

Learning Outcomes	Related Courses
2. Identify the basic laws of physics and chemistry including mechanical, electrical heat, light, sound, and inorganic chemistry.	CHE 151, 152; PHY 201, 202, 203
3. Demonstrate written and oral communication skills including drafting.	COM 211; DRT 196; ENG 111, 112, 113
4. Apply the laws of mechanics.	MET 211, 212
5. Use computers to problem solve.	IET 198
6. Develop an understanding of the engineering profession and related fields.	Engineering Electives

III. **Assessment Method(s):** A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

a. **Formative Assessment Method(s) and Description:** a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Formative assessment is completed on a course-by-course basis.

b. **Summative Assessment Method(s) and Description:** a measurable indicator of end-of-program success in attaining the stated program learning outcomes(s).

The capstone courses for the university parallel program in Engineering Technologies are MET 211-212 (Engineering Mechanics I & II). These courses require students to use math and physics as applied to engineering. Students are required to use a problem solving process and document a solution at an introductory engineering design level.

IV. **Results:** A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

There are about 12 students per year who complete the Engineering Science University Parallel program. Most students complete their four-year degree program at University of Dayton, Wright State University, Ohio State University or University of Cincinnati. Informal feedback indicates that the Sinclair students do better at these schools than the native students.

- V. **Analysis/Actions:** From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

Better information is needed to track student performance at four-year schools.

- VI. **General Education:** Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

No information is available at this time.

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

No information is available at this time.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

No information is available at this time.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

No information is available at this time.

- * Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.

II. Program Learning Outcomes: A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.*

The Mechanical Engineering Technology (MET) program learning outcomes have not been revised during the past year.

An entry-level graduate with an Associate of Applied Science Degree in Mechanical Engineering Technology, Mechanical Design Option Sinclair Community College will be able to:

Learning Outcomes	Related Courses
1. Utilize computer software to enhance technical communication. Write computer programs and use computer software to solve problems.	MET 198, 203, 260; IET 198; DRT 196, 198; ENG 121, 122, 113; HUM/EGR 132
2. Accurately apply mathematical solutions to define mechanical systems. Use dimensional analysis to help create and verify mathematical representations of mechanical systems.	MAT 131, 132, 133; MET 104, 203; PHY 131
3. Create free body diagrams to represent static and dynamic equilibrium so as to calculate forces in machines and structures.	MET 203; PHY 131; MAT 131, 132; QET 132
4. Analyze motions, velocities and accelerations of objects and the forces and torques necessary to create or created by those conditions.	MET 203, 204; PHY 131; MAT 133
5. Calculate stresses in members of machines and structures. Establish failure modes and safe-working limits based on characteristics of engineering materials.	MET 203, 207; QET 132; EET 119
6. Solve fluids technology problems by applying the concepts of fluid mechanics. Apply concepts of thermodynamics and to analyze thermal energy systems.	MET 203, 204, 205, 225; PHY 132

Learning Outcomes	Related Courses
7. Specify and select commercially available mechanical and control components, integrated with custom designed parts to create a finished machine.	MET 228, 231, 232; EET 119; PSY 229

III. **Assessment Method(s)**: A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

- a. Formative Assessment Method(s) and Description: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Formative assessment is completed on a course-by-course basis. Coursework in the MET program consists of hands-on application of a concept. Students go through lab exercises and learn to use equipment appropriately. Most exercises involve using equipment for measuring, collecting data and then analyzing that data. The analysis step will lead the students to a conclusion. The lab exercises substantiate the lecture. Students are assessed for lab competence and lecture concepts. Labs are part of MET 205, 207, 228 and QET 132-133. Computer labs are included in MET 205, 207 and 228.

- b. Summative Assessment Method(s) and description: a measurable indicator of end-of-program success in attaining the stated program learning outcome(s).

All mechanical design majors are required to enroll in MET 231, Machine Design I, and MET 232, Computer Aided Machine Design Project. Each class is two hours of lecture and two hours of laboratory.

In both MET 231 and 232, students must demonstrate competency in machine design principles by successfully solving problems that are given to them through the lecture and laboratory sessions. Students are assessed for competency in completing "mini projects." One example of a project would be to design a garage door opener. MET 231 and 232 require that all previous knowledge and skills acquired in MET classes be applied to various scenarios in solving various machine design problems. A mid-term and final examination are used to assess student performance level in each class. An example of a problem students might solve would be to size and design a system that will accomplish its purpose as defined by stated facts/guidelines. Machine Design covers clutch and brakes, gears, springs, linkages, etc.

IV. **Results**: A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

Most students perform well in both MET 231 and 232 since students with inadequate skills generally withdraw earlier from the program. MET 231 includes

computer-aided design techniques. MET 260, Engineering Technology Applications with Computers, has been revised to include MathCAD. Students who come into MET 231 now have a background in MathCAD so that they can concentrate on demonstrating design proficiency, not on acquiring skills using the software package.

Many MET majors are already working when they enroll in the program. Some students enroll in MET to assist them in achieving promotions, some are personal interest students, and some want to transfer to four-year institutions. Some transfer to University of Dayton through the dual admission agreement and do well there.

- V. **Analysis/Actions:** From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

The department has found that the industry doesn't always have an accurate idea of what two-year technical degrees can do. The program receives high marks from students and employers, but expectations from employers are high. The MET curriculum is a traditional one. Changes need to be made judiciously so that the program is kept current but retain the focus on a two-year program.

The department is not currently experiencing any pressing issues in the MET program. Students are employed and the employers are satisfied.

The department is planning on focusing on assessment methodologies and learning outcomes over the next two years because of new requirements for TAC/ABET accredited programs. The new requirements stipulate that the program being evaluated has the responsibility to demonstrate learning. The department is participating in the Engineering Technologies Learning Challenge Grant, "A Computer-Based Model for Outcomes Assessment and Student Retention Through Continuous Feedback" that has been awarded for two years starting in fall of 2000. The purpose of the grant is to develop and implement an assessment system that will satisfy the new TAC/ABET requirements

- VI. **General Education:** Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

MET faculty don't currently use the writing or oral communication checklists. A number of faculty need to be introduced to these.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Writing is reinforced throughout the program through the use of required written laboratory reports in every MET lab course. Research papers are also required in some classes. Writing assignments are part of these courses: MET 104, 205, 207, 228, 231, 232.

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

Oral communication skills are emphasized through the communications general education requirement. The Department is anticipating changing the communications requirement to COM 206 (from COM 211) to better focus on interpersonal communication skills.

MET 104 requires an oral presentation and students also work in teams.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

Students have to think to solve problems in MET 203 (Statics) because there is not set process to follow. MET 204 (Dynamics with Kinematic Analysis) and 207 (Strength of Materials) also emphasize thinking skills. Most of the MET courses require students to use thinking skills.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Values/community/citizenship skills are reinforced through informal discussions in courses.

- * Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.

The American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) is the primary professional association which influences the HVAC program. Sinclair has a student branch. The Department Chair serves on the local ASHRAE chapter Board of Governors and department faculty continue to serve as Chair of the Student Activities Committee.

Curriculum review continues to be an important task for the local advisory committee. Major curriculum issues are always brought before the advisory committee for its input.

The one-year certificate in HVAC differs from the degree program in terms of mathematics and science preparation.

- II. Program Learning Outcomes:** A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.*

No changes have taken place to the program learning outcomes since the last report.

An entry-level graduate with an Associate of Applied Science Degree in Mechanical Engineering Technology, Heating and Air Conditioning option, from Sinclair Community College will be able to:

Learning Outcomes	Related Courses
1. Use computer software to enhance technical communication. Write computer programs and use computer software to solve problems.	MET 198, 242; DRT 196, 198, 199; ENG 121; HUM/EGR 132
2. Accurately apply mathematical solutions to define mechanical systems. Use dimensional analysis to help create and verify mathematical representations of mechanical systems.	MAT 131, 132, 133; PHY 131
3. Select basic components of a heating and air conditioning system.	MET 106, 115, 125, 135, 145, 229, 240; PHY 132
4. Select proper control system components.	MET 228, 229, 242, 244; EET 119
5. Troubleshoot and/or design systems for proper operational and human comfort.	MET 106, 125, 145, 240, 244

Learning Outcomes	Related Courses
6. Apply the concepts of environmental safety as they relate to HVAC systems.	MET 125, 224, 244
7. Perform a bid estimate for a mechanical system.	MET 106, 115, 125, 135, 244; CCT 216
8. Use computer software to design a complete HVAC system.	MET 115, 125, 135, 145, 198, 240, 242, 244

III. **Assessment Method(s):** A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

- a. Formative Assessment Method(s) and Description: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Students are assessed through homework, tests and project assignments. There are courses which serve as end-of-sequence checks. This includes MET 240, Advanced HVAC Applications, which uses content from all 100-level courses and brings them together in a systems approach. MET 242, Computer Applications in HVAC, is a pre-requisite to the capstone course, and students use the computer instruction from MET 242 in the capstone. MET 242 is project-oriented and requires students to interact with the instructor and other students in the class during lab. MET 244 has no lecture and is designed to have students complete one big project. Students work in teams to complete an HVAC design project. The instructor uses a building downtown and has students complete the mechanical design for it.

The courses which emphasize controls are in sequence (EET 119, Basic Electrical Circuits and Controls; MET 228, Equipment Measurements and Control; MET 229, Controls for HVAC System).

The curriculum really is a combination of three sets of sequenced courses. The 100-level sequence must be completed before either of the two second-year sequences, but those second-year courses can run parallel to each other. Ideally, those two sequences would be offered sequentially, but that design is impossible with the enrollment restraints of a two-year program.

- b. Summative Assessment Method(s) and description: a measurable indicator of end-of-program success in attaining the stated program learning outcome(s).

HVAC majors are required to enroll in MET 244, HVAC Applications Project, a three-credit-hour course. Students are required to design an HVAC system by applying skills and knowledge acquired in previous HVAC courses. Control systems are not part of the 244 course. Instead, the project includes loads, psychrometric analysis,

and the system layout and design. Students work in teams. They must submit a notebook which includes the draft of the system, computer calculations, assumptions made in designing the system, and the design itself. Guidelines and specific parameters are provided by the instructor.

Employer surveys are conducted when the department is preparing for an ABET site visit; surveys are not currently a part of the summative assessment process. Assistance is needed from Institutional Planning and Research for surveys.

The current chair is working with employers and human resource personnel in the community to find out what is needed by employers in terms of this degree.

IV. Results: A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

A survey was administered to employers and graduates as part of the last ABET accreditation visit. Results were positive but the numbers responding to the survey were small. HVAC surveys aren't specific; they are consolidated with all MET surveys.

Student success in MET 244 is fine; but by the time students reach the 200-level courses, all poor students have usually dropped the program. The majority of students who are in the HVAC program are currently employed. For those who wish to pursue further education, the agreement with University of Dayton (UD) and with Ferris State University are options. Students who have transferred to UD or Ferris State have done well in their respective programs.

V. Analysis/Actions: From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

The department is just finishing the first group of students who are taking the revised program. The department will be following their progress to see how well the new curriculum is working for students, both in skill preparation and success in the workplace.

The department is planning on focusing on assessment methodologies and learning outcomes over the next two years because of new requirements for TAC/ABET accredited programs. The new requirements stipulate that the program being evaluated has the responsibility to demonstrate learning. The department is participating in the Engineering Technologies Learning Challenge Grant, "A Computer-Based Model for Outcomes Assessment and Student Retention Through Continuous Feedback" that has been awarded for two years starting in fall of 2000. The purpose of the grant is to develop and implement an assessment system that will satisfy the new TAC/ABET requirements

VI. General Education: Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

HVAC faculty don't currently use the writing or oral communication checklists. A number of faculty who need to be introduced to these.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Writing is reinforced throughout the program through the use of required written laboratory reports in every HVAC lab course (MET 106, 125, 135, 145, 224, 244). Research papers are also used as an option in some classes (MET 145).

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

Oral communication skills are emphasized through the Communications course general education requirement. The department is anticipating changing the Communications requirement to COM 206 (from COM 211) to better focus on interpersonal communication skills.

Students use oral skills in all HVAC courses for working in labs or on teams.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

All courses in the HVAC program require students to use thinking skills. Types of thinking used include problem solving, analytical, trouble shooting and sometimes creative.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Values/community/citizenship skills are reinforced through informal discussions in courses. In CCT 216, Construction Estimating, students examine the ethics and legal issues of estimating an HVAC installation. MET 244 addresses issues surrounding "code" requirements.

* Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.

A second major influence on the QET program comes from Advisory Committee members. In addition, faculty expertise coupled with input from major employers such as GM, Wright Patterson Air Force Base, and Meade have influenced the development of the program.

- II. Program Learning Outcomes:** A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.*

An entry-level graduate with an Associate of Applied Science Degree in Quality Engineering Technology from Sinclair Community College will be able to:

Learning Outcomes	Related Courses
1. Demonstrate the basic laws of applied chemistry and physics.	QET 105, 111, 112, 113, 120, 131, 132
2. Develop a continual improvement system.	QET 101
3. Describe the impact of cultural diversity.	EGR/HUM 132; MET 104
4. Design a complete quality system.	QET 221
5. Apply reliability management techniques.	QET 101, 201, 202, 211
6. Employ appropriate technical communication techniques.	ENG 121, 122, 113; DRT 196, 198; social science elective
7. Apply systematic problem solving to the solution of technical problems.	QET 101; MAT 131, 132; MET 198; QET M30

An entry-level graduate with an Associate of Applied Science Degree in Quality Engineering Technology, Quality Assurance option, from Sinclair Community College will be able to:

Learning Outcomes	Related Courses
1. Demonstrate the basic laws of applied chemistry and physics.	QET 105, 111, 112, 113, 120, 132; PHY 131, 133; CHE 131

Learning Outcomes	Related Courses
2. Develop a Continual Improvement Program.	QET 101
3. Study the impact of cultural diversity.	EGR 132; MET 104
4. Design a complete quality system.	QET 221
5. Apply reliability management techniques.	QET 101, 201, 202, 211, 212
6. Employ appropriate technical communication techniques.	COM 206 or 211; ENG 121, 122, 113; DRT 196, 198; social science elective
7. Apply systematic problem solving to the solution of technical problems.	QET 101; IET 198; MAT 131, 132, 133; MET 198

An entry-level graduate with an Associate of Applied Science Degree in Quality Engineering Technology, Packaging option, from Sinclair Community College will be able to:

Learning Outcomes	Related Courses
1. Demonstrate the basic laws of applied chemistry and physics.	QET 105, 111, 112; PHY 131, 132; CHE 131
2. Demonstrate proficiency in measuring the properties of materials.	QET 111, 112, 120, 133, 134, 201
3. Describe the various functions of product packaging.	QET 105, 252
4. Describe the distribution environment and the design of protective packaging.	QET 105, 134, 254
5. Use a total systems approach to develop a total packaging concept.	QET 105, 221, 250; MET 104
6. Employ appropriate technical communication techniques.	ENG 121, 122, 113; DRT 196, 198; COM 206 or 211; HUM/EGR 132; social science elective
7. Apply systematic problem solving to the solution of technical problems.	QET 101; IET 198; MAT 131, 132, 133; MET 198

III. **Assessment Method(s)**: A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

- a. Formative Assessment Method(s) and Description: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Formative assessment is completed on a course-by-course basis. Small projects are completed by students in MET 104. All 200-level courses incorporate teamwork and some 100-level courses do also. Hands-on labs are used in every course. The QET 131-132-134 sequence has labs where students use equipment to do materials testing. Students are also assessed through tests and quizzes.

- b. Summative Assessment Method(s) and Description: a measurable indicator of end-of-program success in attaining the stated program learning outcomes(s).

Summative assessment is completed through capstone courses. The Quality Assurance Option (QASO) uses QET 295, Quality Seminar. Students work in teams to complete projects.

The packaging option uses QET 254, Packaging Shock and Vibration, for the capstone. Students complete several product examination projects for a variety of packaging options. The product examination includes looking at the product as a whole, as well as the design. Tests are run and students analyze the results to evaluate the packaging.

Students who are taking the core QET program complete QET 211, Reliability I. In this course students are required to complete a project in which they apply all previously acquired knowledge and skills. Students examine a product and determine the design capability with respect to the failure modes, effect analyses, and a study of the criticality of failures. Students work in teams and are assessed on their contributions as a team member as well as their individual contributions.

IV. **Results**: A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

QET 295 was offered for the first time in spring of 2000. No feedback is available at the time of this report.

QET 254 is rarely offered since there aren't many packaging students. There are currently no students in the program.

In QET 211 students do well in the course assessments.

There is good feedback from employers on average. Those students in the QASO and QET programs do exceptionally well; students in the packaging option receive favorable reviews, but not as stellar as the QET students.

- V. **Analysis/Actions:** From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

The department is planning on focusing on assessment methodologies and learning outcomes over the next two years because of new requirements for TAC/ABET accredited programs. The new requirements stipulate that the program being evaluated has the responsibility to demonstrate learning. The department is participating in the Engineering Technologies Learning Challenge Grant, "A Computer-Based Model for Outcomes Assessment and Student Retention Through Continuous Feedback" that has been awarded for two years starting in fall of 2000. The purpose of the grant is to develop and implement an assessment system that will satisfy the new TAC/ABET requirements.

- VI. **General Education:** Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

QET faculty don't currently use the writing or oral communication checklists. There are a number of faculty who need to be introduced to these.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Writing is reinforced throughout the program through the use of required written laboratory reports in every QET lab course. Research papers are also required in some classes.

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

Oral communication skills are emphasized through the Communications general education requirement. The department had previously discussed changing the Communications requirement to COM 206 (Interpersonal Communication) from COM 211(Speech) but has decided to give students a choice.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

No information given.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Values/community/citizenship skills are reinforced through informal discussions in courses.

- * Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.