineering Technology Blackboard shell has been created to allow students receive or post related information to the EGT programs at NKU.

B. Describe the academic advising process for students in the program.

Students are advised by the program coordinator and faculty. Prior to registration students are mandated to contact their advisors and discuss the courses that they are planning to enroll. After advisor approval the advising hold will be removed allowing students to enroll for a set of courses.

C. Identify discipline-related student organizations that are sponsored by the program/faculty?

Faculty currently sponsor a Society of Manufacturing Engineering (SME) student chapter at NKU.

D. Describe their activities.

"The Society of Manufacturing Engineers is an organization of engineering, technical and management professionals who present the manufacturing enterprise. The society engages its members to provide the networking and knowledge that enables their professional growth in the manufacturing community. Success in that

endeavor has earned SME and international reputation for providing outstanding service to manufacturing." SME

E. Discuss the results of any assessment process used to evaluate student satisfaction with the program.

Different assessments are taken from student to find their satisfaction with the program while at NKU or prior to graduation. Student alumni are also surveyed to collect their progress in life after graduation.

A BlackBoard Senior Survey is conducted Fall and Spring Semester for students enrolled in Senior project course. This survey also serves as the Exit survey for students in the Engineering Technology Programs.

The result of this survey indicates that 63% of the student finished their degrees in more than 4 years. The data indicates that 36% of students were between 23 to 25 years of age and 36% were in the 30 to 38 years of age at the time of graduation. Thirty six percent rated the interest and commitment of the faculty as high and forty five percent rated it moderate. For a copy of this survey and related data please refer to Appendix B.

Students are also required to take an exit survey as part of the graduation process. This exit survey is conducted and monitored by the NKU Institutional Research office. Please refer to Appendix B for a copy of the senior survey and data related to the survey. For other related information please refer to the Institutional Research link: http://www.nku.edu/~oir/Senior_Survey/senior_survey.htm

8. Information Resources and Instructional Equipment –describe the adequacy of the program's facilities, equipment, and library resources.

a. Identify the number and type of library holdings for the program

To quote a statement by Dr. Charles Hawkins, Chair of the Physics and Geology Department at Northern Kentucky University: "**As with all the sciences, there tends to be a distinction between holdings of monographs and holdings of journals. Monographs are less important in the sciences than in many other disciplines, with current journals playing a much larger role."** (Physics/Geology Department Program Review Report, 2007) The scientific achievements and developments for the areas Electronic and Manufacturing engineering are part of the "sciences" identified by Dr. Hawkins. Numbers are no longer the major indicator of the strength of a library's materials collection, since online journal vendors have provided online access to the latest journal issues for most subject areas. Monograph titles are selectively purchased and there are many e-book titles which come via publisher's e-book packages from Wiley, Safari, and Net-Library. Monograph statistics may show a specific number of titles added, but how many of those e-book titles are filling your current information needs? Currently journal articles are the major vehicle of current scientific events and developments and become more important than the library's

book collection. To satisfy the information and research needs of the Engineering Technology faulty and students, the Steely Library has access to online journal full-text services which can be searched from either on or off campus. Selected sources include 1) EJS E-Journals is a database of more than 8,700 E-Journals which is available via EBSCO's Electronic Journal Service. (http://library.nku.edu/data/db4.html#e). 2) A-Z Journals is a database which covers over 200 engineering journal titles and provides full text articles. (http://atoz.ebsco.com/titles.asp?Id=3273&sid=166274152&TabID=2) 3) Applied Science & Technology Full Text is a third database covering many peer-reviewed journals covering over 40 engineering/technology subject areas. (http://library.nku.edu/data/db1.html). 4) Electronic Collections Online identifies books, journal articles, which are online, or if need be, can be requested through interlibrary loan. (http://library.nku.edu/data/db4.html#e) 5) J-STOR is a journal archives database complementing the other online services, JSTOR offers researchers the ability to retrieve high-resolution, scanned images of journal issues and pages as they were originally designed, printed, and illustrated. The journals archived in JSTOR span many disciplines." (http://library.nku.edu/data/db5.html#j). To fill in the existing information gaps within these online services, the Steely Library has a document delivery system which includes the online interlibrary loan request service (ILLIAD, (http://nku.illiad.oclc.org/illiad/logon.html), and a document delivery system. Essentially Steely Library strives to provide core resources to the technology faculty and students through materials ownership or shared access through consortia. Currently the evaluation of library materials for any area is beyond numbers. PhilipYannarella, Documents Librarian.

b. Comment on the adequacy of library holdings for the program.

Library holdings for the program are adequate. The MMET program benefits from a significant body of library holdings in various fields of Mechanical and Manufacturing Engineering as well as Engineering Materials. Comprehensive lists of books are provided to the library for purchase from the Engineering Technology library fund. The new media supplement the needs of the program in keeping up with the emerging technologies, undergraduate research, senior design projects, and faculty scholarly activities. In addition, there is some overlap with library materials that support the physics and pre-engineering programs, further enhancing the library's support of the MMET program.

c. Strengths and weaknesses of library holdings and department's information resources, e.g. computers and journals for students).

Through instructional equipment proposals and outside grants, the department managed to place computers in most of the labs by the mid-90s and was actively involved in using computerized data collection and analysis in the introductory courses, in experiments that lent themselves to such an approach.

One caveat is appropriate: We have become almost totally dependent on the computers and "smart" classrooms, but there are few backup units. The result is that if instructor or student equipment fails, the result is often a mad scramble to replace the faulty unit in order to avoid canceling one or more classes.

d. Quality of current facilities and capital equipment used by the program.

Current facilities are adequate for the program. In order to be part of the new initiatives by NKU and to strengthen community services, new and more advanced equipment and software are necessary. Engineering Technology Faculty have been successful in securing resources to update and purchase some equipment. Several major pieces of equipment were purchased from external funds including a rapid prototyping machine, a Coordinate Measurement Arm (CMM), and a GPS system. An Amatrol Mechanical system was purchased by grant funds and the College Technology Fund this year (2007-2008). Software licenses and updates are obtained on an annual basis.

The MMET program uses two well maintained classrooms (ST115 & ST125) and one laboratory facility (ST 121) for teaching, research, and hands on activities. Recent upgrades to the classrooms include conversion of ST125 to a Smart lab. Computers in these labs are on a four year replacement cycle.

e. Strengths and weaknesses in facilities and capital equipment.

The strengths of the facilities and equipment include the capacity to combine lecture based classes with hands-on experimentation. Most of the facilities and equipment are multi-user in nature. Many MMET classes and learning activities benefit from the same resources, including computers, machinery, and lab equipment.

Safety of the equipments is the primary concern and a weakness when funds are not available for capital equipment upgrade. MMET has on older CNC milling machine that does not meet current OSHA safety regulation. We are in the process of upgrading the machine by retrofitting its' control. At this time this upgrade is done through grant money. Upkeep of equipment should be done through maintenance fund and not grants.

f. Identify resources available for integration of technology into learning activities.

MMET program has access to two labs with computer: ST115 and ST125. These resources allow faculty to integrate CAD/CAM, simulation software and access to engineering related data bases into the courses in the program.
These facilities also provide integration of software with manufacturing related technologies such as the rapid prototyping machine, and the Faro Arm coordinated measuring device. Various other software and hardware used for data acquisition, tensile testing, and robotics are available in the engineering technology labs.

CAD LAB (AST 115) – General Description: This laboratory provides access to software applications for both Engineering Technology programs (MMET and EET) and is connected to the NKU intranet and the Internet.

Courses that benefit from this lab: EGT 212, EGT 310, EGT 412, EGT 462, and any other course requiring design work.

SPECIAL FEATURES OR FUNCTIONS:

- Ceiling-mounted LCD projector
- Presentation console containing personal computer and software
- AutoCAD 2008 Autodesk Design Institute (ADI) package, Microsoft package including Microsoft Project Management, SPSS, etc. Licenses are updated annually.
- Laser-jet HP plotters, HP printer,
- HP 8500 poster plotter Obtained in 2007
- Faro Arm Coordinate Measuring device, Obtained in 2006
- Pro_Engineer Software, license renewed annually.
- 21 Optiplex GX740 Minitower computers.
- Dimension Rapid Prototype Machine, 2006.
- Roland – MDX-20 MODELA - 3D PLOTTER/SCANNER, , 2006
- Roland – PICZA 3D SCANNER, 2006.
- 20 Dell Computers – computers in this lab are on a four year replacement cycle.

GENERAL COMPREHENSIVE MANUFACTURING FACILITY LAB (AST 121) – General Description: This lab is designed to address modern manufacturing processes and computer integrated manufacturing needs. It is divided into four areas; 1) hot metal forming, 2) machining technology, 3) pneumatics and hydraulics, and 4) computer integrated manufacturing. Each area is outfitted with state-of-the-art features and equipment. The lab is designed to be flexible in its instructional use in order to accommodate the widest possible configuration of manufacturing equipment and processes.

Courses that benefit from this lab: EGT 116, EGT 265, EGT 316, EGT 320, EGT 361, EGT 365, EGT 450, and EGT 465

SPECIAL FEATURES OR FUNCTIONS:

- Two melting furnaces and one heat treating furnace
- Plasma, gas, and arc welding stations
- Turning, milling (horizontal and vertical), grinding, drilling, and surface finish machines.
- A new lathe and a Bridgeport mill. Obtained in 2004.
- Workcell area for hydraulics and pneumatics, robotics, and programmable logic controls.

- Mitsubishi robot system equipped with Roboware robotics program, plus vision sensor, sonar, actuator, and a conveyer belt all controlled through a PLC or (Labview - Purchased in 2006).
- Horizontal and vertical band saws
- Shear machine
- Sand blaster
- Metal forming/bending machine
- Compression/Tension testing machine
- Amatrol Hydraulic stations.
- Instron compression/tension testing machine - This is a full industrial size Universal Testing Instrument - This machine was donated to NKU by ZF - Sacks Industry – Obtained in 2006
- HYUNDAI – HIT 8S - CNC Turning Center – This machine was donated to NKU by Mazak – Obtained in 2005.
- Two Rhino Robots were purchased through grants by M. Sadat, 2005. One of these robots is a Scara robots and other one is a universal joint type robot. These robots are used in EGT320 – Robotics and Automation course and EGT465 – Automated Manufacturing Course. Obtained in 2005
- Lab-view software and data acquisition cards capable of programming robots and absorb data from Instron Tensile Testers. Obtained in 2005.

INDUSTRIAL MATERIAL LAB (AST 125) – General Description: This laboratory is well equipped with test and process equipment for inspecting and analyzing engineering and industrial materials, both metallic and non-metallic.

Courses that benefit from this lab: EGT 261, EGT 300, EGT 361, EGT 340, EGT380, and EGT 450

SPECIAL FEATURES OR FUNCTIONS:

- Instron compression/tension testing machine - This is a full industrial size Universal Testing Instrument (Instron 4206) equipped with a 15,000 kg. Load cell. This machine is regularly calibrated and kept up to date do through a contract between NKU and Automotive Mannesmann Sachs Inc.
- Metal platting equipment.
- Electric furnace for heat treatment or annealing applications.
- Nikon and (Image Pro) Microscopes and attachments: digital camera & Pc plus software to analyze and save images captured through the cameras.
- Rockwell hardness testing machines.
- Twelve Personal computers with CAD, CAM, and PLC simulator software.
- MasterCAM (6 seats) upgraded in 2005.
- Ashby Materials selection software, purchased through library funds in 2006.

g. Comment on the adequacy of IT support for this program

Information Technology (IT) has directly supported Engineering Technology in different ways. One example is the software support fund provided to renew CAD

licenses. During the past several years IT has partially paid for the license renewal for ACAD (ADI) bundle and Pro-Engineer annual fees.

Other important services by IT include:

Email and Telephone support

Hardware setup (printer, plotter, and equipment) and configuration

Network services

Blackboard administration, training

Software upgrade, maintenance and some training

Window setup and maintenance

Computer lab support and maintenance

Smart classroom and instructor station support

Multimedia support (Camera, Video, etc.)

Faculty/Staff Computer replacement, support

h. Most pressing unmet needs of the program as related to facilities and equipment. Explain these needs.

The most unmet pressing need of the program is the upgrade of equipment and renovation of ST121. ST121 was built as a large manufacturing research lab. The nature of manufacturing has drastically changed from 25 years ago, when the building was constructed. Today's manufacturing is smart, clean and follows multiple ISO standards to stay lean and profitable. It is hard to portray or even emulate modern manufacturing if the facilities are not upgraded and maintained.

AST121 needs to be renovated to allow better utilization of space and dividing the space into three different rooms. A classroom space, a clean-room space for precision equipments, and a conventional manufacturing laboratory space would be created.

9. Program Benchmarking –helps the department gather information about best practices used by NKU's benchmark institutions. Based on your review of materials gathered from the peer institutions, address the following:

a. Briefly describe the process for selecting benchmark institutions.

The ABET accreditation process, and the surrounding ABET-accredited industry and community colleges supplying engineers and engineering technologist (ET) provide the best benchmark for good practice. All the two year institutions must meet commercial efficiency goals in preparing ET graduates, but the accrediting process becomes a valuable measure of the quality of the graduate, and the adequacy of their career preparation.

Arizona State University, Purdue University in Indiana and Weber State University in Utah are some institutions that offer strong Engineering Technology degrees in Mechanical and Manufacturing. We have studied these institutions as model programs to modify the MMET curriculum. These institutions like NKU offer BS degrees in MMET that are ABET accredited. All these programs are laboratory intensive programs; offer co-op courses and require students in these programs to finish a senior/capstone project prior to graduation.

b. Briefly describe the process for gathering information from the benchmark institutions and identify contacted institutions.

ABET provides detailed information, including a pre-visit self-study, that prepares a program in engineering technology for the accreditation visit. Two EGT faculty have attended ABET accreditation workshops. Their involvement in the self-study preparation caused immediate improvement in both EET and MMET programs.

c. List any significant similarities and differences between your program and related programs at the benchmark institutions. Identify institution and comment on findings.

There are not a large number of institutions with Mechanical and Manufacturing Engineering Technology programs combined in one degree, although some institutions have started to do so. A quick web search shows that more institutions with *engineering* degrees have combined Mechanical and Manufacturing programs than institutions with *engineering technology* degrees.

The ABET web-site, http://www.abet.org/accredittac.asp, allows one to conduct a search for accredited institutions with similar names. NKUs' Engineering Technology program is currently listed under the Manufacturing Engineering Technology, but after it is accredited it should show up under both Mechanical Engineering Technology, as well as the Manufacturing Engineering Technology.

Arizona State University http://www.asu.edu/aad/catalogs/graduate/p-cst.html , Polytechnic campus offers MMET degree. Purdue University http://www.tech.purdue.edu/met/, offers separate programs in Mechanical Engineering Technology and Manufacturing Engineering Technology.

d. List features of analogous programs at the benchmark institutions that are not currently practices in your program but that you believe should be considered for adoption by your program. List at least two and explain your choices.

What is not practiced at NKU is the recognition given to Engineering and Engineering Technology Programs. What is clear at the benchmark institutions is the visibility of their Engineering/Technology programs. Engineering and Engineering Technology programs at these benchmark institutions are all placed in colleges of

Engineering/Technology. In-order for these programs to grow, NKU should establish a department of Engineering/Technology.

e. List resources needed to incorporate these features into your program.

What is needed is a commitment to promote Engineering and Engineering Technology at NKU by:

- Establishing a department of Engineering/Technology
- Fill vacant faculty line in Engineering Technology

10. External Evaluators Provide the following information on any previous reviews of the program

a. Year: 2007

Accrediting Body – American Board of Engineering and Technology

ABET, Inc.
111 Market Pl., Suite 1050
Baltimore, MD 21202
(410) 347-7700
http://www.abet.org/

Status:
MMT Programs is in the reaccreditation process. The MMET program was reviewed and the following recommendations have been issued.

Recommendations:

Introduction

The Mechanical and Manufacturing Engineering Technology program has established Seven educational objectives for graduate as follows:

- have a working knowledge of engineering materials, manufacturing, processes, dynamics, applied mechanics, applied fluids, applied thermal services, electricity, computer aided design, automated manufacturing and mechanical systems;
- have demonstrated an ability to communicate effectively in oral, written or visual forms;
- have demonstrated an ability to work effectively in teams;
- have ability to use their knowledge to solve mechanical and manufacturing problems;
- have demonstrated an ability to design, analyzed, develop, document, and implement and oversee mechanical systems;
- have demonstrated an awareness of ethical, professional and social issues;
- and have demonstrated the recognition of the need for and possess the abilities to purse lifelong learning.

Graduates of the program accept such positions as managers, supervisors and engineers predominately in the manufacturing and machining sectors.

The Program Criteria for Mechanical Engineering Technology and Similarly Named Programs and the Program Criteria for Manufacturing Engineering Technology and Similarly Named Programs as published in the 2007-08 TAC criteria document also were used to evaluate this program. Findings in meeting the provisions of ABET criteria and policies are described below.

Note: Findings cited under Institutional Factors also apply to this program.

Program Weaknesses

1. Criterion: Criterion 2. Program Outcomes states, "An engineering technology program must demonstrate that graduates have ...d. an ability to apply creativity in the design of systems, Components or processes appropriate to program objectives...h. a recognition of the need for, and an ability to engage in lifelong learning...j. a respect for diversity and knowledge of contemporary professional, societal and global issues." Creativity, while not deterred, is neither promoted nor assessed in this program. When student projects are evaluated, faculty members do consider creativity in the awarding of grades. Creativity is important to the engineering technology profession, and a failure to stress the importance or recognize the existence of creativity can restrict the student's ability to solve problems and apply skills. No evidence was provided to demonstrate the program is emphasizing or assessing the ability of its graduates to engage in lifelong learning. Without the ability to engage in lifelong learning, graduates will be handicapped in their abilities to remain technologically current and be able to enter positions of increasing responsibility. The program indicated that diversity and contemporary professional, societal, and global issues was being addressed in a general education philosophy. However, no evidence of coursework was provided, and no evidence of the assessment or evaluation of the level of achievement of this outcome was provided. Without a respect for diversity, graduates will not have a full understanding or appreciation of diversity and gender issues found in all work places limiting their ability to function and capitalize on the global opportunities offered.

Therefore, it is required that the program demonstrate that its graduates have (1) an ability to apply creativity in the design of systems, components or processes appropriate to program objectives, (2) a recognition of the need for, and an ability to engage in lifelong learning, and (3) a respect for diversity and a knowledge of contemporary professional, societal and global issues.

2. Criterion: Criterion 3. Assessment and Evaluation states, "Each program must utilize multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met...Each program must demonstrate that the results of the assessment of program objectives and outcomes are being used to improve and further develop the program in accordance with documented process." Although there was a continuous improvement plan and a list of measures to use in assessing outcomes and objectives, there was no evidence to show that the results of assessment of program objectives and outcomes are being used to further develop the program. A well defined and functional continuous improvement plan that uses assessment of program objectives and outcomes to further develop the program can help assure employer satisfaction as encourage future program growth.

Therefore, it is required that the program (1) demonstrate that it is utilizing multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met and (2) demonstrate that the results of the assessment of

program objectives and outcomes are being used to improve and further develop the program in accordance with documented process.

3. Criterion: Criterion 4. Program Characteristics states, "Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and nontechnical skills in solving problems." Although the program has a senior project course that is intended to provide the capstone function, it did not provide any evidence that the course was successfully combining technical and non-technical skills. Senior projects are accepted by the responsible faculty without demonstrating application of the core program elements. The evaluation rubric for this project is used to evaluate student writing competencies, student presentation style and competencies, and student use of presentation aides. There is no evaluation of the technical content of the project or of the student ability to integrate technical and non-technical skills. Without the assessment of the technical skills or the ability to integrate technical and non-technical skills within the senior project, the program has no means to evaluate the student's grasp of the technical concepts which comprise the core elements of the required curriculum. Therefore, it is required that the program demonstrate that capstone or other integrating experiences are drawing together diverse elements of the curriculum and developing student competence in focusing both technical and non-technical skills in solving problems.

Program Concerns

l. Criteria: Criterion 5. Faculty states, "The program must have an effective professional development plan for its faculty." Criterion 7. Institutional and External Support states, "Institutional support must include...resources sufficient to...provide for the continued professional development of a well-qualified faculty". Faculty members make concerted efforts to attend professional development activities even when it involves out-of-pocket expenses for them. Limited funding is provided by the institution for this purpose. Additional funds to assist faculty members in participating in professional activities would help them remain technically current. Without technically current and professionally active faculty, the quality of graduates from the program and employer satisfaction with graduates can suffer. Therefore, this finding remains a concern until the program demonstrates (1) that it has an effective professional development plan for its faculty, and (2) that it is being provided with resources sufficient to provide for the continued professional development of its faculty.

Observations for Improvement

1. With the exception of some stand-alone brochures, university catalogs and other publications do not provide readily-accessible information on the Mechanical and Manufacturing Engineering Technology program. Lack of visibility of the program may prevent much needed exposure to the program and thus prevent students from being attracted into the program. It is suggested that an aggressive marketing plan be developed and implemented for the Mechanical and Manufacturing Engineering Technology program to attract more students into the program.

2. While there is evidence that input from multiple constituencies are used in developing program objectives, there was no evidence that student input was involved. The absence of formal student input in developing program objectives and program learning outcomes can neglect the insight and contributions from the student point of view. It is suggested that student input be considered in developing program learning outcomes and educational objectives.

Status of Implementing Recommendations:

Due to the fact the visit was made in October of 2007, there has been very little time to implement all the recommendations. We have implemented some actions in response to the recommendations and are in the process of reporting the correction actions to TAC-ABET before February 15, 2008.

Barriers

Some of the barriers are; as stated by ABET evaluation report, under program weakness 2.

A well defined and functional continuous improvement plan that uses assessment of program objectives and outcomes to further develop the program can help assure employer satisfaction and encourage future program growth.

To satisfy the above program weakness there needs to be a well established structure, to collect and analyze data necessary for a complete continuous improvement cycle. With lack of resources and limited number of faculty and staff in the program, it is very hard to put in place all the steps necessary to satisfy this weakness in a short time.
It is expected that as NKU gears up and prepares for the SACS reaffirmation we in Engineering Technology would benefit in terms of sharing the same tools used for SACS reaffirmation and the Quality Enhancement Plan.

Outcome

WEAVE online and Digital Measure are two of these tools that could help alleviate this weakness. With utilization of WAVE we expect it to help improve the TAC-ABET accreditation, assessment and quality improvement process.

Next accreditation:

Next accreditation is contingent upon the decision of the accreditation commission. ABET accreditation commission will study institutions response letter to the above stated weaknesses and concerns and decides if there is a need for an interim meeting.

If there are many weakness in a program, ABET might find it necessary to require an interim visit. This decision is made based on the status of the program and amount of deficiencies found at the time of the visit. Under normal circumstance, accreditation is granted to programs for a full six years term.

11. Program Planning (SACS, Institutional, CPE) - discuss the program's planning process for the next 5 years. 10 years.

a. Describe current and long-range opportunities that are available to the program.

MMET program is a unique bachelor degree program that combined two fields of study into one degree. The program has a great potential for growth as NKU develops to be a major metropolitan higher education institution.

The region benefits from the existence of major tier one manufacturers and numerous other small industries. MMET program is geared to satisfy the demands for skilled Engineering Technology graduates.

During the next five years NKU should initiate a department of Engineering/Technology. Data indicate incoming students mark engineering/technology as one of their top four choices at NKU.

b. Describe current and long-range challenges facing the program.

Main challenges of EGT programs include lack of visibility (short term) and again of the facilities (long term). In addition, the program has lost faculty lines (long term).

c. What are the program's strategies for taking advantage of these opportunities and meeting these challenges?

There have been discussions on the visibility of MMET and EET programs in Physics and Geology department. These include: establishing a two department, separate web-sites, and improvement of the recruitment strategies

Facility maintenance (long term) needs to be discussed on department level and further followed up to administration. To maintain accreditation each EGT program must have 2 ½ full-time faculty. Currently there are four full time faculty teaching in the two EGT programs with one retired faculty position (Randy Holt) being discussed and it is hoped it will be returned to EET program.

d. How does the program's strategic plan relate to Academic Affairs' Academic Plan (http://programreview.nku.edu/academicstrategicplan2002.pdf) and to the University's Strategic Agenda (http://president.nku.edu/page.asp?p=0715900)

The EGT programs do not have a formal written strategic plan at this time. Program objectives are continuously assessed by the programs constituencies. Objectives are then aligned according to the assessment findings, SACS objectives, and NKU mission and vision statements.

It is the goal of EGT faculty and director to have program strategic plans that is reflective of the University's overall strategic plan. Some of the proposed Unit priorities for Action are:

1. Increase the number of transfer students into undergraduate engineering Technology programs

2. Require all the students in EGT majors to have more integrated work-study (co-op) experience while at NKU.
3. Improve the technological capabilities of our laboratory facilities, students, and faculty
4. Promote internationalization of NKU through globalized engineering education.
5. Increase integration of online and web-based learning in the EGT classes.
6. Increase the amount of scholarship funds for engineering/technology

12. Dean's Response and Recommendations - The appropriate college dean (and Dean of Graduate Programs in the case of graduate programs) will comment in writing on the program's self-study and make recommendations about issues raised in the report and a general recommendation as outlined in Program Review Results section above. College deans and the Dean of Graduate Programs will share their comments with each other during the response and recommendation phase of the review process. The dean's (or deans' in the case of graduate programs) response and recommendations will be attached to the self-study and the two documents will be forwarded together to the Program Review Steering Committee for review (by March 15).

APPENDIX A

CHARTS SHOWS:
PROGRAM OUTCOMES vs. PROGRAM OBJECTIVES
PROGRAM OUTCOME vs. ABET OUTCOMES
PROGRAM OBJECTIVES vs. COURSES IN THE PROGRAM
PROGRAM OUTCOMES vs. COURSES IN THE PROGRAM

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