



College of Engineering, Technology, and Computer Science

Department of MCET

Assessment and Continuous Improvement Plan

(prepared 1/08)

1. Introduction

The Department of Manufacturing & Construction Engineering Technology and Interior Design (MCET) in the College of Engineering, Technology and Computer Science serves the needs of students, industry and government in northeastern Indiana.

The department offers Associate of Science (A.S.) degrees in Architectural Engineering Technology (ARET), Civil Engineering Technology (CET), Industrial Engineering Technology (IET), Mechanical Engineering Technology (MET), and Interior Design (ID). The department also offers Bachelor of Science (B.S.) degrees in Construction Engineering Technology (CNET), IET, MET, and ID. It also has a Certificate in Quality.

The Engineering Technology (ET) programs, both A.S. and B.S., are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700 (www.abet.org). The Interior Design B.S. program will be accredited by CIDA (Council of Interior Design Accreditation) in due course of time. They do not accredit A.S. programs. The department offers Master of Science in Technology courses for the track of Industrial Technology/Manufacturing. The graduate program has a separate assessment plan and is not included in this plan.

The primary focus of the Department of MCET is the development of its students. It encourages students to acquire the knowledge and understanding that helps them contribute to society by leading meaningful, constructive, and productive lives.

The major thrust of the Department of MCET is to prepare graduates to understand basic concepts of knowledge, have studied one technical field in sufficient depth to appreciate its methodologies and fundamental unresolved questions, and have acquired a basis for life-long learning. Attainment of the above is accomplished through the establishment of

courses in: (1) technical courses in the major area, (2) elective courses combining breadth of subject matter with specific study in depth, and (3) core of general education. Laboratory and project work experience is an essential part of both associate and bachelor degree programs.

2. Department Mission

The mission of the Department of MCET is to support the career aspirations of undergraduate and graduate students, and to fulfill the needs of their current and future employers. The department offers, develops, and continuously improves educational programs to meet these needs. The programs are accessible to traditional and nontraditional students, and support evolving career objectives by emphasizing lifelong learning.

3. Department Goals

1. Offer certificate, associate, bachelor, and graduate degree programs that meet the varied needs of regional industry.
2. Support a diverse community of learners.
3. Promote the scholarly and creative achievements of faculty and students.
4. Pursue continuous improvement.

4. Program Objectives

A. ET Programs

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation. They are consistent with the mission of the university, the mission of the college and the goals of the department. They are determined and periodically evaluated based on the needs of the constituencies served by the programs. The program objectives of the individual AS and BS programs are given below:

1. ARET AS Degree

1. To provide education of the traditional and returning adult student for career success in the construction industry.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To be responsive to the ever-changing technologies of the construction industry.
4. To instill in students the desire for and ability to engage in life-long learning.

2. CET AS Degree

1. To provide education of the traditional and returning adult student for career success in the construction industry.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To be responsive to the ever-changing technologies of the construction industry.
4. To instill in students the desire for and ability to engage in life-long learning.

3. IET AS Degree

1. To prepare graduates with knowledge, technical, analytical, and managerial skills necessary to develop, implement, and improve integrated systems in manufacturing and service industries that include people, materials, equipment, information, and energy.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To prepare graduates for both immediate employment and continuation in the BS program.

4. MET AS Degree

1. To prepare graduates with knowledge, problem solving ability and hands-on skills to enter careers in installation, manufacturing, testing, evaluation, computer-aided design, or maintenance of basic mechanical systems.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To prepare graduates for both immediate employment and continuation in the BS program.

5. CNET BS Degree

1. To provide education of the traditional and returning adult student for career success in the construction industry, with a special emphasis on sustainable construction.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To be responsive to the ever changing technologies of the construction industry.

4. To instill in students the desire for and ability to engage in life-long learning.

6. IET BS Degree

1. To prepare graduates with knowledge, technical, analytical, and managerial skills necessary to develop, implement, and improve integrated systems in manufacturing and service industries that include people, materials, equipment, information, and energy.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.
3. To prepare graduates for careers in higher levels of system design, integration, and management.

7. MET BS Degree

1. To prepare graduates with knowledge, problem solving ability, and hands-on skills to enter careers in analysis, applied design, development, implementation, manufacturing, testing, technical sales, evaluation, or oversight of mechanical systems and processes.
2. To develop a respect for diversity and a knowledge of contemporary professional, societal, and global issues with an understanding of professional and ethical responsibilities.

B. Non-ET Programs

The educational objectives for Interior Design are similar to those of ET programs. Interior Design objectives, known as “Standards”, are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation. These standards are consistent with the mission of the university, the mission of the college and the goals of the department. They will be determined and periodically evaluated based on the needs of the constituencies served by the programs. Interior Design Standards are given below:

1. Interior Design AS and BS Degrees

- (1) Curriculum Structure: The curriculum is structured to facilitate and advance student learning.
- (2) Professional Values: The program leads students to develop the attitudes, traits, and values of professional responsibility, accountability, and effectiveness.
- (3) Design Fundamentals: Students have a foundation in the fundamentals of art and design; theories of design, green design, and human behavior; and discipline-related history.

- (4) Interior Design: Students understand and apply the knowledge, skills, processes, and theories of interior design.
- (5) Communication: Students communicate effectively.
- (6) Building Systems and Interior Materials: Students design within the context of building systems. Students use appropriate materials and products.
- (7) Regulations: Students apply the laws, codes, regulations, standards, and practices that protect the health, safety, and welfare of the public.
- (8) Business and Professional Practice: Students have a foundation in business and professional practice.

2. Quality Certificate

Prepare graduates with skills in techniques related to quality, such as design of experiments, metrology, and statistical process control.

5. Program Outcomes

A. ET Programs

Program outcomes describe the knowledge, skills, and abilities students are expected to acquire from the program, to prepare them to achieve the program educational objectives. The outcomes are demonstrated by the student in each course in the curriculum and measured by the program at the time of graduation.

The ET program outcomes are developed based TAC/ABET general and program criteria. The TAC/ABET program outcomes in the general criteria are common to all ET programs. The program outcomes for all ET programs are given next followed by the individual program-specific outcomes.

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of the appropriate ET program.
- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
- c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
- d. an ability to apply creativity in the design of systems, components or processes.
- e. an ability to function effectively on teams.
- f. an ability to identify, analyze and solve technical problems.
- g. an ability to communicate effectively.
- h. a recognition of the need for, and an ability to engage in lifelong learning.
- i. an ability to understand professional, ethical and social responsibilities.
- j. a knowledge of and respect for diversity, contemporary societal and global issues related to the profession.
- k. a commitment to quality, timeliness, and continuous improvement.

The program-specific outcomes of the ET programs are given in Appendix A.

B. Non-ET Programs

1. ID AS Degree (Based on CIDA Professional Standards)

- (1) Students are able to advance their learning. (CIDA Professional Standard 1: Curriculum Structure) *
 - a. Be able to interact with multiple disciplines.
 - b. Have opportunities for design work experience.
- (2) Students have the attitudes, traits, and values of professional responsibility, accountability, and effectiveness. (CIDA Professional Standard 2: Professional Value) *
 - a. Have critical, analytical, and strategic thinking abilities.
 - b. Be able to have creative thinking (exhibit a variety of ideas, approaches, concepts with originality and elaboration).
 - c. Have the ability to think visually and volumetrically.
 - d. Have active listening skills leading to effective interpretation of requirements.
- (3) Students have a foundation in the fundamentals of art and design; theories of design, green design, and human behavior; and discipline-related history. (CIDA Standard 3: Design Fundamentals) *
 - a. Understanding design elements (for example, space, line, mass, shape, texture) and principles (for example, scale, proportion, balance, rhythm, emphasis, harmony, variety).
 - b. Understanding color principles, theories, and systems (for example, additive and subtractive color; color-mixing; hue, value, and intensity; the relationship of light and color).
 - c. Understanding theories of design and design composition.
 - d. Understanding principles of lighting design (for example, color, quality, sources, use).
 - e. Understanding of the history of architecture and finishes.
- (4) Students understand and apply the knowledge, skills, process, and theories of interior design. (CIDA Professional Standard 4: Interior Design) *
 - a. Apply 2-dimensional design elements and principles in interior design projects.
 - b. Select and apply color in interior design projects.
 - c. Have competent schematic design, concept development, and problem solving skills.
- (5) Students communicate effectively. (CIDA Professional Standard 5: Communication) *
 - a. Be competent in drafting with computer-aided techniques.
 - b. Be competent in digital 3D modeling.
 - c. Be competent in illustrative sketching.
 - d. Be competent in presentation of color, materials, and furnishings (for example, sample boards, collages, mock-ups, digital representations).

- e. Be able to express ideas clearly in oral presentations and critiques.
 - f. Be able to render by any medium, manual or computer-generated, that successfully communicates the design intent.
 - g. Be able to communicate 3-dimensional space and form, such as in perspectives and models (computer-generated or manual).
- (6) Students are able to design within the context of building systems. Students are able to use appropriate materials and products. (CIDA Professional Standard 6: Building Systems and Interior materials) *
- a. Understanding that design solutions affect and are impacted by construction system and method, mechanical, electrical, plumbing/HVAC and other systems.
 - b. Be able to select and apply materials and products appropriately on the basis of their properties and performance criteria.
 - c. Have the knowledge of installation methods (for example, carpet, resilient flooring, wall covering).
- (7) Students are able to apply the laws, codes, regulations, standards, and practices that protect the health, safety, and welfare of the public. (CIDA Professional Standard 7: Regulations) *
- a. Have the ability of appropriate application of codes and regulations, barrier-free design guidelines.
 - b. Understanding of the impact on health and welfare of indoor air quality, noise and lighting.
- (8) Students have a foundation in business and professional practice. (CIDA Professional Standard 8: Business and Professional Practice) *
- a. Have the knowledge of certification, licensing, and registration requirements and professional design organizations.
 - b. Understanding of basic business computer applications (for example, word processing, spreadsheets).

2. ID BS Degree (Based on CIDA Professional Standards)

- (1) Students are able to advance their learning. (CIDA Professional Standard 1: Curriculum Structure)*
- a. Be able to interact with multiple disciplines.
 - b. Have exposure to a variety of business.
 - c. Have opportunities for design work experience.
- (2) Students have the attitudes, traits, and values of professional responsibility, accountability, and effectiveness. (CIDA Professional Standard 2: Professional Value) *
- a. Have professional ethics and the role of ethics in the practice of interior design.
 - b. Have environmental ethics and the role of sustainability in the practice of interior design.
 - c. Have a global perspective and approach to thinking and problem solving.
 - d. Have critical, analytical, and strategic thinking abilities.

- e. Be able to have creative thinking (exhibit a variety of ideas, approaches, concepts with originality and elaboration).
 - f. Have the ability to think visually and volumetrically.
 - g. Have professional discipline skills (for example, time management, organizational skills).
 - h. Have active listening skills leading to effective interpretation of requirements.
- (3) Students have a foundation in the fundamentals of art and design; theories of design, green design, and human behavior; and discipline-related history. (CIDA Standard 3: Design Fundamentals) *
- a. Be able to utilize design elements (for example, space, line, mass, shape, texture) and principles (for example, scale, proportion, balance, rhythm, emphasis, harmony, variety).
 - b. Be able to utilize color principles, theories, and systems (for example, additive and subtractive color; color-mixing; hue, value, and intensity; the relationship of light and color).
 - c. Be able to utilize theories of design and design composition.
 - d. Understanding principles of lighting design (for example, color, quality, sources, use).
 - e. Understanding of theories of human behavior in interior environments.
 - f. Understanding of principles and theories of sustainability.
 - g. Understanding of the history of art, architecture, interior and finishes.
- (4) Students understand and apply the knowledge, skills, process, and theories of interior design. (CIDA Professional Standard 4: Interior Design) *
- a. Apply 2-dimensional design elements and principles in interior design projects.
 - b. Apply 3-dimensional design elements and principles to the development of the spatial envelope (for example, volumes of space, visual continuity and balance, visual passages, interconnecting elements).
 - c. Select and apply color in interior design projects.
 - d. Have programming skills.
 - e. Have competent schematic design, concept development, and problem solving skills.
 - f. Have competent design development skills.
 - g. Have competent skills in preparing drawings, schedules, and specifications as an integrated system of contract documents, appropriate to project size and scope and sufficiently extensive to show how design solutions and interior construction are related.
 - h. Have design development skills.
- (5) Students communicate effectively. (CIDA Professional Standard 5: Communication) *

- a. Be competent in drafting and lettering, both manual and computer-aided techniques.
 - b. Be competent in illustrative sketching.
 - c. Be competent in presentation of color, materials, and furnishings (for example, sample boards, collages, mock-ups, digital representations).
 - d. Be able to express ideas clearly in oral presentations and critiques.
 - e. Be able to communicate in writing (using correct spelling, grammar, and syntax) in specifications, schedules, and contracts and other business-related documents such as project programs, concept statements, reports, research papers, resumes, and correspondence.
 - f. Be able to render using any manual or computer-generated medium that successfully communicates the design intent.
 - g. Be able to communicate 3-dimensional space and form, such as in perspectives, pralines, and models (computer-generated or manual).
 - h. Have the ability to apply the metric system to design work.
 - i. Be able to communicate through alternative presentation techniques (for example, audio, electronic, film, photography, slides, video).
- (6) Students are able to design within the context of building systems. Students are able to use appropriate materials and products. (CIDA Professional Standard 6: Building Systems and Interior materials) *
- a. Understanding that design solutions affect and are impacted by construction system and method, mechanical, electrical, plumbing/HVAC and other systems.
 - b. Be able to select and apply materials and products appropriately on the basis of their properties and performance criteria.
 - c. Have the knowledge of sources for materials and products.
 - d. Understanding of the concept of sustainable building methods and materials.
 - e. Have the knowledge of installation methods (for example, carpet, resilient flooring, wall covering).
 - f. Understanding material maintenance requirements.
- (7) Students are able to apply the laws, codes, regulations, standards, and practices that protect the health, safety, and welfare of the public. (CIDA Professional Standard 7: Regulations) *
- a. Understanding of the impact of fire and life safety principles on space planning.
 - b. Have the ability of appropriate application of codes and regulations, barrier-free design guidelines, ergonomic and human factors data.
 - c. Understanding of the impact on health and welfare of indoor air quality, noise and lighting.

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- d. Demonstrate understanding of universal design concepts and principles.
- (8) Students have a foundation in business and professional practice. (CIDA Professional Standard 8: Business and Professional Practice) *
 - a. Understanding of project management practices.
 - b. Have the knowledge of certification, licensing, and registration requirements and professional design organizations.
 - c. Understanding of basic business computer applications (for example, word processing, spreadsheets).
 - d. Have the knowledge of business processes (for example, marketing, strategic planning, and accounting procedures).

3. Quality Certificate

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of quality, metrology, SPC, SQC, TQM, ISO standards, and DOE.

6. Relationship of Courses, Outcomes, and Objectives

Relationships between program outcomes and objectives are shown in Table 1.

Table 1. Objectives and Outcomes of all ET Programs.

Out-come	Description	AS – Objectives				BS – Objectives		
		ARET	CET	IET	MET	CNET	IET	MET
a	mastery of knowledge	1*	1	1, 3	1, 3	1	1, 3	1
b	emerging knowledge	1, 3	1, 3	1, 3	1, 3	1, 3	1, 3	1
c	laboratory	1	1	1	1	1	1	1
d	creativity in design	1, 3	1, 3	1, 3	1, 3	1, 3	1, 3	1
e	team work	2	2	2	2	2	2	2
f	technical problems	1, 3	1, 3	1	1	1, 3	1	1
g	communication	2, 4	2, 4	2	2	2, 4	2	2
h	lifelong learning	3, 4	3, 4	3	3	3, 4	3	1
i	ethics	2	2	2	2	2	2	2
j	diversity, social, global	2	2	2	2	2	2	2
k	quality, timeliness, CI	2, 4	2, 4	2, 3	2, 3	2, 4	2	2

* The numbers in the table refer to the listing of program objectives given in Section 4.

Curriculum Map

The program outcomes covered in courses are given at the end of this plan in Appendix A. They are given from Table A1 onwards. For most programs, the mapping indicates whether a program outcome is (1) covered and assessed, (2) covered, or (3) not covered.

7. Assessment Measures, Methods, and Procedures

Program objectives and program outcomes are assessed through multiple direct and indirect measures to demonstrate that they are being met by the graduates. Details on the actual assessment processes are given in the Methods section. Details on the assessment and continuous improvement cycle are given in the Procedures section.

Measures

The measures used in assessment suit the culture and traditions of the department and meet the needs of achieving continuous improvement of our programs. Table 2 gives the measures with their frequency and responsibility.

Table 2. Assessment Measures Used for Objectives and Outcomes.

Purpose	Measures	Semester, Frequency	Responsibility of
Assessment of Program Objectives	(1) IAC	Spring, 2 years	Program Coordinators
	(2) Employer Survey	Spring, 2 years after graduation	Chair/Assessment Director/Coordinators
	(3) Alumni Survey	Spring, at 2 years after graduation	Chair/Assessment Director/Coordinators
Assessment of Program Outcomes	(1) Capstone Project Assessment	Fall or Spring, yearly	Capstone Faculty
	(2) Course Assessment	Fall or Spring, yearly	All Faculty, full-time, part-time
	(3) Graduate Exit Survey	Every semester	Program Coordinators
	(4) IAC	Spring, yearly	Program Coordinators
	(5) Co-op Survey	when applicable	Coop Faculty

The indirect measures consist of surveys that have questions pertaining to objectives or outcomes. The surveys vary from program to program and are not described in this plan. The direct measures of course assessment and capstone project assessment are described in the next section. Those responsible for direct measures should ensure that the assessment procedures are followed according to this plan.

Methods

Performance Criteria and Learning Outcomes

Performance criteria are measurable statements and indicate the specific attributes or characteristics students should demonstrate as achieved at a desired competency level. Table 3 shows some examples of performance criteria.

Learning outcomes are derived from and linked to the program outcomes. They consist of the knowledge, skill, attitudes, and values that students should be able

to demonstrate by the end of the program. Learning outcomes that are broad statements are non-measurable and may be considered as a subset of program outcomes.

Faculty are responsible for evaluating student performance with respect to learning outcomes and program outcomes. Course syllabi should list the learning outcomes and their corresponding program outcomes.

Table 3. Program Outcomes and Measurable Performance Criteria.

PO	Description	Performance Criteria (Ability to)
a	mastery of knowledge (traditional knowledge)	1. Define/list/explain/draw/understand/compare/develop/apply/use
b	emerging knowledge (application of emerging technologies)	1. Same as above when emerging or current trends, techniques, skills are taught.
c	laboratory work	1. Perform/set up/analyze/program/interpret lab. 2. Give appropriate results/conclusions of lab.
d	creativity in design (build or design projects)	1. Select a well-defined problem for project. 2. Design/build/construct project using proper knowledge and skills. 3. Design/build/construct project creatively or accurately.
e	team work	1. Attend team meetings regularly. 2. Participate professionally and objectively in team discussions. 3. Does team-assigned work ethically and on time.
f	technical problems	1. Analyze/formulate/determine/calculate/solve
g	written communication	1. Write clear and concise report. 2. Organize report well. 3. Write in professional language and style. 4. Write free of typographical errors.
g	oral communication	1. Presentation includes introduction, body, & conclusion. 2. Speak clearly. 3. Have well-prepared audiovisual materials. 4. Respond effectively to questions and comments.
h	lifelong learning	1. Use external sources in course/project work.
i	ethics	1. List professional code of ethics in the discipline. 2. Use ethics in a professional problem.
j	diversity	1. Describe diversity in the profession or its history. 2. Describe diverse workplace cultures.
j	social issues	1. Describe social issues concerning the profession.
j	global issues	1. Describe global issues concerning the profession.
k	quality	1. Present course work neatly and professionally. 2. Use computer for doing course work.
k	timeliness	1. Complete assignments on time. 2. Come to class on time. 3. Conduct oral presentation within scheduled time.
k	continuous improvement	1. Demonstrate improvement in outcome xx over time.

At the end of each semester, faculty prepare a Course Assessment and Improvement Report as described in the next section.

Course Assessment and Improvement Report

This report is a 1-page summary of the course assessing student achievement of program outcomes. It consists of:

- (1) The course title and course number, semester and year.
- (2) The name of the course instructor.
- (3) Program outcomes covered in the course according to the curriculum map.
- (4) A numerical score of student achievement under each program outcome covered in the course. More discussion on the numerical scoring is given in the section of capstone project assessment.
- (5) Faculty analysis of student performance relative to program outcomes.
- (6) Proposals for continuous improvement.

Any supporting data if necessary for understanding the report should also be provided.

Capstone Project Assessment

Senior design capstone projects are judged by the appropriate faculty and Industrial Advisory Committee members. Table 4 shows a typical form that can be used to assess a written capstone project report. The assessment form for project presentation is developed using the measurable performance criteria for oral communication given in Table 3.

The course faculty is responsible to prepare a summary of feedback from IAC and faculty similar to the course assessment and improvement report described before.

For consistency and meaningful assessment of the capstone projects, the faculty and the IAC members should be provided a scoring rubric by which they can assess the projects satisfactorily under the three categories of “Good”, “Average”, and “Unacceptable”. A brief description of a scoring rubric is provided below. Program coordinators are responsible to provide a meaningful rubric to their capstone project evaluators for assessing the written report.

Scoring Rubric

A scoring rubric contains measurable performance criteria by which a student’s performance is assessed. A 3-level scoring rubric shown in Table 5 has been recommended for program assessment. The three levels are:

- (1) Above Expectations or Good.
- (2) Meets Expectations or Average.
- (3) Below Expectations or Unacceptable.

Table 4. Assessment of Capstone Project Report.

Course: _____ Semester: _____	Not Applicable	Unacceptable	Average	Good
Project Title: _____				
Evaluator: _____ IAC Member / Faculty				
Definition of Problem				
(d) Selected problem is of appropriate level				
(d) Problem has been clearly defined in proper technical language				
Use of Knowledge and Skills				
(a) The technical knowledge and skills for students to demonstrate				
(a) are listed in this section				
(a)				
(b)				
(f)				
Testing, Results, and Conclusions				
(c) Valid, logical, and appropriate testing procedure				
(f) Feasible and practical solution				
Written Report				
(g) Clear and concise technical content				
(g) Well-organized				
(g) In professional language and style				
(g) Free from typographical errors				
Evidence of:				
(c) Experimental setup and data analysis				
(d) Creativity in design				
(e) Teamwork				
(h) Research work				
(i) Application of ethics (health, safety, wellbeing, etc.)				
(j) Diversity in knowledge & solution				
(j) Knowledge of societal issues (economic, productive)				
(j) Knowledge of global issues (environment, cultural needs)				
(k) A commitment to quality				
(k) A commitment to timeliness (project completion times)				
(k) A commitment to continuous improvement				

Table 5. Scoring Rubric.

Above Expectations	Meets Expectations	Below Expectations
Describe specific expectations of this level. (Achievement of these expectations is worth at least 80%.)	Describe specific expectations of this level. (Achievement of these expectations is worth between 70-79%.)	Describe specific expectations of this level. (Achievement of these expectations is worth less than 70%.)

For convenience of comparison and benchmarking student achievement, a numerical score is assigned based on average class performance on learning outcomes assessed through exams, quizzes, homework, lab and project work. In course syllabi these learning outcomes have already been shown to relate to specific program outcomes.

If faculty use the 3-level scoring rubric, the number of students out of the total who have achieved each level is used and a numerical score is obtained using weights of Above Expectations = 4, Meets Expectations = 3, and Below Expectations = 2. For faculty using more than 3 levels, the weights can be appropriately distributed among the levels with maximum weight of 4.

For faculty who do not use a scoring rubric, their numerical score of achievement of program outcome is the average class percentage achieved in the learning outcomes linked to the program outcome.

An average of 75% on each program outcome is considered to meet our expectation of achieving program outcomes. If using a scoring rubric, an average achievement score of 3.0 is considered to meet our expectations of achieving program outcomes. These thresholds are subject to revision on an annual basis if necessary.

Procedures

The Department has formal procedures for continuous improvement at the course level as described in Figure 2, and at the program level as described in Figure 3. Responsibilities of the faculty and administration are as follows:

1. The faculty shall:

1. Prepare the course syllabus listing department, course number and title, course description, prerequisites, text(s), topics or learning outcomes, related program outcomes, performance criteria used, class/laboratory schedule, and date of preparation and forward an electronic copy to the department chair.
2. Assess student performance on measurable learning outcomes that are given in the curriculum map as covered and assessed.
3. Conduct a student survey to determine how well the course satisfies the learning outcomes as listed in the syllabus.
4. Solicit student feedback to find areas for course improvement.
5. Submit a Course Assessment and Improvement Report to the department chair along with relevant data at the beginning of the next semester.

6. Arrange to meet and review the course assessment with the department chair as needed.

Figure 2 shows the assessment loop at the course level. The courses that need to do the assessment will be selected by the program coordinators depending on their coverage of program outcomes. All outcomes should be covered at least once in a one-year cycle starting from Fall 2007.

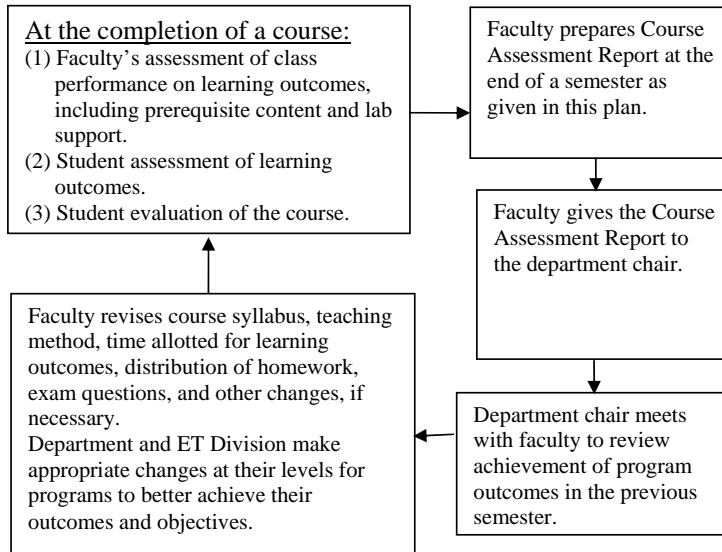


Figure 2. The Assessment Cycle at the Course Level.

2. The program coordinators shall:

1. Meet with the program faculty to assist them in proper preparation of course syllabi and course assessment reports.
2. Conduct and compile graduate exit survey every semester and forward to the department chair.
3. Meet with department chair at least once a year prior to the IAC meeting to discuss achievement of program outcomes and objectives in one-year cycle of Spring and Fall semesters.
4. Help set agenda for Industrial Advisory Committee meetings.
5. Conduct and compile capstone project assessment and forward to the department chair.
6. Forward Industrial Advisory Committee comments and recommendations to the department chair.

7. Conduct and compile stakeholder surveys and forward to the department chair.
 8. Meet with program faculty to prepare and submit to the department chair an Annual Program Assessment Report summarizing any course and curriculum changes based on the evaluation of assessment data collected from IAC, assessment reports, and surveys.
 9. Meet with assessment director on a regular basis to work towards achieving common and unified approach to outcome-based assessment.
- 3. The assessment director shall:**
1. Schedule regular assessment-related meetings with program coordinators and individual faculty if necessary, for simplifying and streamlining assessment efforts.
 2. Assist the department chair in preparation of assessment-related reviews and reports for individual programs and the department.
 3. Keep abreast of assessment-related guidelines and procedures that may affect the programs of the department.
- 4. The department chair shall:**
1. Review faculty course assessment reports at the beginning of each semester and confirm accuracy of curriculum maps.
 2. If necessary, meet with individual faculty to review their course assessment reports.
 3. Review capstone project assessment.
 4. Review data collected from internal and external surveys.
 5. Meet with program coordinators prior to IAC meetings to discuss achievement of program outcomes and objectives in one-year cycle of Spring and Fall semesters.
 6. Review recommendations from IAC advisors.
 7. Review recommendations for curriculum change to reflect reasonable stakeholder recommendations.
 8. Ensure the assessment/continuous improvement feedback loops have been closed.

9. Review the assessment and continuous improvement procedures and plan.
10. Ensure the program objectives and outcomes retain an appropriate, rational, and meaningful relationship.

Figure 3 summarizes the closing of the assessment loop at the program level.

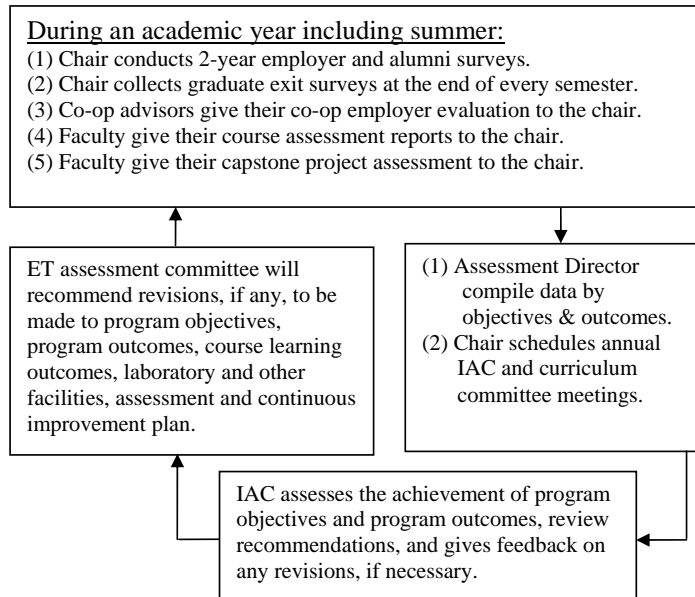


Figure 3. The Assessment Cycle at the Program Level.

8. Assessment of Department Goals

Goals 1, 2, and 4 will be evaluated annually by the assessment committee as part of the normal program review process. Goal 3 will be evaluated as part of the annual progress and planning report prepared by the chair.

Goal 1 Offer Certificate, Associate and Bachelor's degree that meet the needs of regional industry.

Measures

- a. Graduate exit surveys done every semester.
- b. Annual Industrial Advisory Committee review of AS and BS programs.
- c. Employer surveys conducted annually at 2 years after graduation.
- d. Alumni surveys conducted annually at 2 years after graduation.
- e. Maintenance of continuous TAC/ABET program accreditation.

Goal 2 Support a diverse community of learners.

Measures

- a. Various teaching methods involving both traditional lectures, hands on laboratories, projects, and co-op experience.
- b. Flexible course scheduling provides both day time and evening courses to support both full time traditional and part time adult students.
- c. Where appropriate, expand course scope to include issues of cultural diversity.
- d. Student evaluation survey.
- e. Graduate exit survey.

Goal 3 Promote the scholarly and creative achievements of faculty and students.

Measures

- a. Students and MCET faculty are encouraged to collaborate with local industry for projects and funding for senior design projects (capstone course). Evaluation is the number and percentage of sponsored projects.
- b. Faculty membership and leadership in professional organizations are encouraged and supported. Evaluation is the number of active members and their list of activities from the annual faculty review.
- c. Student participation in campus and professional student organizations. Evaluation is number of members and degree of participation.
- d. Faculty professional publications and presentations at professional conferences are encouraged and supported. Evaluation is number and type of publications and presentations and attendance at professional conferences from annual faculty reviews.
- e. Grant applications, by faculty, are encouraged. Evaluation is the number and types of proposed grants from annual faculty reviews.
- f. Faculty are encouraged to consult with industry in their field of specialty to help maintain currency in their profession. Evaluation is the amount and type of consulting from annual faculty reviews.

Goal 4 Pursue continuous improvement.

Measures

- a. Apply the results of the assessment and continuous improvement plan.
- b. Plan and request funding for laboratory equipment and software upgrades on an annual basis. Seek external funding and donations of equipment on an ongoing basis. Develop new laboratories as indicated by program changes. Evaluation is the amount of equipment specified, funded and installed.
- c. Provide increased co-op and internship opportunities for students. Evaluation is the number of opportunities available to students.

Appendix A

This appendix consists of program-specific outcomes and curriculum maps.

The program-specific outcomes of the ET programs are given below. The subdivision of program outcomes is not a requirement of this plan but can be done by the program faculty according to their convenience in monitoring curriculum improvement in specific areas of student learning:

1. ARET AS Degree (* = ABET required)

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines. (*)
 - a1. employing concepts of architectural theory and design in a design environment. (*)
 - a2. utilizing modern instruments, methods and techniques to produce A/E documents and presentations. (*)
 - a3. conducting standardized field and laboratory testing on construction materials. (*)
 - a4. utilizing modern instruments and research techniques for site development and building layout. (*)
 - a5. estimating material quantities for technical projects. (*)
 - a6. utilizing codes, contracts and specifications in design, construction and inspection activities. (*)

- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology. (*)
 - b1. utilize current industry standard equipment.
 - b2. employing productivity software to solve technical problems. (*)

- c. an ability to conduct. Analyze and interpret experiments and apply experimental results to improve processes. (*)
 - c1. conduct, analyze, and interpret experiments then apply results. (*)

- d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives. (*)
 - d1. in-class projects requiring design decisions.
 - d2. student design projects for external presentation.

- e. an ability to function effectively on teams. (*)
 - e1. actively participate in team activities during and outside class.
 - e2. orally and graphically present teams results.

- f. an ability to identify, analyze and solve technical problems. (*)
 - f1. determine forces and stresses in elementary structural systems. (*)
 - f2. calculate basic loads & demands in mechanical/electrical systems (*)

- f3. solve problems in math, statistics, and physics courses.
- g. an ability to communicate effectively. (*)
 - g1. demonstrate effective oral communication skills.
 - g2. demonstrate effective written communication skills.
 - g3. demonstrate effective graphic communication skills.
- h. a recognition of the need for, and an ability to engage in lifelong learning. (*)
 - h1. require library research and reporting.
 - h2. require Web research and reporting.
- i. an ability to understand professional, ethical and social responsibilities. (*)
 - i1. demonstrate knowledge of professional code of ethics.
 - i2. service learning component.
- j. a respect for diversity and a knowledge of contemporary professional, societal and global issues. (*)
 - j1. social studies elective.
 - j2. exposure to other cultures building practices.
- k. a commitment to quality, timeliness, and continuous improvement. (*)
 - k1. quality and timeliness is required aspect of course.
 - k2. course evaluation performed each semester.

2. CET AS Degree (* = ABET required)

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines. (*)
 - a1. utilize graphic techniques to produce engineering documents. (*)
 - a2. utilize modern surveying methods for land measurement and/or construction layout. (*)
 - a3. estimate material quantities for technical projects. (*)
 - a4. technical expertise in applied statics and strength of materials.
- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology. (*)
 - b1. utilize current industry standard equipment.
 - b2. employ productivity software to solve technical problems. (*)
- c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes. (*)
 - c1. conduct standardized field and laboratory testing of materials. (*)
- d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives. (*)
 - d1. in-class projects requiring design decisions.

- e. an ability to function effectively on teams. (*)
 - e1. actively participate in team activities during and outside class.
 - e2. resolve problems as they arise.
- f. an ability to identify, analyze and solve technical problems. (*)
 - f1. determine forces and stresses in elementary structural systems. (*)
 - f2. solve pressure and open channel flow problems.
 - f3. close a traverse survey.
 - f4. solve problems in mathematics, statistics, and physics courses.
- g. an ability to communicate effectively. (*)
 - g1. demonstrate effective oral communication skills.
 - g2. demonstrate effective written communication skills.
 - g3. demonstrate effective graphic communication skills.
- h. a recognition of the need for, and an ability to engage in lifelong learning. (*)
 - h1. require library research and reporting.
 - h2. require Web research and reporting.
- i. an ability to understand professional, ethical and social responsibilities. (*)
 - i1. demonstrate knowledge of professional code of ethics.
 - i2. service learning component.
- j. a respect for diversity and a knowledge of contemporary professional, societal and global issues. (*)
 - j1. social studies elective.
 - j2. humanities elective.
- k. a commitment to quality, timeliness, and continuous improvement. (*)
 - k1. quality and timeliness is required aspect of course.
 - k2. course evaluation performed each semester, software updates

3. IET AS Degree

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of industrial engineering technology.
 - a1. technical expertise in quality, metrology, and SPC.
 - a2. technical expertise in ergonomics, and work methods design.
 - a3. technical expertise in facilities layout, and production planning and control.
 - a4. technical expertise in CAD, engineering graphics, and GD&T.
 - a5. technical expertise in materials and processes, and basic machining.
 - g1. an ability to communicate effectively.
 - g2. an ability to communicate effectively through oral presentation.

- j1. a knowledge of and respect for diversity.
- j2. a knowledge of contemporary societal issues related to the profession.
- j3. a knowledge of contemporary global issues related to the profession.
- k1. a commitment to quality.
- k2. a commitment to timeliness.
- k3. a commitment to continuous improvement.

4. MET AS Degree

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of mechanical engineering technology.
 - a1. technical expertise in engineering materials, applied mechanics, and applied fluid sciences.
 - a2. technical expertise in manufacturing processes, mechanical design, and computer-aided engineering graphics with added technical depth in computer-aided engineering graphics.
 - a3. expertise in applied physics having emphasis in applied mechanics plus fundamentals of electricity in physics.

5. CNET BS Degree (* = ABET required)

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines. (*)
 - a1. utilizing modern instruments, methods and techniques to implement construction contracts, documents, and codes. (*)
 - a2. evaluate materials and methods for construction projects. (*)
 - a3. utilize modern surveying methods for construction layout. (*)
 - a4. estimate material quantities. (*)
 - a5. estimate material costs. (*)
- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology. (*)
 - b1. utilize current industry standard equipment.
 - b2. employ productivity software to solve problems. (*)
- c. an ability to conduct. Analyze and interpret experiments and apply experimental results to improve processes. (*)
 - c1. determine forces and stresses in structural systems. (*)
 - c2. perform economic analyses related to design, construction, and maintenance. (*)
- d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives. (*)
 - d1. produce design for construction and operations documents utilization. (*)

- d2. perform standard analysis and design in one technical specialty in construction. (*)
- d3. select appropriate construction materials and practices. (*)
- e. an ability to function effectively on teams. (*)
 - e1. participate actively in team activities during and outside class.
- f. an ability to identify, analyze and solve technical problems. (*)
 - f1. apply basic concepts to the solution of hydraulic and hydrology problems. (*)
 - f2. apply basic concepts to the solution of geotechnics problems. (*)
 - f3. apply basic concepts to the solution of structures problems. (*)
 - f4. apply basic concepts to the solution of construction scheduling and management problems. (*)
 - f5. apply basic concepts to the solution of construction safety problems. (*)
- g. an ability to communicate effectively. (*)
 - g1. demonstrate effective oral communication skills.
 - g2. demonstrate effective written communication skills.
- h. a recognition of the need for, and an ability to engage in lifelong learning. (*)
 - h1. conduct web and library research and report findings.
- i. an ability to understand professional, ethical and social responsibilities in construction. (*)
 - i1. apply principles of construction law and ethics.
 - i2. perform service learning.
- j. a respect for diversity and a knowledge of contemporary professional, societal and global issues. (*)
 - j1. understand societal and global issues.
 - j2. understand issues of human diversity.
- k. a commitment to quality, timeliness, and continuous improvement. (*)
 - k1. produce work of quality and timeliness.
 - k2. evaluate each course each semester.

6. IET BS Degree

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of industrial engineering technology.
 - a1. technical expertise in quality, metrology, advanced SPC, SQC, TQM, ISO standards, and design of experiments.

- a2. technical expertise in ergonomics, work methods design, optimization, engineering economy, and cost estimating.
- a3. technical expertise in facilities layout, production planning and control, queuing theory, modeling, and simulation.
- a4. technical expertise in CAD, engineering graphics, GD&T, gage capability studies, and measurement uncertainty.
- a5. technical expertise in materials, manufacturing processes, design for manufacturing and assembly, and CNC machining.
- g1. an ability to communicate effectively.
- g2. an ability to communicate effectively through oral presentation.
- j1. a knowledge of and respect for diversity.
- j2. a knowledge of contemporary societal issues related to the profession.
- j3. a knowledge of contemporary global issues related to the profession.
- k1. a commitment to quality.
- k2. a commitment to timeliness.
- k3. a commitment to continuous improvement.

7. MET BS Degree

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of mechanical engineering technology.
 - a1. technical expertise in engineering materials, statics, dynamics, strength of materials, fluid mechanics, fluid power, thermodynamics, heat transfer, and electronic control.
 - a2. technical expertise in manufacturing processes, mechanical design, and computer-aided engineering graphics, engineering materials, automatic controls, industrial operations with added technical depth in manufacturing processes, computer-aided engineering graphics, mechanical design and engineering materials.
 - a3. expertise in applied physics having an emphasis in applied mechanics plus fundamentals of electricity in physics and inorganic chemistry.

Table A1. Curriculum Map of Industrial Engineering Technology.

Courses	Program Outcomes																				Total	
	a1	a2	a3	a4	a5	b	c	d	e	f	g1	g2	h	i	j1	j2	j3	k1	k2	k3		
ETCS101													2	3	3	3	3		3		17	
IET 105	2	2	2							3	3		2		3	2	3			3	25	
IET 204	4					3	4		4	3	3			2			2	4		2	31	
IET 224			4			2		4	2	3	3	3	2				2	2	2		29	
IET 257		4				2	4	4	3	3	3	3			3		2				31	
IET 267		4				2		4	2	3	3	3	2	2		2		2		2	31	
IET 310			4			2	3	4	4	3	3	3						2		2	30	
MET 104				4		2		4		3	3								3	2	20	
MET 180					4	2	4		4	3	3			2	2		2		3		28	
MET 223				4		2		4		3									3	2	20	
MET 335					4	2	4	4		3											17	
A.S. subtotal	6	10	10	8	8	19	19	28	19	30	27	12	8	9	11	7	14	10	11	13	279	
MET 201					4	2				4	3								2		15	
MET 300					4	2				4	3								2		15	
MET 347					4	2	4		2	2	2						2	3			21	
IET 304	2			2			4	4	2	3	3	3	2			2		2			29	
IET 350		4								4				2	3	3	2				18	
IET 362		4				2	2	4	2	4	3										21	
IET 369			4			2	2	4	2	4	3										21	
IET 401					4			4		4	3	2	2					2		2	23	
IET 454	4					2		3		4	3										16	
IET 480	2	3	3	3	3	2		4		3	4	4	3	3	3	2	2	3	3	3	53	
B.S. subtotal	8	11	7	5	19	14	12	23	8	36	27	9	7	5	6	7	6	10	7	5	232	
Total	14	21	17	13	27	33	31	51	27	66	54	21	15	14	17	14	20	20	18	18	511	
Outcome Description	quality SPC	method ergo	layout ppc	CAD GDT	mat. procs	emerg know ledge	lab	design project	teams	tech probs.	written com	oral com	lifelong learning	ethics	diverse	social issues	global issues	quality	timeliness	cont. impr		
	traditional knowledge																					

- 4 = Outcome addressed considerably
- 3 = Outcome addressed moderately
- 2 = Outcome addressed briefly
- 1 = Outcome addressed but not assessed
- 0 = Outcome not addressed

Table A2. Curriculum Map of Mechanical Engineering Technology.

A.S.	a1	a2	a3	b	c	d	e	f	g	h	i	j	k
MET 104	□	■	□	□	□	■	□	■	■	□	□	□	□
MET 106	□	□	□	■	■	□	■	□	■	■	■	■	■
MET 180	■	■	□	■	■	□	■	□	■	□	□	□	■
MET 201	■	□	□	□	□	■	□	■	■	□	□	□	□
MET 202	■	□	□	□	□	□	□	■	□	□	□	□	■
MET 216	□	■	□	■	□	■	□	■	□	■	□	□	■
MET 223	□	■	□	□	□	■	□	□	■	□	■	■	■
MET 330	■	□	□	□	■	□	■	■	■	□	□	□	■
MET 335	□	■	□	■	■	□	□	■	□	■	■	□	■
IET 105	□	■	□	□	□	□	□	□	■	■	□	■	■
IET 204	□	■	□	□	■	□	■	□	■	□	■	■	■

B.S.	a1	a2	a3	b	c	d	e	f	g	h	i	j	k
MET 247	□	■	□	■	□	■	□	■	□	■	□	□	■
MET 300	■	□	■	■	□	□	□	□	□	□	□	□	□
MET 312	■	□	□	■	□	■	□	■	□	■	□	□	■
MET 347	□	■	□	■	■	□	■	■	■	■	■	□	■
MET 350	■	□	■	■	□	■	□	■	□	■	□	□	■
MET 370	■	□	■	■	□	■	□	■	□	■	□	□	■
MET 381	■	■	□	■	□	□	□	□	■	□	□	□	■
MET 487	□	■	□	■	■	□	■	■	■	□	□	□	■
MET 494	■	■	□	■	■	□	■	■	■	□	□	□	■
IET 350	□	■	□	□	□	□	□	□	□	□	■	■	□

Outcome is not applicable □
 Outcome is addressed ■
 Outcome is measured ■

MET Outcomes

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of mechanical engineering technology.
 - a1. (A.S.) Technical expertise in engineering materials, applied mechanics, and applied fluid sciences.
 - a1. (B.S.) Technical expertise in engineering materials, statics, dynamics, strength of materials, fluid mechanics, fluid power, thermodynamics, heating and air- conditioning, and electronic control.
 - a2. (A.S.) Technical expertise in manufacturing processes, mechanical design, and computer-aided engineering graphics with added technical depth in computer-aided engineering graphics.
 - a2. (B.S.) Technical expertise in manufacturing processes, mechanical design, and computer-aided engineering graphics, engineering materials, automatic controls, industrial operations with added technical depth in manufacturing processes, computer-aided engineering graphics, mechanical design and engineering materials.
 - a3. (A.S.) Expertise in applied physics having an emphasis in applied mechanics plus fundamentals of electricity in physics.
 - a3. (B.S.) Expertise in applied physics having an emphasis in applied mechanics, plus fundamentals of electricity in physics and inorganic chemistry.
- b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
- c. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
- d. An ability to apply creativity in the design of mechanical systems, mechanical components or manufacturing processes.
- e. An ability to function effectively on teams.
- f. An ability to identify, analyze and solve technical problems in mechanical engineering and engineering technology.
- g. An ability to communicate effectively.
- h. A recognition of the need for and an ability to engage in lifelong learning.
- i. An ability to understand professional, ethical and social responsibilities.
- j. A respect for diversity and knowledge of contemporary professional, societal and global issues.
- k. A commitment to quality, timeliness, and continuous improvement.

Table A3. Curriculum Map of Architectural Engineering Technology.

PROGRAM OUTCOME MATRIX ARCHITECTURAL ENGINEERING TECHNOLOGY		CAET Faculty											IPFW Faculty											
		ARET 123 PT	ARET 124 PT	ARET 167	ARET 222 PT	ARET 281 PT	ARET 282 PT	CET 104	CET 181	CET 266	CET 283	CNET 276	CNET 280	INR 121 PT	INR 220 PT	MA 159	STAT 301	PHYS 218	PHYS 219	ENG w/31	COM 114	Spec Elect		
⊕	Engineering Technology Outcome Criteria A. an appropriate mastery of knowledge, techniques, skills & modern tools																							
	Architectural Engineering Technology Outcomes																							
⊕	1. employ concepts of architectural theory & design in design environment																							
⊕	2. utilize modern instruments, methods & techniques for A/E documents																							
⊕	3. conduct standardized field & lab testing on construction materials																							
⊕	4. utilize modern instruments & techniques for site and building layout																							
⊕	5. estimate material quantities for technical projects																							
⊕	6. utilize codes, contracts & specs in design, inspection & construction																							
⊕	Engineering Technology Outcome Criteria B. apply knowledge, adapt to emerging opps of math, science, engr & tech																							
	Architectural Engineering Technology Outcomes																							
⊕	1. utilize current industry standard equipment																							
⊕	2. employ productivity software to solve technical problems																							
⊕	Engineering Technology Outcome Criteria C. conduct, analyze & interpret experiments & apply results to processes																							
	Architectural Engineering Technology Outcomes																							
⊕	1. conduct, analyze, and interpret experiments then apply results																							
⊕	Engineering Technology Outcome Criteria D. apply creativity in design of systems, components, or processes																							
	Architectural Engineering Technology Outcomes																							
⊕	1. in-class projects requiring design decisions																							
⊕	2. student design projects for external presentation																							
⊕	Engineering Technology Outcome Criteria E. ability to function effectively on teams																							
	Architectural Engineering Technology Outcomes																							
⊕	1. actively participate in team activities during and outside class																							
⊕	2. orally and graphically present team results																							
⊕	Engineering Technology Outcome Criteria F. identify, analyze and solve technical problems																							
	Architectural Engineering Technology Outcomes																							
⊕	1. determine forces and stresses in elementary structural systems																							
⊕	2. calculate basic loads & demands in mechanical/electrical systems																							
⊕	3. solve problems in math, statistics, and physics courses																							
⊕	Engineering Technology Outcome Criteria G. ability to communicate effectively																							
	Architectural Engineering Technology Outcomes																							
⊕	1. demonstrate effective oral communication skills																							
⊕	2. demonstrate effective written communication skills																							
⊕	3. demonstrate effective graphic communication skills																							
⊕	Engineering Technology Outcome Criteria H. recognition of need & ability to engage in lifelong learning																							
	Architectural Engineering Technology Outcomes																							
⊕	1. require library research and reporting																							
⊕	2. require Web research and reporting																							
⊕	Engineering Technology Outcome Criteria I. understand professional, ethical and social responsibilities																							
	Architectural Engineering Technology Outcomes																							
⊕	1. demonstrate knowledge of professional code of ethics																							
⊕	2. service learning component																							
⊕	Engineering Technology Outcome Criteria J. respect for diversity, & knowledge of prof., societal, and global issues																							
	Architectural Engineering Technology Outcomes																							
⊕	1. social studies elective																							
⊕	2. exposure to other cultures building practices																							
⊕	Engineering Technology Outcome Criteria K. commitment to quality, timeliness, and continuous improvement																							
	Architectural Engineering Technology Outcomes																							
⊕	1. quality and timeliness is required aspect of course																							
⊕	2. course evaluation each semester																							

Revised 9-29-07
 Special Mark ⊕ indicates ASET required Architectural Engineering Technology Outcome
 ⊕ indicates TESTED Outcome --- Blank indicates Not Addressed
 ⊕ indicates DISCUSSED Outcome --- Light Hatching indicates OUTCOME NOT TESTED
 ⊕ indicates TESTED Outcome --- Heavy Hatching indicates TESTED Outcome

Table A4. Curriculum Map of Civil Engineering Technology

Program Outcome Matrix CIVIL ENGINEERING TECHNOLOGY	MCET FACULTY										IPFW FACULTY												
	ARET 123	ARET 124	ARET 167	CET 104	CET 108	CET 181	CET 206	CET 209	CET 253	CET 266	CET 283	CNET 276	CNET 280	MA 159	STAT 301	PHYS 218	PHYS 219	ENG W131	COM 114	Social Elec.	Human, Elec.		
a) an appropriate mastery of the knowledge, techniques, skills & modern tools of their disciplines																							
a1 utilize graphic techniques to produce engineering documents (*)																							
a2 utilize modern surveying methods for land measurement and/or construction layout (*)																							
a3 estimate material quantities for technical projects (*)																							
a4 technical expertise in applied statics and strength of materials																							
b) an ability to apply current knowledge & adapt to emerging applications of math, science, eng'g, & technology																							
b1 utilize current industry standard equipment																							
b2 employ productivity software to solve technical problems (*)																							
c) an ability to conduct, analyze & interpret experiments & apply experimental results to improve processes																							
c1 conduct standardized field and laboratory testing of materials (*)																							
d) an ability to apply creativity in the design of systems, components or processes appropriate to program objectives																							
d1 in-class projects requiring design decisions																							
e) an ability to function effectively on teams																							
e1 actively participate in team activities during and outside class																							
e2 resolve problems as they arise																							
f) an ability to identify, analyze and solve technical problems																							
f1 determine forces and stresses in elementary structural systems (*)																							
f2 solve pressure and open channel flow problems																							
f3 close a traverse survey																							
f4 solve problems in mathematics, statistics, and physics courses																							
g) an ability to communicate effectively																							
g1 demonstrate effective oral communication skills																							
g2 demonstrate effective written communication skills																							
g3 demonstrate effective graphic communication skills																							
h) a recognition of the need for, and an ability to engage in lifelong learning																							
h1 require library research and reporting																							
h2 require Web research and reporting																							
i) an ability to understand professional, ethical and social responsibilities																							
i1 demonstrate knowledge of professional code of ethics																							
i2 service learning component																							
j) a respect for diversity and a knowledge of contemporary professional, societal and global issues																							
j1 social studies elective																							
j2 humanities elective																							
k) a commitment to quality, timeliness, and continuous improvement																							
k1 quality and timeliness is required aspect of course																							
k2 course evaluation performed each semester, software updates																							

(*) indicates ABET required Civil Engineering Technology Outcomes. = Direct Measure = Indirect Measure = Not Addressed

Table A5. Curriculum Map of Construction Engineering Technology

Program Outcome Matrix CONSTRUCTION ENGINEERING TECHNOLOGY	MCET FACULTY											IPFW FACULTY													
	CNET 344	CNET 348	CNET 442	CNET 443	CNET 445	CNET 448	CNET 457	DET 381	DET 431	ARET 324	Tech. Elective	Tech. Elective	ARET Criteria	DET Criteria	GEOL 6100	GEOL 1100	MA 227	ENG W234	COM 315 or 323	Artistic Elec.	Humanity Elec.	Social Elec.	Inquiry Elec.		
a) an appropriate mastery of the knowledge, techniques, skills & modern tools of their disciplines																									
a1 utilize modern instruments, methods, and techniques for construction contracts, documents, and codes (*)	■	■			■	■			■	■					a2	a1									
a2 evaluate materials and methods for construction projects (*)		■		■		■	■			■	■						■	■							
a3 utilize modern surveying methods for construction layout (*)		■				■									a4	a2									
a4 estimate material quantities for projects (*)		■				■	■								a5	a3									
a5 estimate material costs for projects (*)		■	■			■																			
b) an ability to apply current knowledge & adapt to emerging applications of math, science, eng'g. & technology																									
b1 utilize current industry standard equipment		■		■	■				■	■					b1	b1									
b2 employ productivity software to solve technical problems (*)		■	■		■	■		■							b2	b2									
c) an ability to conduct, analyze & interpret experiments & apply experimental results to improve processes																									
c1 determine forces and stresses in structural systems (*)									■	■					f1	f1									
c2 perform economic analyses related to design, construction, and maintenance (*)		■	■	■		■				■															
d) an ability to apply creativity in the design of systems, components or processes appropriate to program objectives																									
d1 produce design for construction and operations documents utilization (*)		■				■				■					d1	d1									
d2 perform standard analysis and design in one technical specialty in construction (*)		■				■									d1	d1									
d3 select appropriate construction materials and practices (*)	■	■		■		■																			
e) an ability to function effectively on teams																									
e1 actively participate in team activities during and outside class	■	■	■	■	■	■	■	■	■	■	■	■	■	■	e1	e1									
f) an ability to identify, analyze and solve technical problems																									
f1 apply basic concepts to the solution of hydraulics and hydrology problems (*)		■				■				■						f									
f2 apply basic concepts to the solution of geotechnics problems (*)										■						f									
f3 apply basic concepts to the solution of structures problems (*)		■				■			■						f	f									
f4 apply basic concepts to the solution of construction scheduling and management problems (*)		■				■	■																		
f5 apply basic concepts to the solution of construction safety problems (*)	■	■		■	■	■	■	■																	
g) an ability to communicate effectively																									
g1 demonstrate effective oral communication skills	■	■				■	■			■					g1	g1				■					
g2 demonstrate effective written communication skills	■	■	■	■	■	■	■	■	■	■	■	■	■	■	g2	g2			■						
h) a recognition of the need for, and an ability to engage in lifelong learning																									
h1 conduct web and library research and reporting	■	■		■	■	■	■	■	■	■	■	■	■	■	h	h					■				
i) an ability to understand professional, ethical and social responsibilities																									
i1 apply principles of construction law and ethics	■	■	■	■	■	■	■	■	■	■	■	■	■	■	i1	i1									
i2 perform service learning		■				■				■					i2	i2									
j) a respect for diversity and a knowledge of contemporary professional, societal and global issues																									
j1 understand societal and global issues		■				■				■														■	
j2 understand issues of human diversity		■				■				■													■		
k) a commitment to quality, timeliness, and continuous improvement																									
k1 produce work of quality and timeliness	■	■	■	■	■	■	■	■	■	■	■	■	■	■	k1	k1									
k2 evaluate each course each semester	■	■	■	■	■	■	■	■	■	■	■	■	■	■	k2	k2									

(*) indicates ABET required Construction Engineering Technology Outcomes

30 ■ = Direct Measure ■ = Indirect Measure □ = Not Addressed