ABET
Self-Study Report

for the

Bachelor of Science in Mechanical Engineering Technology Program

at

Central Washington University

Ellensburg, WA

June 30, 2017

CONFIDENTIAL

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GLOSSARY OF TERMS/DEFINITIONS

Program Educational Objectives
Program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. Program educational objectives are based on the needs of the program's constituencies.

Student Outcomes
Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program.

Assessment
Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured. Appropriate sampling methods may be used as part of an assessment process.

Evaluation
Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement.

Program Self-Study Report
for
ETAC of ABET
Accreditation or Reaccreditation

BACKGROUND INFORMATION

A. Contact Information

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B. Program History

Timeline:
1983: Mechanical Technology and Manufacturing Technology programs initiated
1987: Dr. Walter Kaminsky hired to expand program
1989: Program titles change to Mechanical Engineering Technology & Manufacturing Engineering Technology; Facilities expanded and improved
1996: Programs combined into Mechanical Engineering Technology major with Mechanical Option and Manufacturing Option
1997: First ABET accreditation for MET program 2003: Second ABET accreditation for MET program 2009: Third ABET accreditation for MET program
2010-12: Hogue Building Expansion and Renovation
2013: MET 'Options' eliminated in favor of more flexible elective "Tracks" 2015: Fourth ABET accreditation application for MET program

The Mechanical Engineering Technology (MET) program at Central Washington University (CWU) was an outgrowth of the Mechanical Technology and Manufacturing Technology programs first begun in 1983 by Professor Bo Beed. In September 1987, the program began a major expansion when Dr. Walt Kaminski, a mechanical engineer with 28 years of industrial experience, was hired by the IET Department. On February 7, 1989, the Washington Higher Education Coordination Board (HEC Board) approved a program title change from the B.S. in Mechanical Technology to the current Bachelor of Science in Mechanical Engineering Technology (BSMET).

The basic curriculum was approved by the CWU Faculty Senate in the fall of 1995. At this time, an industrial advisory committee was formalized to support the MET program.

With the history of having a Mechanical Technology and Manufacturing Technology, it seems logical to form the initial accreditation of the MET program as: a Mechanical Engineering Technology program with a Mechanical Option and a Manufacturing Option. In 1996 Dr. Craig Johnson brought his experience to CWU both as an engineer, licensed in Metallurgical Engineering, and as an educator, licensed as a secondary education teacher. Dr. Johnson also applied his experience from his participation in the ABET re-accreditation process at Washington State University (Pullman, WA) the previous year.

The MET program at CWU was first accredited in 1997 by ABET. In response to the ABET accreditation review in 1997, the fluid mechanics course was added to the required MET core classes (the Manufacturing Technology major had not required it previously). Another change included separating the lab component from the dynamics and thermodynamics courses to allow transfer students who have had the lecture portion of those courses at their community college to take the lab. Other minor changes included prerequisites and course names.

Facility Development: In March of 1989, a fully equipped 2000 sq. ft. multi-purpose Mechanical Technology laboratory was established to support MET courses and activities. In September of 1995, the multi-purpose Mechanical Technology Laboratory was moved into a larger 3700 sq. ft. laboratory, and the old space continued to serve as the Plastics and Composites lab for the MET program, sharing that space with the Soils Lab for the Construction Management program.

In 2012, an addition to the Hogue Technology Building was built and the original building was renovated. This increased the size of Hogue to 95,966 SF. Most MET labs were moved to the new building (Thermo-Fluids, Machining, and Senior Project Labs), with the exception of the Hot Metals Lab, which remained in place (Welding & Fabrication, Foundry). The Materials Lab (Metallurgy, Materials Testing, Composites and Plastics) moved into an expanded and dedicated space in the renovated portion of the original building. With the new building, the machine shop lost some space but gained significant new capabilities (automated mills and lathe with tool change capabilities), expanded and improved computer labs, and dedicated space for the senior projects lab. A detailed list of the equipment is in the appendix.

Overall MET program enrollment has been growing significantly in recent years. Currently there are approximately 130 declared MET majors. MET graduating class size doubled in from 2012 to 2013 and then since 2014 has increased each year by more than 20%. In 2013, the program changed from two degree options to elective tracks.

In 2013, Ted Bramble replaced William Cattin as machine shop instructor, and Darryl Fuhrman was hired as lecturer for statics and mechanics of materials courses. Hiring Darryl freed up Professor Pringle for larger MET core classes that required multiple sections.

In 2016, Darryl left for other opportunities. Mr. Dennis Capovilla replaced him for the ETSC 311 Statics and ETSC 312 Mechanics of Materials courses.

C. Options

The MET program operated since the first ABET accreditation with a common set of core classes and two 'Options': a Mechanical Option (with electives focuses on energy, see Table 1), and a Manufacturing Option (with electives focuses on manufacturing processes, see Table 1). These options reflected the two different degrees that existed prior to the initial accreditation.

In 2013, the officially declared 'Options' were discontinued in favor of advising students into similar Mechanical and Manufacturing 'Tracks' with electives selected from a list of approved electives. Using tracks simplified the administration of degree checkout for the Registrar's office and workload for faculty advisors by reducing the need for substitution forms for elective courses if students missed a class when it was offered (most MET classes are offered only once a year). In consultation with the Industrial Advisory Board, it was determined that the 'Option' on the degree was not considered as relevant on a resume as the list of courses actually taken by a student. Students are advised into one of the two elective tracks (Mechanical and Manufacturing are listed in Table 1), However, time conflicts and sequencing may necessitate they select another course from the elective list.

Table 1. CWU MET Elective Tracks.

Mechanical Track	Manufacturing Track
ETSC 241 PLC	MET 257 Casting
MET 316/316L Heat Transfer	MET 345 Lean Manufacturing
MET 382 / 483 Composites	MET 355 Advanced Machining
MET 411/411L Energy Systems	MET 383/483 Composites
MET 420 FEA	MET 423 CAD/CAM

D. Program Delivery Modes

The MET Program is delivered using a traditional, lecture/lab, with a daytime schedule aimed at on campus students. All core courses, particularly 400 level, are taught by one of the three full-time tenured professors. A few lower division and 300 level courses are taught by Adjuncts. Individuals with EIT's or retired from industry experience are hired to teach statics and mechanics of materials. It is more difficult to achieve such requirements for some of the other elective course.

All required courses have some web enabled content such as notes and quizzes provided through access to Canvas. A few core courses are available as web based courses ETSC 301 - Engineering Project Cost Analysis (summer quarter) and ENG 310 - Technical Writing, as are many general education courses. One elective course, welding (MET 357), is taught in the evenings. There is no off-campus component to the MET program at CWU.

E. Program Locations

The core of the MET program is only available on campus at CWU in Ellensburg, except for the two courses mentioned above that can be taken online (ETSC 301 and ENG 310). A many students transfer into the MET program from community colleges with general education and/or prerequisites. The courses that transfer are, typically, articulated between CWU and the CC in a formal agreement. Courses that are not articulated are reviewed by the MET faculty prior to acceptance or denial.

F. Public Disclosure

The Program Educational Objectives (PEOs), Student Outcomes (SOs), annual student enrollment and graduation data is all made available to the public on the Mechanical Engineering Technology home page:
http://www.cwu.edu/engineering/mechanical-engineering-technology-program

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

The Final Statement of Accreditation to Central Washington University was dated August 2016. The following statements were made regarding the MET program:

"The Program Criteria for Mechanical Engineering Technology and Similarly Named Programs as published in the 2015-2016 ABET *Criteria for Accrediting Engineering Technology Programs* also were used to evaluate this program. Findings related to ABET criteria or policies and procedures are described below."

Program Weaknesses

1. Previous Finding: Criterion 2, Program Educational Objectives states, "There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of the these program educational objectives that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria." The program has provided handwritten notes from the industry advisory committee (IAC) and departmental faculty meetings as evidence of review of PEOs. However, these notes do not indicate an in-depth review of program educational objectives. Review by other

program constituencies was not evident. No documented evidence was found in the IAC meeting minutes and from other campus interviews of constituencies to confirm the PEOs were systematically and periodically reviewed to ensure that they were consistent with the institutional mission, the program's constituents' needs, and ABET criteria. Without a documented, systematically utilized and effective process for gathering information from all of its constituents, the program PEOs may become inconsistent with the Central Washington University's mission, the program constituents' needs and ABET criteria. Therefore, the program must demonstrate that it has a documented, systematically utilized, and effective process, involving all program constituencies, for the periodic review of program education objectives that ensures they remain consistent with the institutional mission, the programs constituents' needs, and ABET criteria.

Actions Taken: MET program has established and implemented a documented, systematically utilized, and effective process, involving all program constituencies, for the periodic review of program education objectives to ensure they remain consistent with the institutional mission, the programs constituents' needs, and ABET criteria. The frequency of review of the PEOs by the industrial advisory board has been established and implemented in the spring of 2016.

2. Previous Finding: Criterion 3, Student Outcomes states, "There must be a documented and effective process for the periodic review and revision of these student outcomes." No documented evidence was found in IAC meeting minutes, campus interviews and display materials to demonstrate that student outcomes were periodically reviewed to ensure that they were consistent with program educational objectives, the institutional mission, the programs constituents' needs, and ABET criteria. Brief handwritten notes of IAC and departmental faculty meeting minutes provided during the campus visit do not provide sufficient documentation of the periodic review and revision of student outcomes. Without a documented and effective process to periodically review and revise student outcomes, the outcomes may lack currency and may not reflect the needs of program constituencies. Therefore, the program must demonstrate that it has a documented and effective process for the periodic review and revision of student outcomes.

   Actions Taken: The MET program has established and implemented a documented process for periodic review and revision of the student outcomes by program constituencies. During the fall 2016 Industrial Advisory board meeting the student outcomes were discussed and approved as written in spring of 2017. In addition a timeline for future review was established.

3. Previous Finding: Criterion 4, Continuous Improvement states, "The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. Other available information may also

be used to assist in the continuous improvement of the program." The Self-Study Report and display materials showed that student outcome assessment metrics include alumni surveys for all outcomes, the FE examination results for outcomes b, c, d and f, and senior project evaluations for outcomes a, c, d, I, j, and k. The display materials and faculty interviews indicated that there was no evaluation of senior-project outcomes attainment. FE examination results were available for only a small number of students. The lack of a rubric and goal for an attainment threshold for student outcomes make it difficult to evaluate the attainment results and to determine shortcomings, and therefore, the need for corrective actions. The program must demonstrate that: (1) the program uses appropriate and documented processes to assess student outcomes and evaluate the extent to which outcomes are attained; and (2) that the result of these evaluation are systematically utilized as input for the continuous improvement of the program.

Actions Taken: The MET program has established and implemented an appropriate and documented process to assess student outcome attainment and utilized the findings for program improvement. A program faculty member received training in program assessment through ABET workshops. The assessment plan utilizes data from NCEES FE and MET Practice FE exam data as well as rubrics. Data collection has been standardized.

4. Previous Finding: Program Criteria for Mechanical Engineering Technology and Similarly Named Programs state, "The mechanical engineering technology discipline encompasses the areas (and principles) of materials, applied mechanics, computer-aided drafting/design, manufacturing, experimental techniques/procedure, analysis of engineering data, machine/mechanical design/analysis, conventional or alternative energy system design/analysis, power generation, fluid power, thermal/fluid system design/analysis, plant operation, maintenance, technical sales, instrumentation/control systems, and heating, ventilation, and air conditioning (HVAC), among others. As such, programs outcomes, based on specific program objectives, may have a narrower focus with greater depth, selecting fewer areas, or a broader spectrum approach with less depth, drawing from multiple areas. However, all programs must demonstrate an applied basis in engineering mechanics/sciences." Display materials and interviews with faculty indicated that there is no documented and effective process for determining program criteria outcome attainment. The lack of specific evaluation processes for program criteria specific outcomes attainment makes it difficult to determine the need for corrective action and continuous improvement of program specific areas. Therefore, the program the MET program must demonstrate that it satisfies all Program Criteria implied by the program title.

   Actions Taken: The program has established and implemented an effective assessment plan that incorporates all of the program specific criteria. All program criteria are assessed to determine student attainment. In addition, results from the student performance is utilized to make program improvements when appropriate.

Program Concern

1. Previous Finding: Criterion 6, Faculty states, “The competence of faculty members must be demonstrated by such factors as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills.” Although funding is provided for professional development and the majority of faculty make excellent use of the resources provided, some faculty members have not taken advantage of the funds provided by the program, college and university for ongoing professional development. If faculty do not maintain their technical currency and teaching effectiveness by professional development efforts, program quality may decline eventually. Without continuous professional development, faculty may lose competence and currency, and may not be able to enable graduates to attain program educational objectives. This finding remains a Concern until all program faculty engage in meaningful professional development to improve skill sets in their related fields of technical expertise.

   Actions Taken: The program and university administration has encouraged and funded engagement in professional development including attendance at conferences.

GENERAL CRITERIA

CRITERION 1. STUDENTS

This Interim Report is focused on addressing the weaknesses presented to the MET program during the previous ABET evaluation cycle. No weaknesses were found for Criterion 1.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

What follows are the mission statement for Central Washington University (CWU), the College of Education and Professional Studies (CEPS) and the Engineering, Technologies, Safety, and Construction (ETSC) Department.

CWU Mission
Central Washington University's mission is to prepare students for responsible citizenship, responsible stewardship of the earth, and enlightened and productive lives. Faculty, staff, students, and alumni serve as an intellectual resource to assist central Washington, the state, and the region in solving human and environmental problems.

Vision
Central Washington University (CWU) is a dynamic, creative, and inclusive environment that promotes engaged learning and scholarship. It is distinguished regionally for the rigor of its curriculum and scholarship, for the excellence of its pedagogy, for the vibrancy of its co-curricular and residential experiences, for its commitment to providing access to higher education, and for its efforts to advance the social and economic health of the region. It is typified by an entrepreneurial spirit that establishes it as a national leader in higher education. It has a strong commitment to engaged learning and scholarship, internationalism, sustainability, inclusiveness, and life-long learning.

Please see: https://www.cwu.edu/president/mission-statement

Core Values
As a community of scholars, we are committed to:

- Each student's greatest good.
- Excellence achieved through a diversity of ideas and people.
- A rigorous curriculum and outstanding teaching.
- Intellectual inquiry, exploration, and application.
- A supportive university community.

College of Education and Professional Studies (CEPS) Mission
The mission of our college is to prepare competent, enlightened citizens who will enhance their respective professions, commit themselves to socially responsible leadership, and help develop the global economy in a spirit of cooperation. Each academic unit of the college has developed specific goals to address this mission.

CWU Core Themes and CEPS Core Themes and Outcomes

1. TEACHING AND LEARNING
    - Maintain required and initiate new accreditation, national, state, and/or professional standards that relate to teaching and learning in all CEPS programs.
    - Provide advising that results in increased efficiency and rate of graduation.
2. INCLUSIVENESS AND DIVERSITY
    - Recognize exemplary teaching, scholarship and service.
    - Recruit and retain diverse faculty.
    - Recruit and retain diverse students.
    - Facilitate inclusiveness throughout CEPS programs.
    - Facilitate globalism throughout CEPS programs.
3. SCHOLARSHIP AND CREATIVE EXPRESSION
    - Students and faculty participation in scholarship and/or creative expression activities (e.g., SOURCE).
    - Obtain grant and private donation funding.
    - Provide and/or maintain hardware and software technologies.
4. PUBLIC SERVICE AND COMMUNITY ENGAGEMENT
    - Facilitate relationships between CEPS and PK-20 educational institutions and/or business and industry professionals.
    - Facilitate interdisciplinary relationships with other universities, colleges and departments.
    - Increase participation in university sponsored life-long learning opportunities.
5. RESOURCE DEVELOPMENT & STEWARDSHIP
    - Restore departmental office goods and services budget to 2009 levels.
    - Expand sources of revenue to support CEPS initiatives.
    - Programs will maintain or increase FTES.
    - Deliver programs at the centers that have the human resources needed to accomplish programmatic goals.
    - Students will be taught primarily by tenure and tenure track positions.
    - Facilitate and monitor mentorship program for new faculty, including tenured faculty, tenure-track faculty, full-time, non-tenure track faculty, and lecturers.
    - Upgrade and/or add onto buildings and facilities.

Found at: http://www.cwu.edu/education-professional-studies/mission-core-themes-and-outcomes

Engineering Technologies, Safety, and Construction (ETSC) Mission

The Engineering Technologies, Safety, and Construction Department mission is to provide a quality education to undergraduate and graduate students who are preparing for professional careers. The department prepares the students for professional technical employment and insightful citizenship.

ETSC Department Goals

1. To nurture excellent programs in Technology, and Engineering Technology related disciplines by maintaining or obtaining national accreditation in the following programs:
    - Maintain ETAC/ABET accreditation for EET and MET
    - Maintain American Council for Construction Education (ACCE) accreditation for Construction Management
    - Maintain Washington State Professional Educator Standards Board (PESB) accreditation for Technology Education
    - Obtain accreditation for Safety and Health Management from ABET/ ASAC by 2016
2. Strengthen the visibility of the department's programs.
    - Develop, publish (hard copy and online) and periodically update program goals, objectives and assessment plans
    - Format all program and departmental web pages consistently
    - Proactive advising of campus students via major fairs, summer orientation, career fairs, and open house
3. Serve the educational needs of the place-bound students.
    - Offer appropriate alternative methods of Distance Education where appropriate, develop and maintain appropriate virtual courses
    - Each program shall develop two DE classes in 5 years
4. Continuously improve physical educational environment
    - Maintain and improve lab equipment and lab experiences consistent, visual aids with current industry practices
5. Continuously improve the cultural, educational, and lifelong learning environment
    - Promote student professional organizations and professional activities
    - Encourage and recognize collaborations in research and publications
    - Encourage service learning from students
    - Sponsor professional short courses and professional seminars
    - Encourage undergraduate research with faculty mentors
    - Support the recruitment of a culturally diverse student and faculty population
    - Programs incorporate diversity ideas and their assessments into courses and student activities
6. Develop a diversified funding base to support academic and student programs
    - Establish and maintain at least one foundation account for each program
    - Each program develop a budget plan for foundations funds and actively seek funding from external sources
    - Establish a software fund for any software used in ETSC courses that has a cost associated with its use
    - Establish a fund and plan for departmental hardware replacement
    - Establish endowed foundations for each program as appropriate

7. Build mutually beneficial partnerships with industry, professional groups, institutions, inter-department, inter-university, and the communities surrounding our campus locations
    - Every program served by an advisory board
    - Encourage faculty membership in professional societies
    - Identify and develop community ties
    - Supply CWU Development Officer with alumni data
8. Continuously improve support for the faculty and staff
    - Increase opportunities for service and scholarship
    - Provided resources for each faculty and staff member to attend one conference or offsite training session per year
    - Obtain necessary administrative and technical help for the department
    - Obtain student help for each program laboratory
    - Increase administrative support by one FTE
    - Increase technical support by one FTE

Please see: http://www.cwu.edu/engineering/about

B. Program Educational Objectives

The following represent what the program educational objectives for the Mechanical Engineering Technology program at Central Washington University are and how they are expected to achieve them.

Program Educational Objective 1: MET graduates will perform effectively within their chosen work environments and will enhance their professional skills through continuing professional development.

Program Educational Objective 2: MET alumni will demonstrate responsible citizenship by participating in professional organizations and community engagement.

The Program Educational Objectives are available on the Central Washington University Mechanical Engineering Technology website.
http://www.cwu.edu/engineering/mechanical-engineering-technology-program

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The development, and review, of the Program Educational Objectives (PEO) involves the Central Washington University (CWU) Mechanical Engineering Technology (MET) faculty and the Industrial Advisory Board (IAB) for the MET program. The objectives for the program were developed with the mission statements of the university, college, and department in mind. The correlation between the PEOs and the various mission statements is as follows:

Objective 1: MET graduates will perform effectively within their chosen work environments and will enhance their professional skills through continuing professional development.

CWU –

Central Washington University's mission is to prepare students for responsible citizenship, responsible stewardship of the earth, and enlightened and productive lives. Faculty, staff, students, and alumni serve as an intellectual resource to assist central Washington, the state, and the region in solving human and environmental problems.

CEPS -

TEACHING AND LEARNING

- Maintain required and initiate new accreditation, national, state, and/or professional standards that relate to teaching and learning in all CEPS programs.
- Provide advising that results in increased efficiency and rate of graduation.

SCHOLARSHIP AND CREATIVE EXPRESSION

- Students and faculty participation in scholarship and/or creative expression activities (e.g., SOURCE).
- Obtain grant and private donation funding.
- Provide and/or maintain hardware and software technologies.

RESOURCE DEVELOPMENT & STEWARDSHIP

- Restore departmental office goods and services budget to 2009 levels.
- Expand sources of revenue to support CEPS initiatives.
- Programs will maintain or increase FTES.
- Deliver programs at the centers that have the human resources needed to accomplish programmatic goals.
- Students will be taught primarily by tenure and tenure track positions.
- Facilitate and monitor mentorship program for new faculty, including TT, FTNTT, and lecturers.
- Upgrade and/or add onto buildings and facilities.

ETSC –

Goal 1: To nurture excellent programs in Technology, and Engineering Technology related disciplines by maintaining or obtaining national accreditation in the following programs:

- Maintain TAC/ABET accreditation for EET and MET
- Maintain ACCE accreditation for CM
- Maintain Washington State PESB accreditation for Technology Education
- Obtain accreditation for SHM from ABET/ ASAC by 2016
- Obtain Association of Technology, Management, and Applied Engineering (ATMAE) accreditation for Master of Science in Engineering Technology (MSET) and Industrial Technology (InT) programs by 2016

Goal 5: Continuously improve the cultural, educational, and lifelong learning environment

- Promote student professional organizations and professional activities
- Encourage and recognize collaborations in research and publications
- Encourage service learning from students
- Sponsor professional short courses and professional seminars
- Encourage undergraduate research with faculty mentors
- Support the recruitment of a culturally diverse student and faculty population
- Programs incorporate diversity ideas and their assessments into courses and student activities

Objective 2: MET alumni will demonstrate responsible citizenship by participating in professional organizations and community engagement.

CWU –

Central Washington University's mission is to prepare students for responsible citizenship, responsible stewardship of the earth, and enlightened and productive lives. Faculty, staff, students, and alumni serve as an intellectual resource to assist central Washington, the state, and the region in solving human and environmental problems.

CEPS –

PUBLIC SERVICE AND COMMUNITY ENGAGEMENT

- Facilitate relationships between CEPS and PK-20 educational institutions and/or business and industry professionals.
- Facilitate interdisciplinary relationships with other universities, colleges and departments.
- Increase participation in university sponsored life-long learning opportunities.

ETSC –

Goal 5: Continuously improve the cultural, educational, and lifelong learning environment

- Promote student professional organizations and professional activities

- Encourage and recognize collaborations in research and publications
- Encourage service learning from students
- Sponsor professional short courses and professional seminars
- Encourage undergraduate research with faculty mentors
- Support the recruitment of a culturally diverse student and faculty population
- Programs incorporate diversity ideas and their assessments into courses and student activities

As one examines the various statements, from the various contingencies, it is clear that the PEOs support the mission of the University, College, and Department. As the mission statements get closer to the students, they become more specific in creating the learning environment.

The MET PEOs strive to further define and fit within the various mission statements. And as society develops, these will be modified to fit the needs of the constituency.

D. Program Constituencies

Central Washington University (CWU) Mechanical Engineering Technology (MET) program relies on three constituencies to provide the necessary feedback to maintain an excellent MET program.

The MET Faculty

The MET faculty regularly assess the curriculum, outcomes, and objectives. Without continuous review and improvement, the program would deteriorate. The faculty have the ability to alter, as needed, the curriculum, outcomes, and objectives to ensure that the students graduating from the CWU MET program are capable of contributing and excelling in the industries and companies they hire into.

The Industrial Advisory Board for the MET program

The Industrial Advisory Board (IAB) consists of a cross section of members that span the diversity of industries that the CWU MET graduates enter (see Table 2-1). The IAB is the MET program's link to industry and the requirements that make the MET graduates job ready. The IAB consists The IAB members include alumni, representatives from industry, and representatives of organizations like ASME and SME. MET students periodically are employed (Internship and full-time) by the companies the IAB members represent.

The MET faculty meet face to face with the IAB twice a year and communicate with them regularly vie email. The face to face meetings are scheduled in the fall and spring quarters to allow the IAB to interact with the students in the MET Capstone course (MET 489). In the fall the IAB can comment on the rigor and feasibility of senior capstone projects. In the spring the IAB reviews the top 10% of the capstone course student's presentations and selects the best one.

Table 2-1. Industrial Advisory Board Members.

Name	Title	Company	Member	Alumni
Julie Bennet	Boeing EMC, Lightning, and Antenna labs	Boeing	8 yrs.	No
Rosemary Brester	CEO/President	Hobart Machining Company	17 yrs.	No
Larry Brester	CEO/President	Hobart Machining Company	17 yrs.	No
Chuck Harmon III	Boeing P-8 Dynamic and Ground Loads	Boeing	9 yrs.	Yes
Amanda Hede	Design Engineer	Triumph Aviation	5 yrs.	Yes
David Kennedy	CWU Boeing Focal	Boeing	1 yr.	Yes
Patrick Kinney	Energy Engineer	University Mechanical	2 yrs.	Yes
Bradford Moravec	Boeing Chief Engineer Propulsion & Fuel Systems	Boeing	10 yrs.	No

E. Process for Review of the Program Educational Objectives

In the Mechanical Engineering Technology (MET) program the faculty have direct control of curriculum and programmatic development.
Review, by the faculty, of the Program Educational Objectives (PEOs) happens continually in an ad-hoc fashion throughout the school year. Discussions of programmatic issues typically happen at the weekly program meetings. The formal review of the PEOs is made per the PEO review schedule in Table 2-2 at the spring Industrial Advisory Board (IAB) meeting.

Table 2-2. Program Educational Objective review schedule.

		Schedule		
MET PEO	Evidence to review	Year 1,4	Year 2,5	Year 3,6
Objective 1: MET graduates will perform effectively within their chosen work environments and will enhance their professional skills through continuing professional development.	IAB Meeting Notes, Student Survey	X		
Objective 2: MET alumni will demonstrate responsible citizenship by participating in professional organizations and community engagement.	IAB Meeting Notes, Student Survey		X	

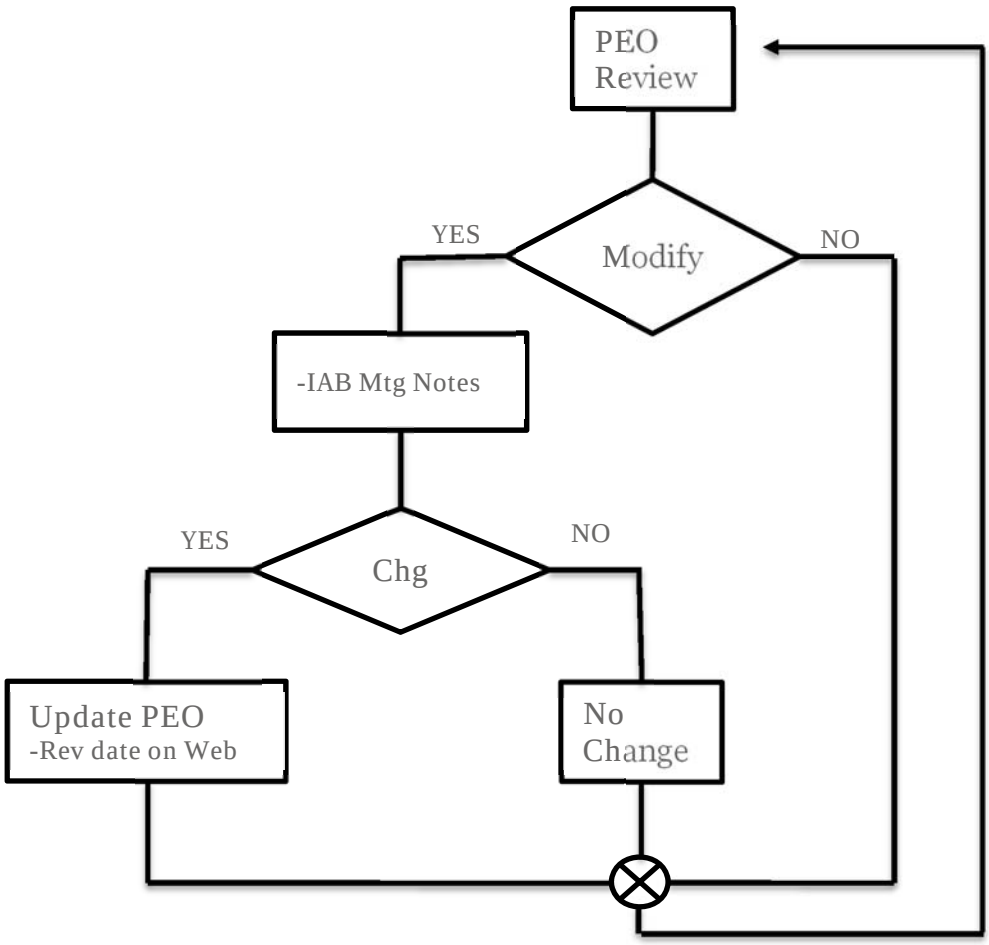


Figure 2-1. Program Educational Objective Review Process.

CRITERION 3. STUDENT OUTCOMES

A. Process for the Establishment and Revision of the Student Outcomes

In the Mechanical Engineering Technology (MET) program the faculty have direct control of curriculum and student outcome development. Review, by the faculty, of the Student Objectives (SOs) for ABET Criterion 3 baccalaureate and ABET Program Criteria for Mechanical Engineering Technology baccalaureate program routinely throughout the throughout the school year. Discussions of student outcome issues typically happen at the weekly program meetings. The formal review of the SOs is made per the periodically at the fall Industrial Advisory Board (IAB) meeting.

The IAB is a major influence and is counted on to provide input on the SO review. The review and modification process is outlined in Figure 3-1. Any suggested modifications are reviewed by faculty prior to any change.

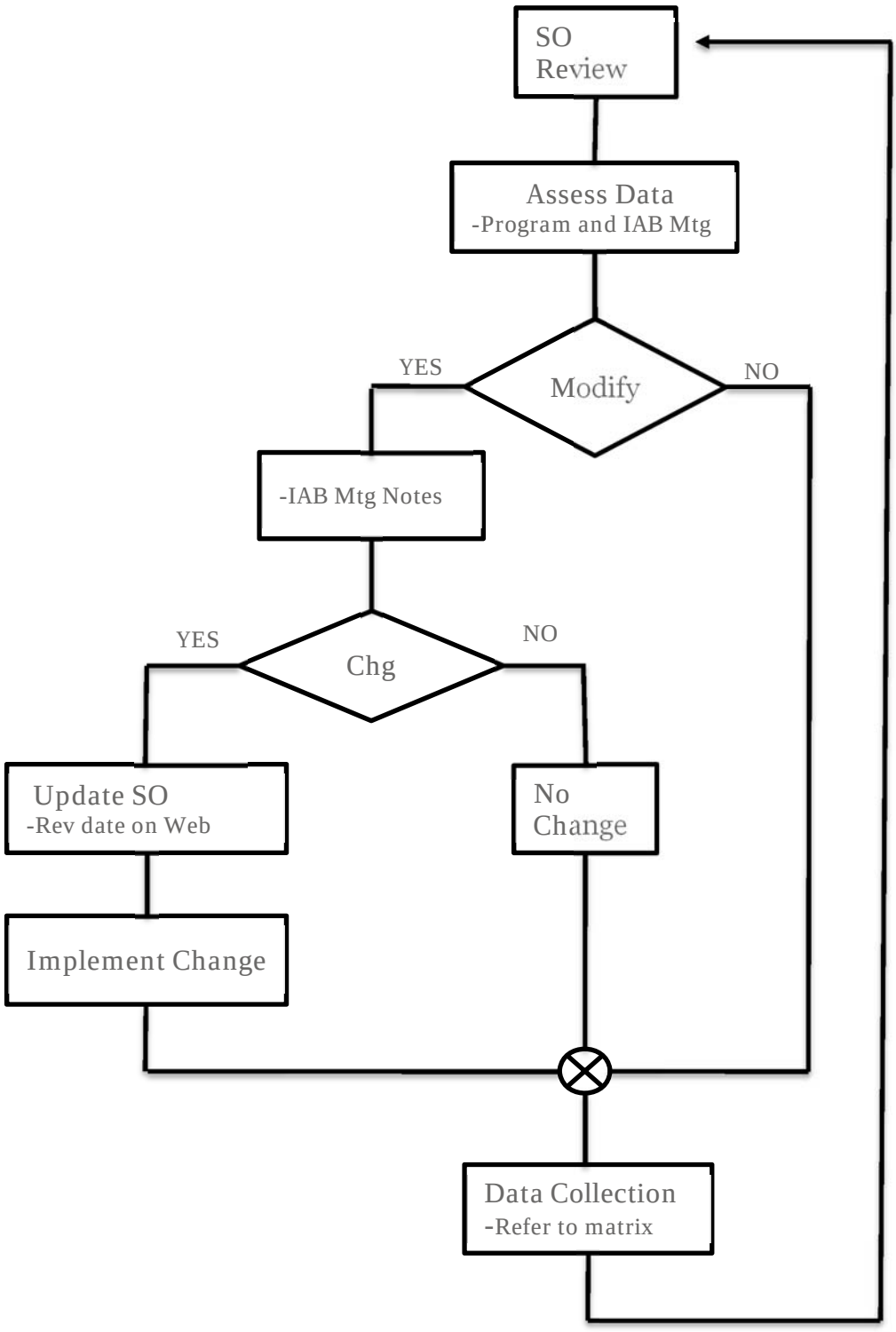


Figure 3-1. Student Outcomes Review Process.

B. Student Outcomes

The Student Outcomes (SOs) for the Central Washington University (CWU) Mechanical Engineering Technology (MET) program incorporate the ABET Criterion 3 SOs and the ABET Program Criteria Outcomes for baccalaureate MET programs. These are reviewed by the faculty with guidance from the stated mission, goals, objectives and outcomes of the university, college and department, and the MET Industrial Advisory Board feedback.

ABET Criterion 3 B Student Outcomes
a. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
b. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
d. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
e. an ability to function effectively as a member or leader on a technical team;
f. an ability to identify, analyze, and solve broadly-defined engineering technology problems;
g. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;
h. an understanding of the need for and an ability to engage in self-directed continuing professional development;
i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;
j. a knowledge of the impact of engineering technology solutions in a societal and global context; and
k. a commitment to quality, timeliness, and continuous improvement.

ABET Program Criteria Outcomes
a. geometric dimensioning and tolerancing; computer aided drafting and design; and a basic knowledge and familiarity with industry codes, specifications, and standards;
b. selection, set-up, and calibration of instrumentation and the preparation of laboratory reports and systems documentation associated with the development, installation, or maintenance of mechanical components and systems;
c. basic engineering mechanics.
d. differential and integral calculus;
e. manufacturing processes; material science and selection; solid mechanics (such as statics, dynamics, strength of materials, etc.) and mechanical system design;
f. thermal sciences, such as thermodynamics, fluid mechanics, heat transfer, etc.;
g. electrical circuits (ac and dc), and electronic controls; and

h. application of industry codes, specifications, and standards; and using technical communications, oral and written, typical of those required to prepare and present proposals, reports, and specifications.

The SOs are listed on the MET web page found here http://www.cwu.edu/engineering/mechanical-engineering-technology-program.

C. Mapping of Student Outcomes to Criterion 3 Learned Capabilities & Program Criteria Outcomes

To produce students that are job ready for the engineering field, the IAB, Faculty, Program, Department, College, and University specify the students must be successful in obtaining the ABET Criteria 3B Student Outcomes and the Program Criteria Outcomes. Tables 3-3 and 3-4 provide the mapping of outcomes to the individual courses the MET students complete.

Table 3 – 3. Mapping of the Program's Student Outcomes to the Criterion 3.

	3(a) an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;	3(b) an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	3(c) an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes	3(d) an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives	3(e) an ability to function effectively as a member or leader on a technical team	3(f) an ability to identify, analyze, and solve broadly-defined engineering technology problems	3(g) an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature	3(h) an understanding of the need for and an ability to engage in self-directed continuing professional development	3(i) an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity	3(j) a knowledge of the impact of engineering technology solutions in a societal and global context	3(k) a commitment to quality, timeliness, and continuous improvement
EET 221											
ETSC 160											
ETSC 265											
ETSC 301											
ETSC 311											
ETSC 312											
MET 255	*	*				*					
MET 314	*	*	*		*	*	*			*	
MET 315	*	*	*		*	*	*			*	
MET 327	*	*	*	*	*	*	*				
MET 351	*	*	*		*	*	*			*	
MET 387	*	*			*			*	*	*	
MET 418					X						
MET 419					X						
MET 426											
MET 488	X	X	X			X		X	X	X	
MET 489A				X			X				
MET 489B				X			X				X
MET 489C			X			X	X				X

Note: * = Topic covered, X = Data collected.

Table 3 – 4. Mapping the Program's Student Outcomes to the Program Criteria.

	(a) geometric dimensioning and tolerancing; computer aided drafting and design; and a basic knowledge and familiarity with industry codes, specifications, and standards	(b) selection, set-up, and calibration of instrumentation and the preparation of laboratory reports and systems documentation associated with the development, installation, or maintenance of mechanical components and systems	(c) basic engineering mechanics	(d) differential and integral calculus	(e) manufacturing processes; material science and selection; solid mechanics (such as statics, dynamics, strength of materials, etc.) and mechanical system design	(f) thermal sciences, such as thermodynamics, fluid mechanics, heat transfer, etc.	(g) electrical circuits (ac and dc), and electronic controls	(h) application of industry codes, specifications, and standards; and using technical communications, oral and written, typical of those required to prepare and present proposals, reports, and specifications
EET 221							*	
ETSC 160	*							
ETSC 265	*							
ETSC 301								
ETSC 311				*				
ETSC 312				*				
MET 255								
MET 314		*				*		
MET 315		*						
MET 327		*						
MET 351					*			
MET 387								
MET 418			*		*			X
MET 419			*		*			X
MET 426			*		X			
MET 488	X	X	X	X	X	X	X	
MET 489A	X				*			*
MET 489B	X				*			*
MET 489C					*			X

Note: * = Topic covered, X = Data collected.

D. Relationship of Student Outcomes to Program Educational Objectives

The depth and breadth of the courses the MET students complete at CWU prepares the student to "...perform effectively within their chosen work environments..." of engineering. The preparatory courses in Science and Math provide a foundation. This is built upon and expanded in the engineering course work. Finally, in the senior year capstone course, the students "put it all together" in a culminating process to produce an engineered device. The capstone experience includes formal design, implementation, and testing of their device. Students are able to use these projects to demonstrate their abilities to potential employers in their particular area of interest. All the student outcomes are integral to the student being successful in industry.

In addition to preparing students for careers in engineering, successful completion of the MET program also enables success in other professional fields. The MET curriculum provides experience in critical thinking, problem solving, and design skills that are esteemed in other professions. Thus, the students are valuable in a wide range of industry sectors.

Along with the technical training the students receive, they are also provided with education in "...responsible citizenship..." as well. This is exhibited in a number of the MET core curriculum courses. This can also be witnessed in some of the projects selected for the senior capstone experience.

With the current selection of courses (See Table 3-5 and Table 3-6), the MET student is well prepared to fulfill the MET PEOs.

Program Educational Objective 1: MET graduates will perform effectively within their chosen work environments and will enhance their professional skills through continuing professional development.

Program Educational Objective 2: MET alumni will demonstrate responsible citizenship by participating in professional organizations and community engagement.

Table 3 – 5. Mapping of the Program's Objectives to Student Outcomes.

	3(a) an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;	3(b) an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	3(c) an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes	3(d) an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives	3(e) an ability to function effectively as a member or leader on a technical team	3(f) an ability to identify, analyze, and solve broadly-defined engineering technology problems	3(g) an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature	3(h) an understanding of the need for and an ability to engage in self-directed continuing professional development	3(i) an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity	3(j) a knowledge of the impact of engineering technology solutions in a societal and global context	3(k) a commitment to quality, timeliness, and continuous improvement
PEO1	X	X	X	X	X	X	X	X	X	X	X
PEO2							X	X	X	X	

Table 3 – 6. Mapping the Program's Objectives to the Program Criteria.

	(a) geometric dimensioning and tolerancing; computer aided drafting and design; and a basic knowledge and familiarity with industry codes, specifications, and standards	(b) selection, set-up, and calibration of instrumentation and the preparation of laboratory reports and systems documentation associated with the development, installation, or maintenance of mechanical components and systems	(c) basic engineering mechanics	(d) differential and integral calculus	(e) manufacturing processes; material science and selection; solid mechanics (such as statics, dynamics, strength of materials, etc.) and mechanical system design	(f) thermal sciences, such as thermodynamics, fluid mechanics, heat transfer, etc.	(g) electrical circuits (ac and dc), and electronic controls	(h) application of industry codes, specifications, and standards; and using technical communications, oral and written, typical of those required to prepare and present proposals, reports, and specifications
PEO1	X	X	X	X	X	X	X	X
PEO2								

CRITERION 4. CONTINUOUS IMPROVEMENT

A. Student Outcomes

Industry is constantly evolving. University programs providing students to industry must continually evolve as well. To achieve a robust and industry relevant program, an active assessment plan must be in place and utilized. The Central Washington University (CWU) Mechanical Engineering Technology (MET) program assess each of the ABET Criterion 3 Section B for baccalaureate programs and ABET Program Criterion for baccalaureate MET programs using the assessment process described below. The data collected for each Student Outcome (SO) and Program Criteria Outcome consists of direct measures including, but not limited to, locally developed test questions, homework assignments, projects, labs, and the capstone experience. Indirect measures of the SOs are achieved through surveys conducted at the end of the quarter.

All direct measure materials are collected by course instructors. The instructor will transfer direct measure data to the data source file on the network drive. The hard copy examples will be placed in the appropriate binder.

Any surveys (indirect measures) are completed anonymously via the Canvas Learning Management System. The data will be downloaded and deposited by the course instructor in the appropriate data source file on the network drive.

While the MET program has been collecting data for many years, no established threshold of attainment was documented. At the spring 2017 IAB meeting, with agreement from the IAB, a threshold of 70% for all SOs was selected as the starting point. Beginning in the fall of 2017, each SO attainment threshold will be reevaluated for validity and adjusted as needed. A summary of the results of the evaluation process using the 70% threshold is provided below.

CWU utilizes the NCEES Ratio Score for assessment. The NCEES Ratio Score is the Institution Average Performance Index (CWU) divided by the ABET Comparator Average Performance Index. This is a convenient and simple way to compare CWU to the national average. The threshold used on NCEES data and the MET practice FE exam will be 0.70.

The periodic review cycle for the SOs is listed in Table 4-1. The collected data are reported and reviewed by MET faculty. All SOs are for the baccalaureate program.

Table 4-1. Student Outcomes review schedule.

	Schedule	
ABET Criterion 3 SO	Year 1,3,5	Year 2,4,6
3a.	X	
3b.	X	
3c.	X	
3d.		X
3e.		X
3f.	X	
3g.		X
3h.	X	
3i.	X	
3j.	X	
3k.		X
Program Criterion SO		
Ma.	X	X
Mb.	X	
Mc.	X	
Md.	X	
Me.	X	
Mf.	X	
Mg.	X	
Mh.		X

Student Outcome: 3a "an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities"

The first metric for SO 3a is assessed using the bi-annual reports produced by the NCEES. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-01. The graph is produced by taking the number of individuals who passed the FE divided by the total number of individuals who sat for the FE in the two categories.

This metric is examined annually.

The attainment threshold is 70% of the students who take the FE will pass. Figure 4-01 shows the percentage of CWU students who took the FE and passed compared to the percentage of students nationally who took the FE and passed. While the 2015-16 data demonstrate threshold achievement, as noted above, 70% is the threshold the MET faculty and IAB initially selected. As additional data are collected, the MET faculty, in conjunction with the IAB, will need to determine if this threshold will be maintained or adjusted.

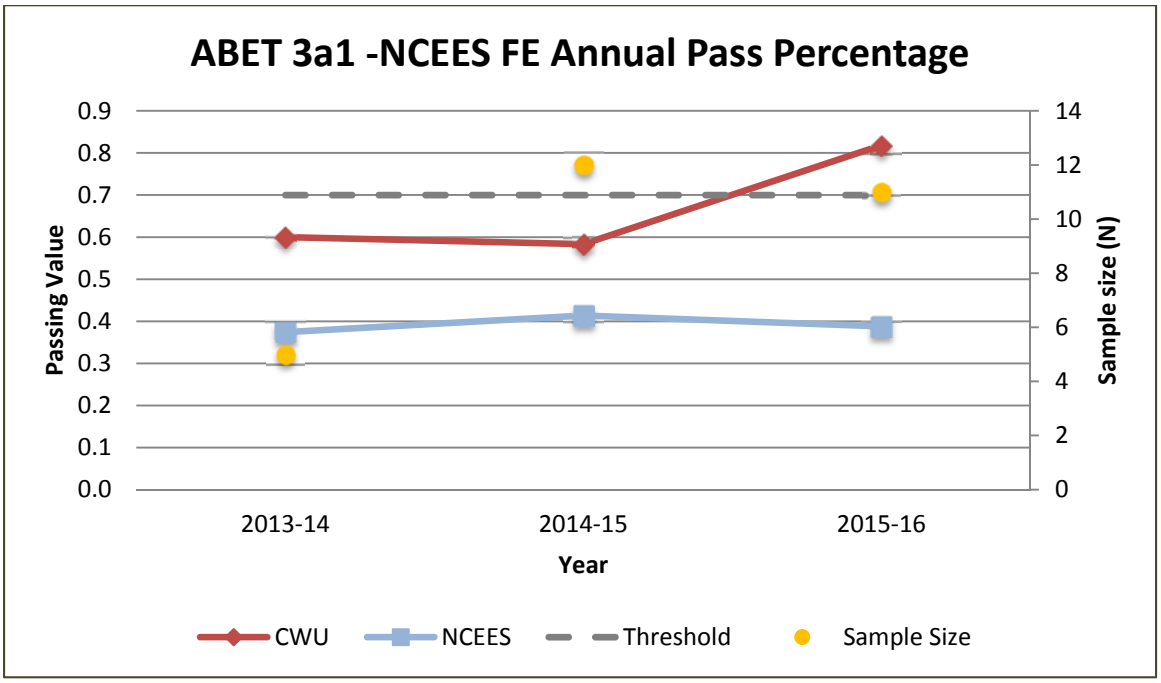


Figure 4-01. Comparison of CWU FE passing percentage to NCEES Annual passing percentage.

The second metric for SO 3a comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The score for each question for each student is recorded in an Excel workbook. This provides information on how each student did in each category and how the class did as a whole. These data are then dropped into another Excel workbook to aggregate the data.

This metric is also examined annually.

The attainment threshold is set at 44%. Historical CWU data show that students who achieved 44%, or higher, on the practice FE exam (the final exam for MET 488) pass the NCEES FE exam. This does not mean that if a student does not score a 44% on the MET practice FE exam s/he will not pass the NCEES FE exam. Occasionally students do.

Figure 4-02 shows the percentage of CWU students who achieved a score of 44% or higher on the MET practice FE exam. While the 2014-15 students' score was an improvement over the 2013-14 students' score and met the established threshold, the 2015-15 students' performance failed to meet the threshold. This metric will be reassessed in the next cycle of data collection and analysis to determine if this is a trend or an anomaly. If the 2016-17 students fail to meet the threshold, corrective action will be taken.

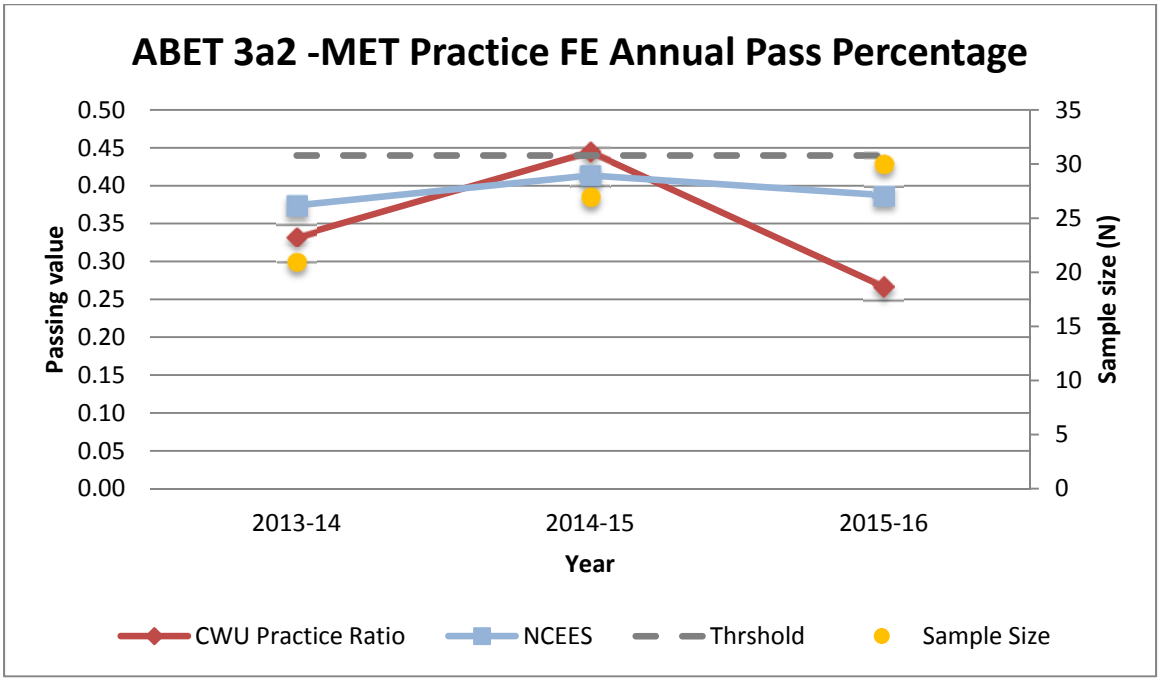


Figure 4-02. Comparison of CWU practice FE passing to NCEES national passing.

Student Outcome: 3b "an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies."

The first metric for SO 3b is the bi-annual reports produced by the NCEES. The data come from the Static, Dynamics Kinematics and Vibrations, and Mechanics of Materials categories of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graphs shown in Figure 4-03, Figure 4-04, and Figure 4-05. These graphs are produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is the ratio score for the CWU students that take the NCEES FE exam will be 0.70 or higher.

Figure 4-03 shows CWU ratio scores for Statics. The CWU students are doing well in the Statics category. If this trend continues, the threshold may need to be adjusted upward.

Figure 4-04 shows the CWU ratio scores for Dynamics. Again, the CWU students are doing well. No action is necessary at this time; however, as noted for the Statics category, if CWU students continue to exceed the 0.70 threshold, it may need to be adjusted upward.

Figure 4-05 shows the CWU ratio scores for Mechanics of Materials. The CWU students are slipping a little in this category; however, they are still exceeding the 0.70 threshold. While the decrease in performance is not significant enough at this time to warrant any action, it will be closely monitored, and corrective measures will be taken if needed.

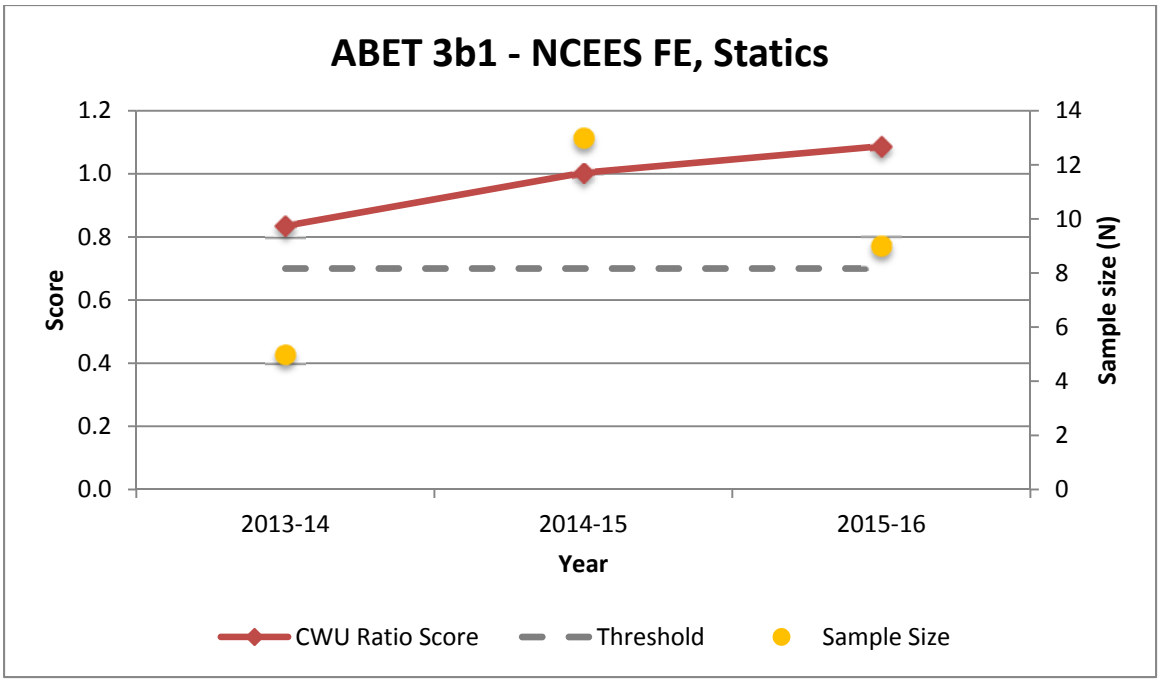


Figure 4-03. CWU Ratio Score in Statics.

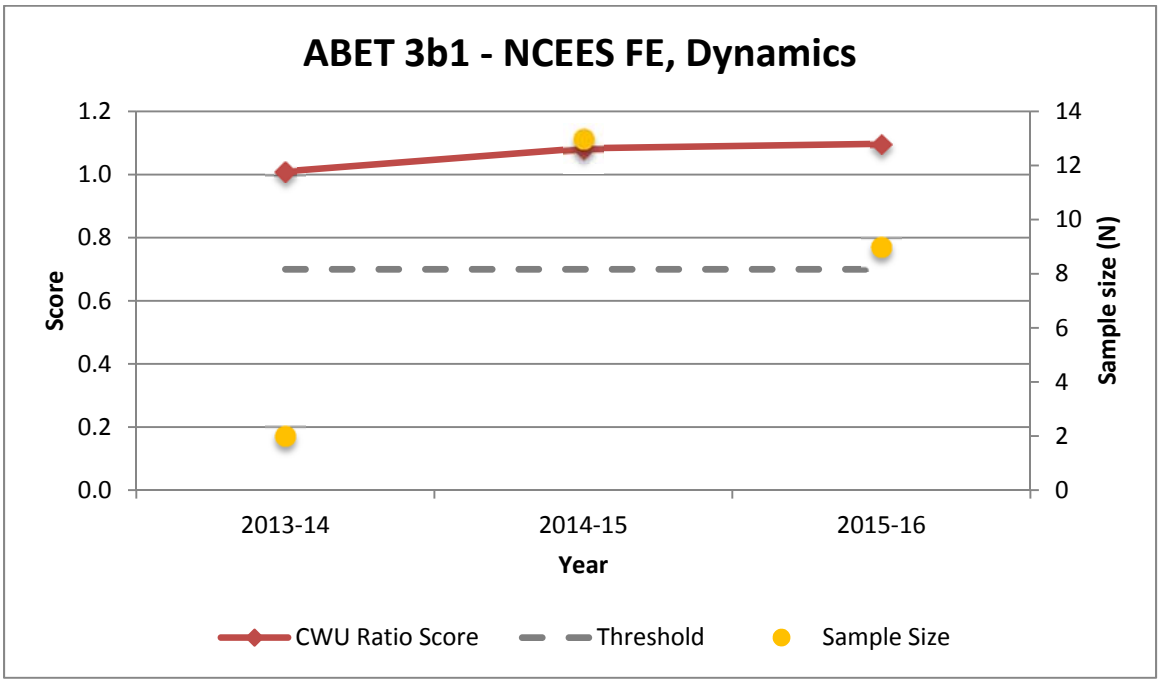


Figure 4-04. CWU Ratio Score in Dynamics.

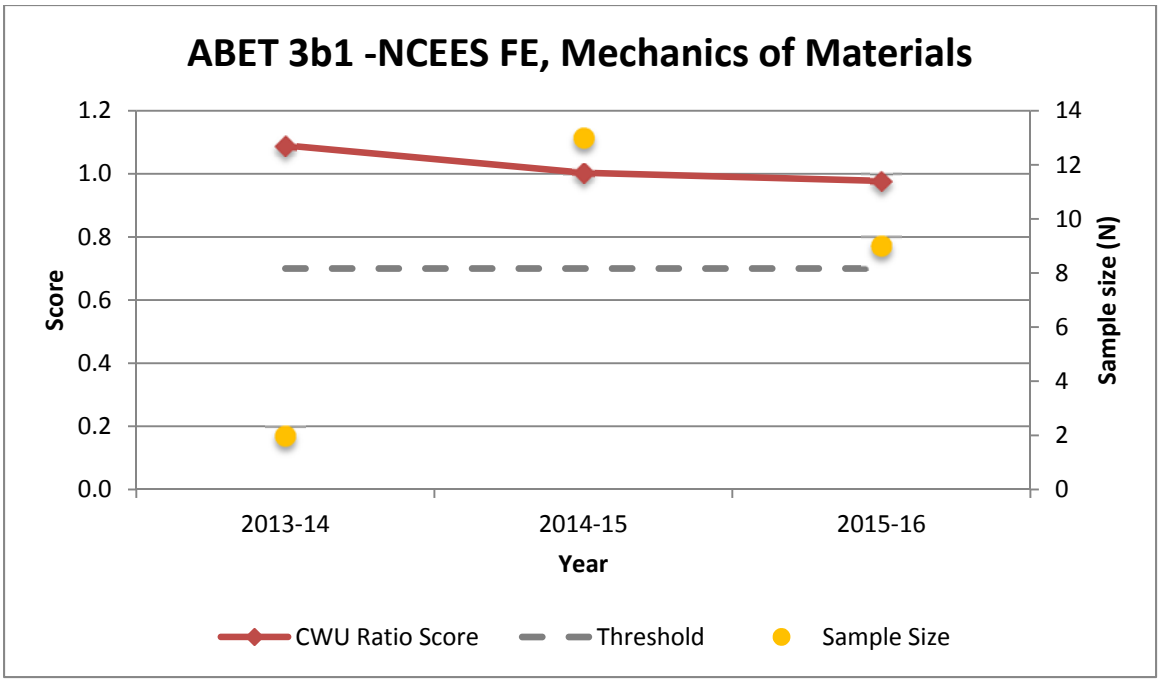


Figure 4-05. CWU Ratio Score in Mechanics of Materials.

The second metric for SO 3b comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Static, Dynamics Kinematics and Vibrations, and Mechanics of Materials categories of the MET practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graphs shown in Figure 4-06, Figure 4-07, and Figure 4-08. These graphs are produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is the ratio score for the CWU students taking the MET practice FE will be .70 or higher.

Figure 4-03 shows CWU ratio scores for Statics. The statics scores for all three student groups exceed the threshold; however, the 2015-16 students' score shows a decrease from the 2013-14 and 2014-45 students' scores. The MET faculty will continue to monitor students' performance on this metric and take corrective action if necessary.

Figure 4-04 shows the CWU ration scores for Dynamics. These scores have been trending downward, and while the 2013-14 students and the 2014-15 students exceeded the .70 threshold, the 2015-16 students failed to meet the threshold. Corrective action is required.

Figure 4-05 shows the CWU ratio scores for Mechanics of Materials. While these scores show some improvement, all three student groups failed to meet the .70 threshold. Corrective action is required.

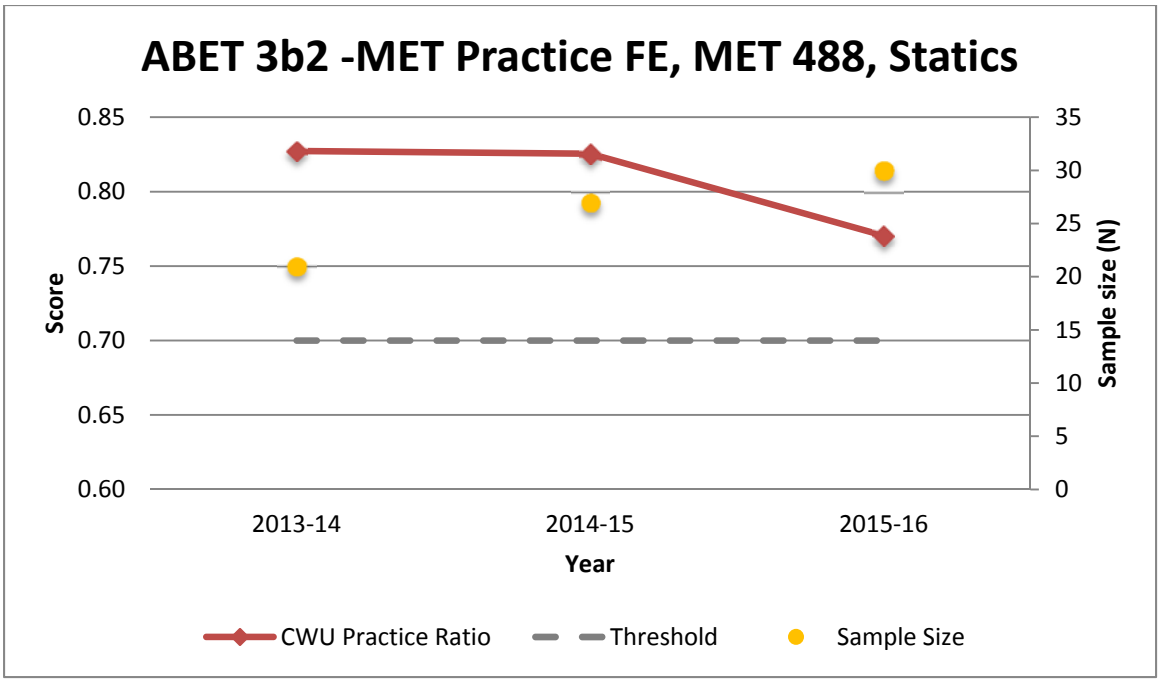


Figure 4-06. Practice FE Ratio Score in Statics.

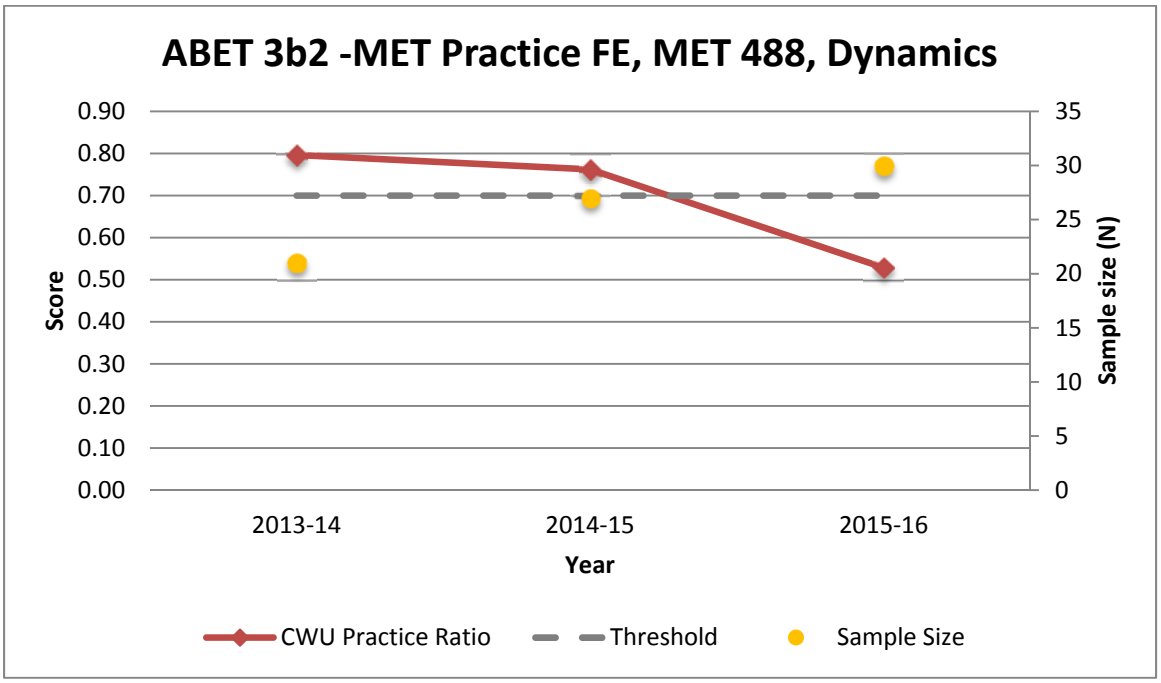


Figure 4-07. Practice FE Ratio Score in Dynamics.

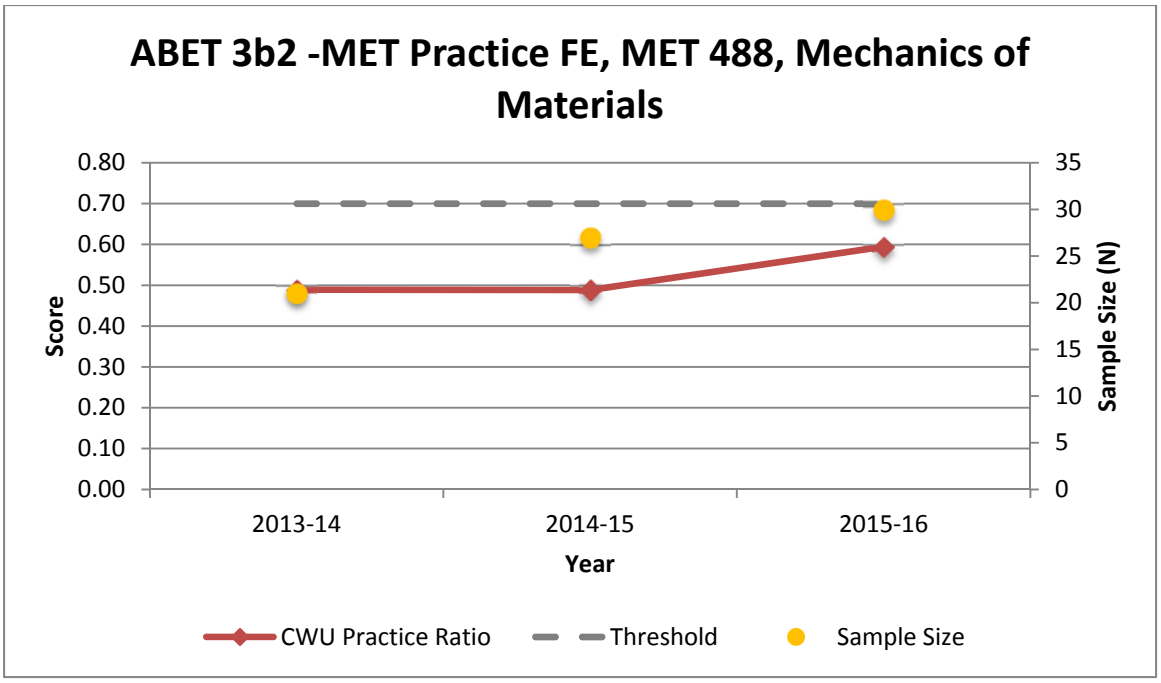


Figure 4.08. Practice FE Ratio Score in Mechanics of Materials.

Student Outcome: 3c "an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes."

The first metric for SO 3c is assessed using the bi-annual reports produced by the NCEES. The data come from the Measurements Instrumentation and Controls category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure 4-09. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.

Figure 4-09 shows CWU ratio scores for Controls. All three student groups have exceeded the .70 threshold. No action is required at this time; however, if students continue to perform this well, the MET faculty and the IAB may elect to increase the threshold.

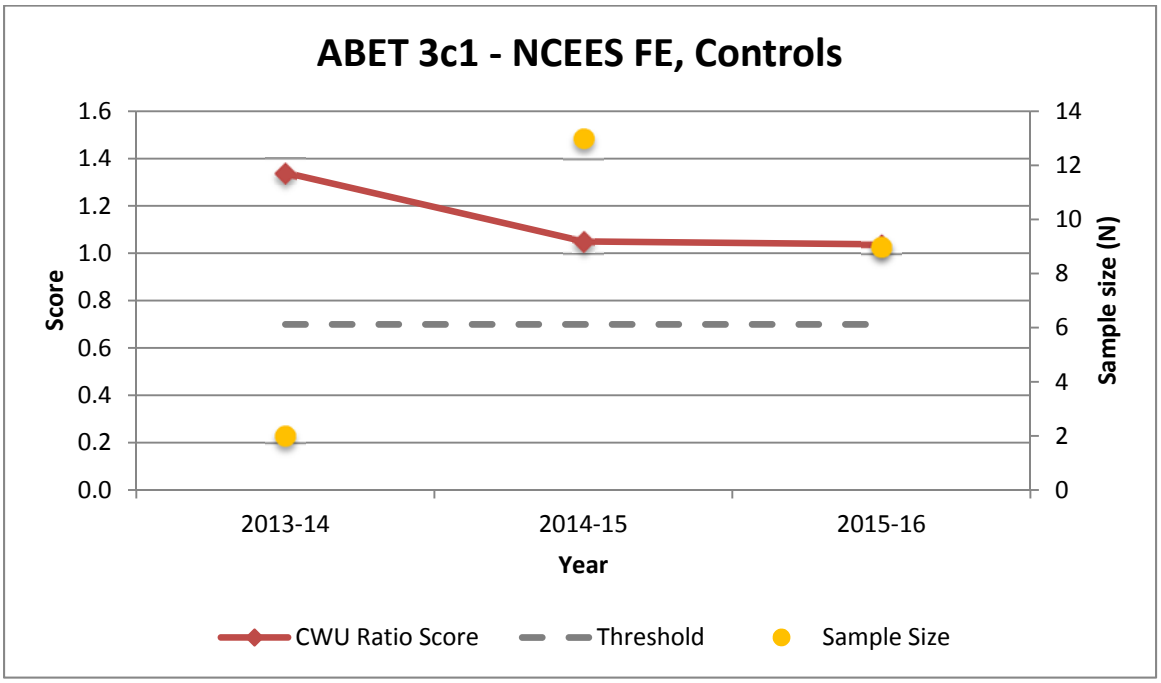


Figure 4-09. CWU Ratio Score in Measurements Instrumentation and Controls.

The second metric for SO 3c comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Measurements Instrumentation and Controls category of the MET practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure 4-10. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.

This metric is examined annually.

The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.

Figure 4-10 shows CWU ratio scores for Measurements Instrumentation and Controls. All three student groups exceeded the threshold; however, the 2015-16 students performed worse than the 2013-14 and 2014-15 students. It will bear monitoring to determine whether corrective action is required to raise the score. Corrective action will be necessary should the 2016-17 students fail to meet the threshold.

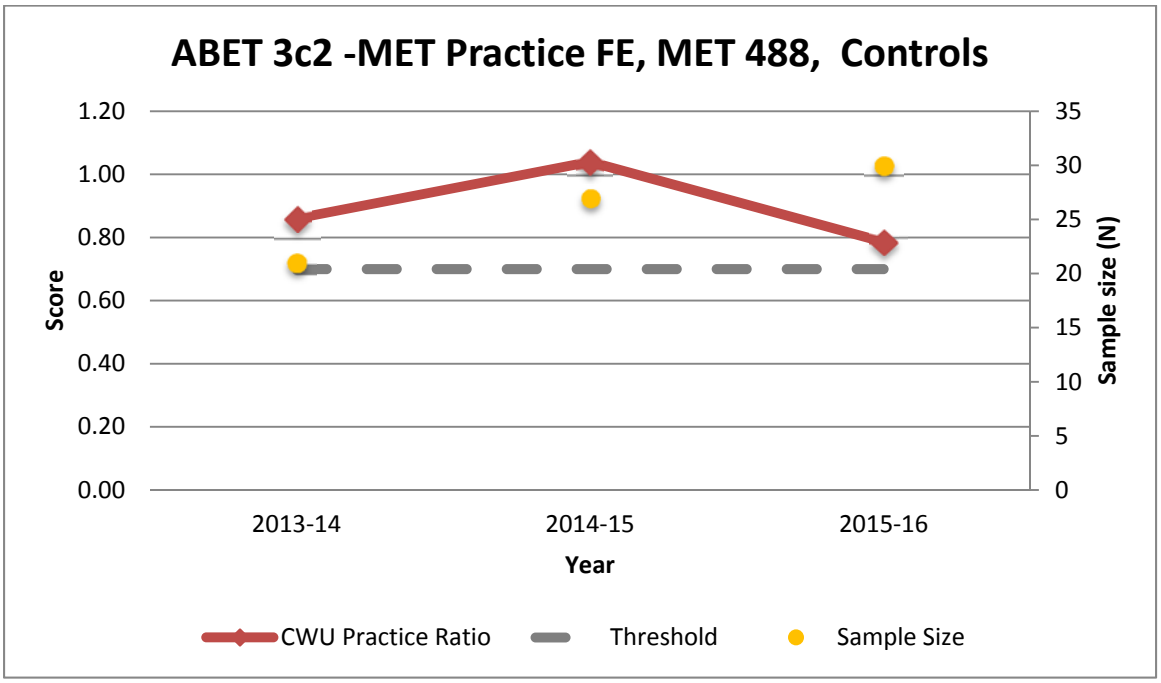


Figure 4-10. Practice FE Ratio Score in Measurements Instrumentation and Controls.

The third metric for SO 3c comes from the Test Design Review (TDR) completed in the final quarter of the capstone experience (MET 489C). The direct measure is an assessment of the students' ability to analyze the test results on their senior project. Each student conducts a test review in front of their peers twice during the quarter. Each time they are assessed on their ability to verbalize their analysis of their test data. The TDR rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-11.

This metric is also examined annually.

The attainment threshold is that 70% of the students will receive a satisfactory or exemplary score.

Figure 4-11 shows the SO 3c TDR level of attainment. For 2013-14, there was only a single assessment, and the students did well – exceeding the 70% threshold. In 2014-15, the MET faculty began conducting two assessments. For both the 2014-15 and 2015-16 student groups, the students performed better on the first assessment compared to the second. While the 2014-15 students failed to meet the threshold on both assessments, the 2015-16 students exceeded the threshold on the first assessment but failed to meet the threshold on the second assessment. Corrective action is required.

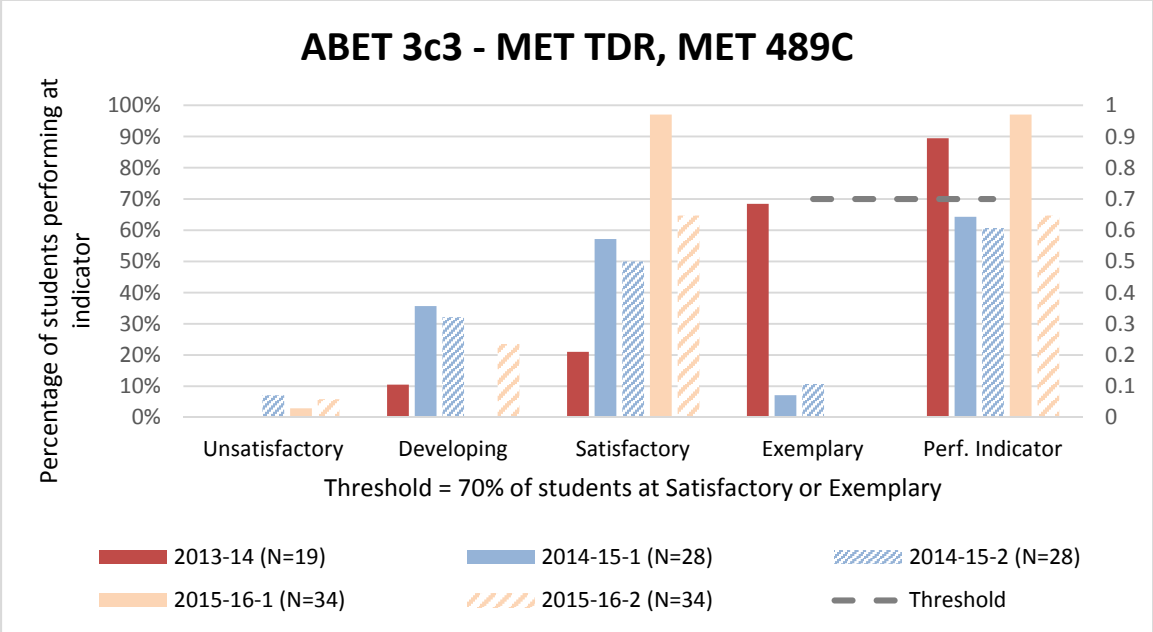


Figure 4-11. CWU ABET 3c Test Design Review Scores.

Student Outcome: 3d "an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives."

The first metric for SO 3d comes from the Requirements, Analysis, Design, and Drawing (RADD) completed in the first quarter of the capstone experience (MET 489A). This quarter is about students' initial design. The direct measure is an assessment of the students' ability to design their senior project. Each student presents a brief review of a requirement, the analysis for that requirement, the design that resulted from that analysis, and finally the drawing of their design. The RADD rubric data is dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-12.

The metric is also examined annually.

The attainment threshold is the student average rubric score will be a 70% or higher. Figure 4-12 shows the level of attainment for design. All three student groups performed well – exceeding the 70% threshold. If students continue to do this well, and if the upward trend in scores continues, the MET faculty and IAB may need to consider increasing the threshold score.

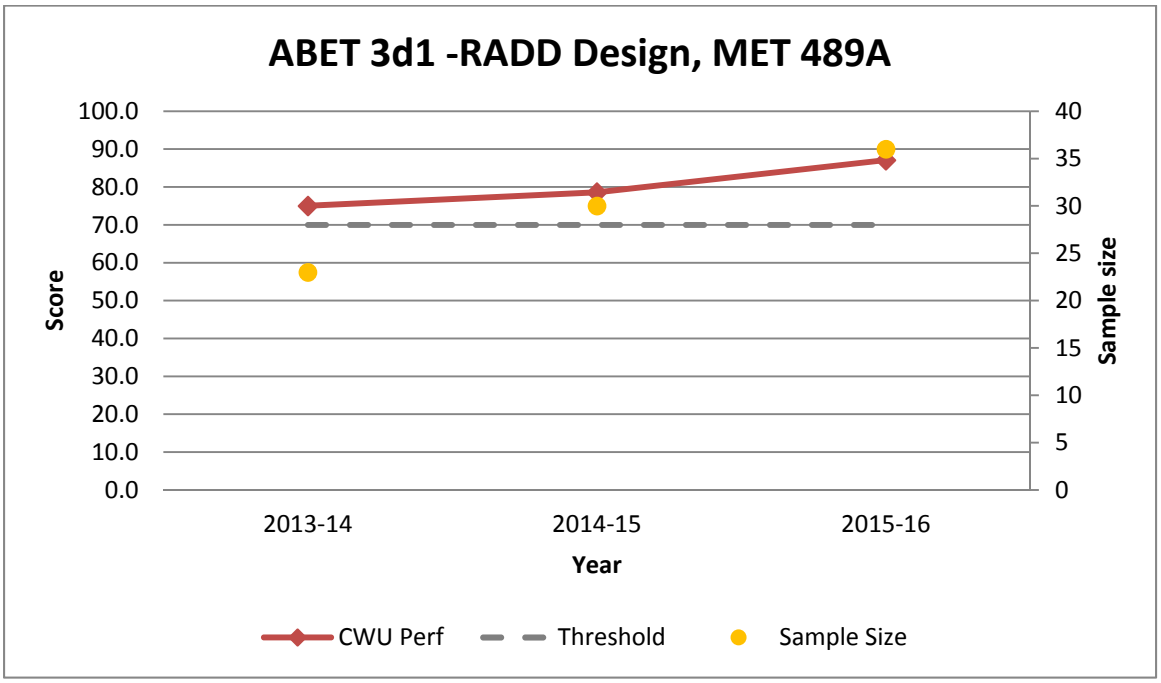


Figure 4-12. Design scores for RADD in MET 489a.

The second metric for SO 3d comes from the Requirements, Analysis, Design, and Drawing (RADD) completed in the second quarter of the capstone experience (MET 489B). This quarter is more about design optimization. The direct measure is an assessment of the students' ability to design their senior project. Each student presents a brief review of a requirement, the analysis for that requirement, the design that resulted from that analysis, and finally the drawing of their design. The RADD rubric data is dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-13.

The metric is also examined annually.

The attainment threshold is the student average rubric score will be a 70% or higher. Figure 4-13 shows the level of attainment. All three student groups performed well – exceeding the 70% threshold. Again, if students continue to do this well, the MET faculty and IAB may need to consider increasing the threshold score.

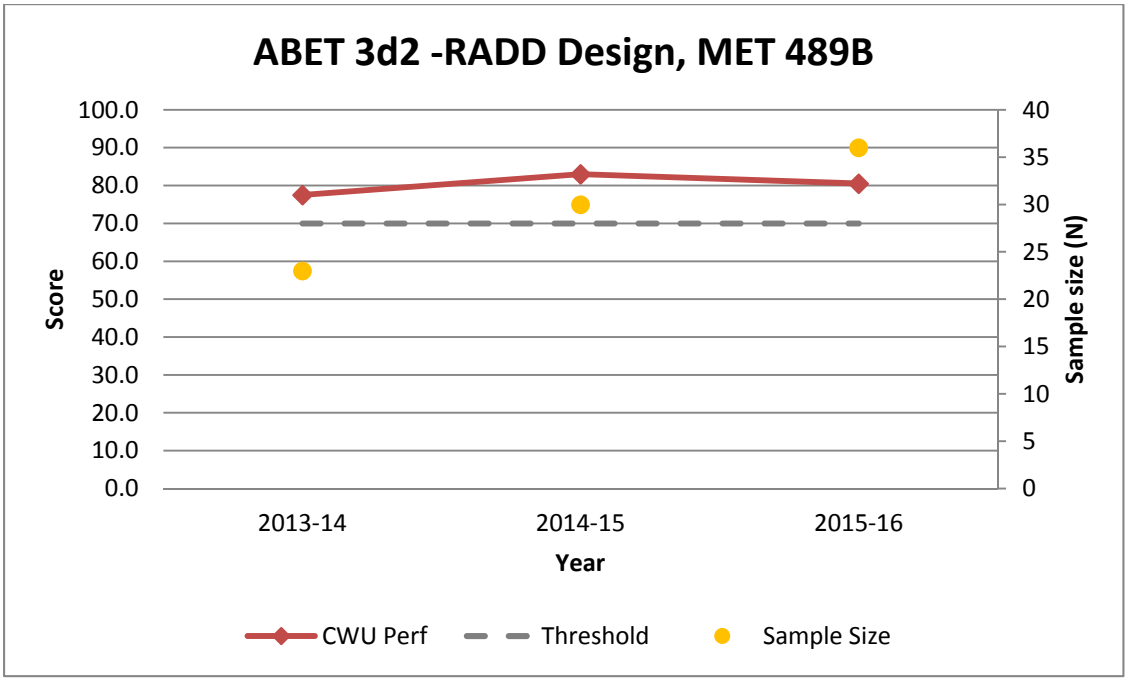


Figure 4-13. Design scores for RADD in MET 489B.

Student Outcome: 3e "an ability to function effectively as a member or leader on a technical team"

The metric for SO 3e comes from the teaming scores in the Mechanical Design I (MET 418) Labs. The direct measure is an assessment of the students' ability to function in and as a team member. Each week the students are randomly placed in teams of three. They are given a design problem and a week to provide a solution. At the end of the week the students assess their fellow team members via a provided rubric. The scores provided by the students are entered into an Excel workbook. The student scores are multiplied by a weighting factor and then summed for a teaming score for the week. The teaming data is dropped into another Excel workbook that aggregates the data to produce the graph shown in Figure 4-14.

This metric is also examined annually.

The attainment threshold is the average student rubric score is a 70% or higher. Figure 4-14 shows the scores for teaming. All three student groups exceeded the threshold. There will be a rubric change for this SO beginning in fall of 2017; the scoring will likely become more demanding. If students continue to exceed the threshold even when the more rigorous rubric is used, the MET faculty and IAB may need to consider increasing the threshold score.

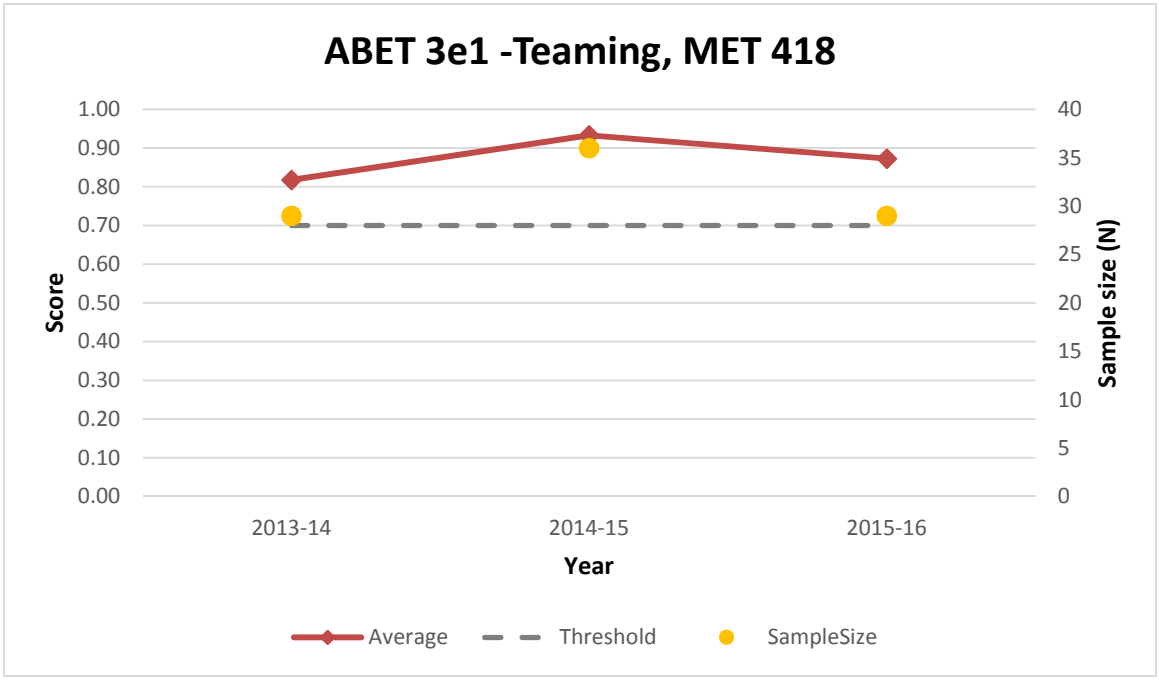


Figure 4-14. Teaming scores.

Student Outcome: 3f "an ability to identify, analyze, and solve broadly-defined engineering technology problems."

The first metric for SO 3f is assessed using the bi-annual reports produced by the NCEES. The data comes from the Mechanical Design and Analysis category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-15. The graph is produced using the NCEES Ratio Score – the ratio of the performance of CWU students to the NCEES comparator performance in each category. These are average scores.

This metric is completed annually.

The attainment threshold is the ratio score for the CWU students that take the FE exam will be .70 or higher.

Figure 4-15 shows CWU ratio scores for Design. All three student groups exceeded the threshold. If these performance levels continue, the MET faculty and IAB may need to consider raising the threshold score.

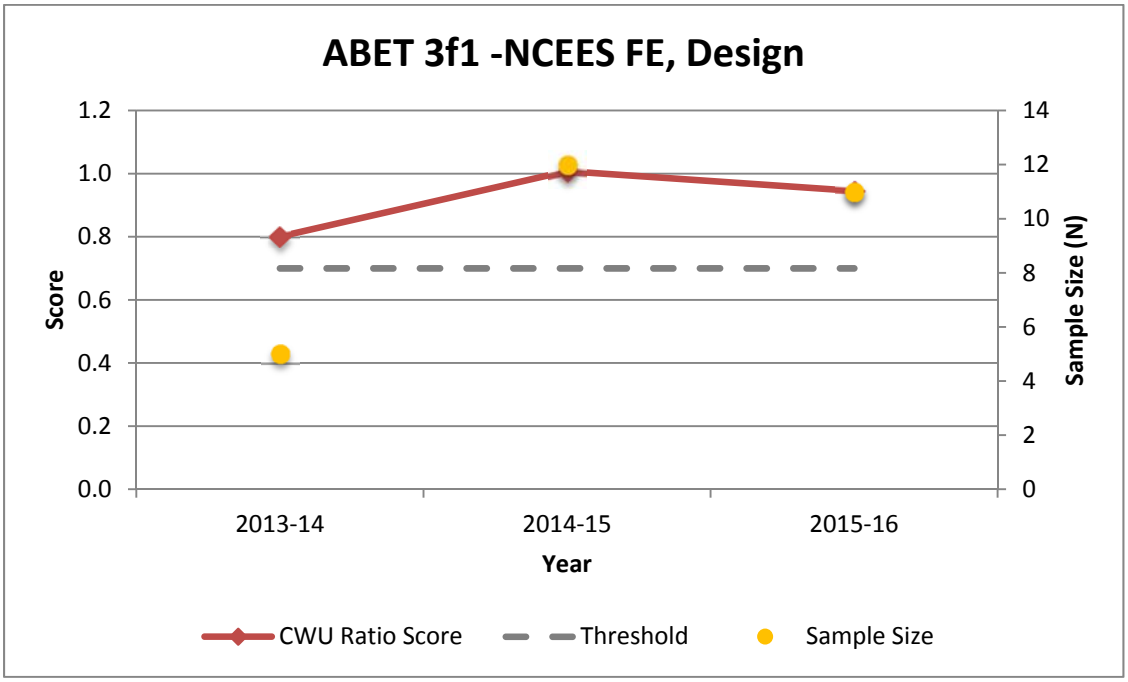


Figure 4-15. CWU Ratio Scores in Mechanical Design and Analysis.

The second metric for SO 3f comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Mechanical Design and Analysis category of the MET practice FE exam. The practice FE exam data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-16. The graph is produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.

Figure 4-16 shows CWU ratio scores for Mechanical Design and Analysis. The students have continually improved with two of the three student groups exceeding the threshold. The MET faculty and IAB will consider increasing the threshold score higher – toward 1.0.

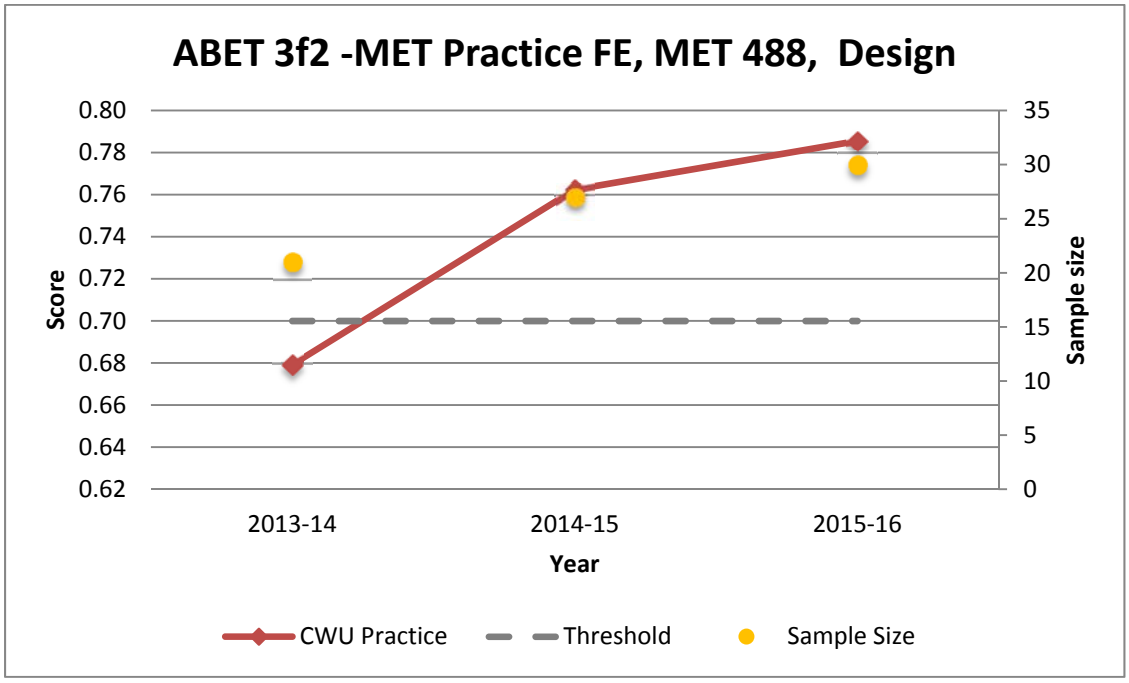


Figure 4-16. Practice FE Ratio Score in Mechanical Design and Analysis.

The third metric for SO 3f comes from the Test Design Review (TDR) completed in the final quarter of the capstone experience (MET 489C). The direct measure is an assessment of the students' ability to state their predicted test result value on their senior project. Each student conducts a test review in front of their peers twice during the quarter. Each time they are assessed on their ability to state their predicted value for the test result. The TDR rubric data is dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure 4-17.

This metric is also examined annually.

The attainment threshold is the 70% of the students will receive a satisfactory or exemplary rubric score.

Figure 4-17 shows the ABET 3f TDR level of attainment. For 2013-14, there was only a single assessment, and the students did well – exceeding the threshold. In 2014-15, the MET faculty began conducting two assessments. The students perform better on the second assessment. This may require an adjustment of the delivery prior to the second assessment. While the 2014-15 students failed to meet the threshold on either assessment, the 2015-16 students exceeded the threshold on both assessments. The MET faculty will continue to monitor students' performance, and should another group of students fail to meet the threshold – and/or if students continue to perform less well on the second assessment compared to the first – corrective action will be taken.

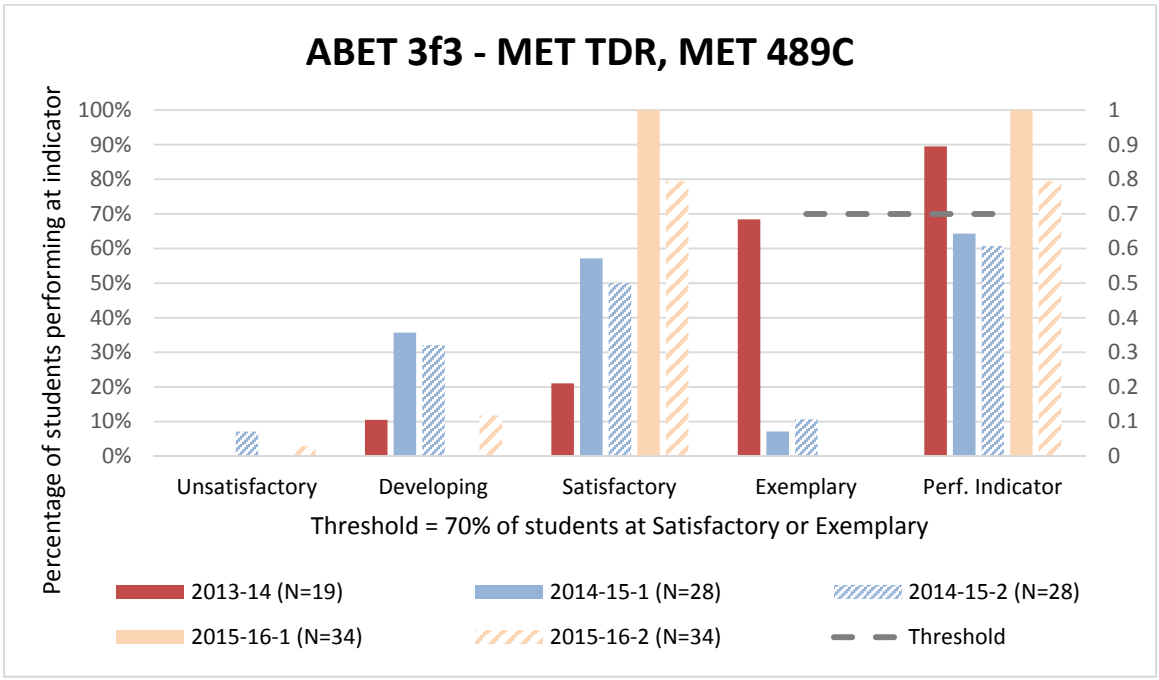


Figure 4-17. CWU ABET 3f Test Design Review Scores.

Student Outcome: 3g "an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature."

The first metric for SO 3g comes from the Proposal Design Review (PDR) completed in the first quarter of the capstone experience (MET 489A). The direct measure is an assessment of the students' ability to communicate their proposed senior project to an audience. Each student presents a short review in front of their peers during the quarter. They are assessed on their ability to apply written, oral, and graphical communication in their proposal. The PDR rubric data is dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure 4-18.

This metric is also examined annually.

The attainment threshold is the student average rubric score will be a 70% or higher. Figure 4-18 shows the ABET 3g PDR level of attainment. All three student groups exceeded the threshold. If students' performance continues to trend in a positive direction, the MET faculty and IAB will consider increasing the threshold score.

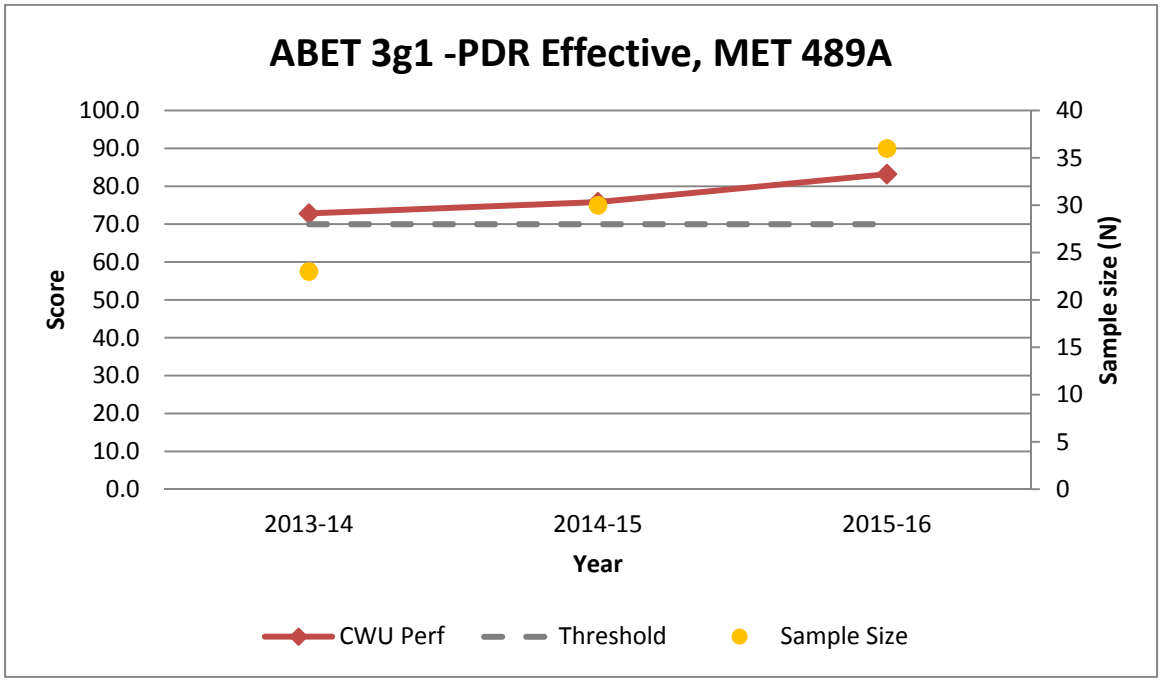


Figure 4-18. ABET 3g Proposal Design Review Scores.

The second metric for SO 3g comes from the Proposal Design Review (PDR) completed in the second quarter of the capstone experience (MET 489B). The direct measure is an assessment of the students' ability to design their senior project. Each student presents a brief review of a requirement, the analysis for that requirement, the design that resulted from that analysis, and finally the drawing of their design. The PDR rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-19.

The metric is also examined annually.

The attainment threshold is the student average rubric score will be a 70% or higher.

Figure 4-19 shows the level of attainment for design. The students are exceeding the threshold. The students are showing a slight improvement over the preceding quarter, as they should. But the decreased performance level of the 2015-16 students is concerning. This will be monitored, and corrective action will be taken if necessary.

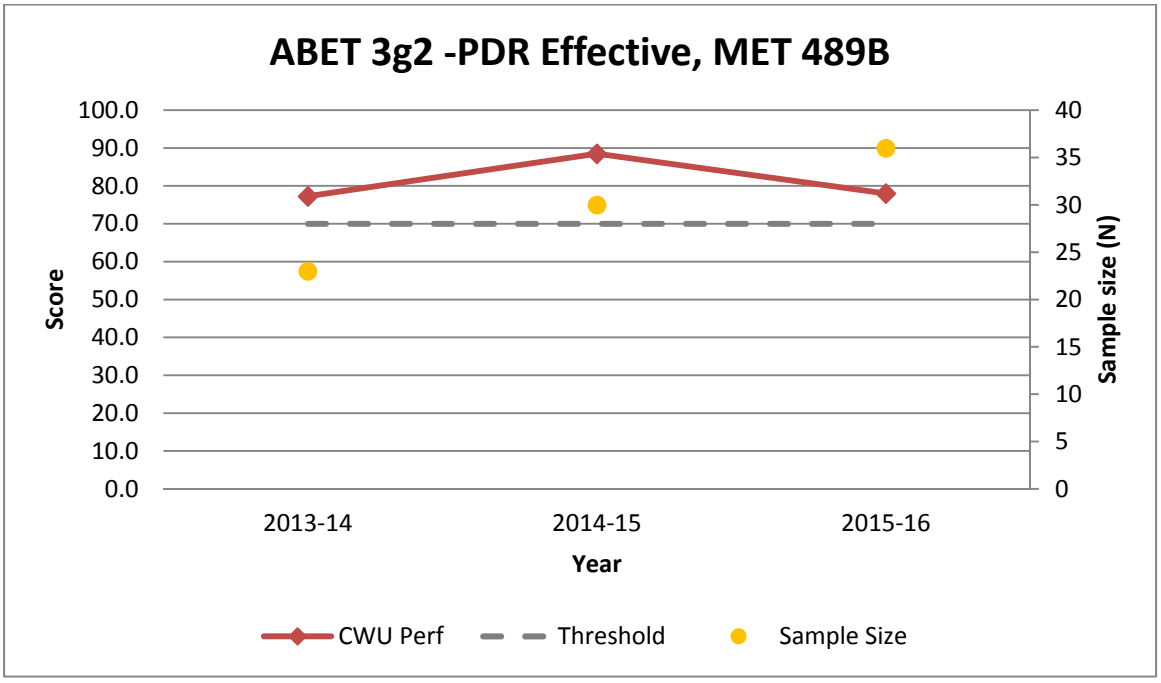


Figure 4-19. ABET 3g Proposal Design Review Scores.

The third metric for SO 3g comes from the Test Design Review (TDR) completed in the final quarter of the capstone experience (MET 489C). The direct measure is an assessment of the students' ability to introduce the test they conducted on their senior project. Each student conducts a test review in front of their peers twice during the quarter. Each time they are assessed on their ability to verbalize what test they conducted on their senior project. The TDR rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-11.

This metric is also examined annually,

The attainment threshold is that 70% of the students will receive a satisfactory or exemplary rubric score.

Figure 4-11 shows the ABET 3c TDR level of attainment. For 2013-14, there was only a single assessment and the students did will – exceeding the threshold. In 2014-15, the MET faculty began conducting two assessments. The students perform better on the first assessment. This will require an adjustment of the delivery prior to the second assessment. While the 2014-15 students failed to meet the threshold on either assessment, the 2015-16 students exceeded the threshold on both assessments. The MET faculty will continue to monitor students' performance, and should another group of students fail to meet the threshold on either or both assessments – and/or should students continue to perform worse on the second assessment – corrective action will be taken.

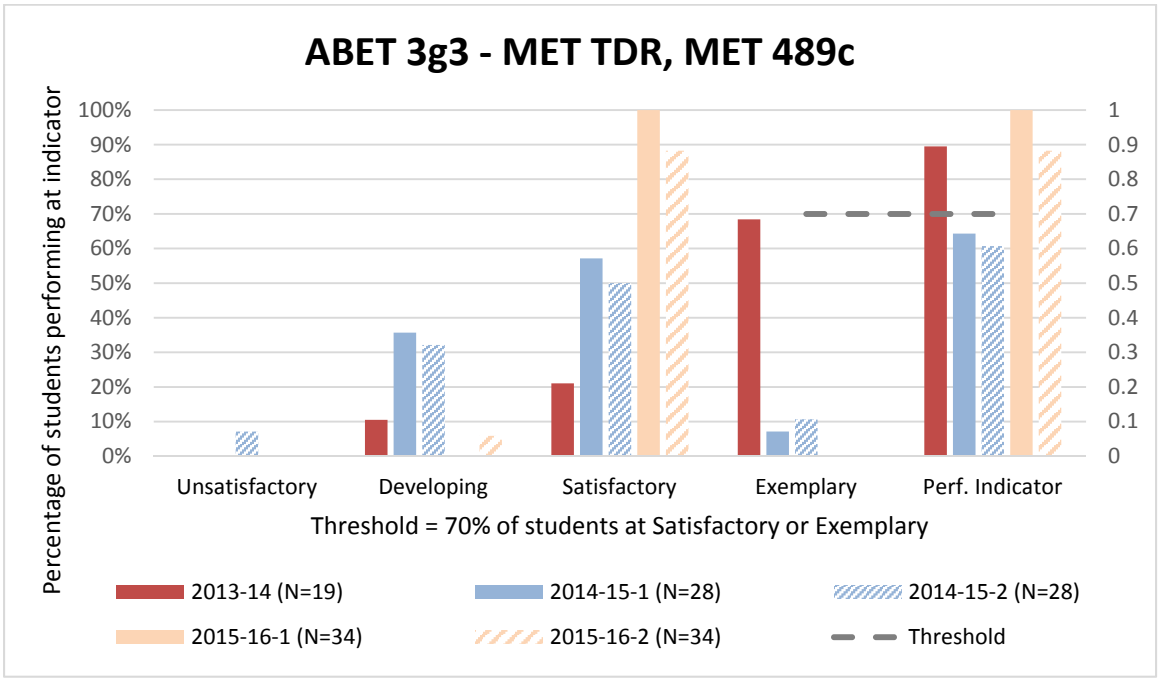


Figure 4-20. CWU ABET 3g Test Design Review Scores.

Student Outcome: 3h "an understanding of the need for and an ability to engage in self-directed continuing professional development"

The first metric for SO 3h is assessed using the bi-annual reports produced by the NCEES. The data come from the header information of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-21. The graph is produced using the NCEES Number of Examinees Taking the FE exam from CWU.

This metric is also examined annually.

The attainment threshold is 70% of the CWU graduating class, each year, will take the FE exam.

Figure 4-21 shows the percentage of the graduating class that took the FE. Clearly, this is deficient, and the students do not understand the need for continuous professional development. This requires a change in the message the students are receiving about the importance and value of professional development. Corrective action will be taken.

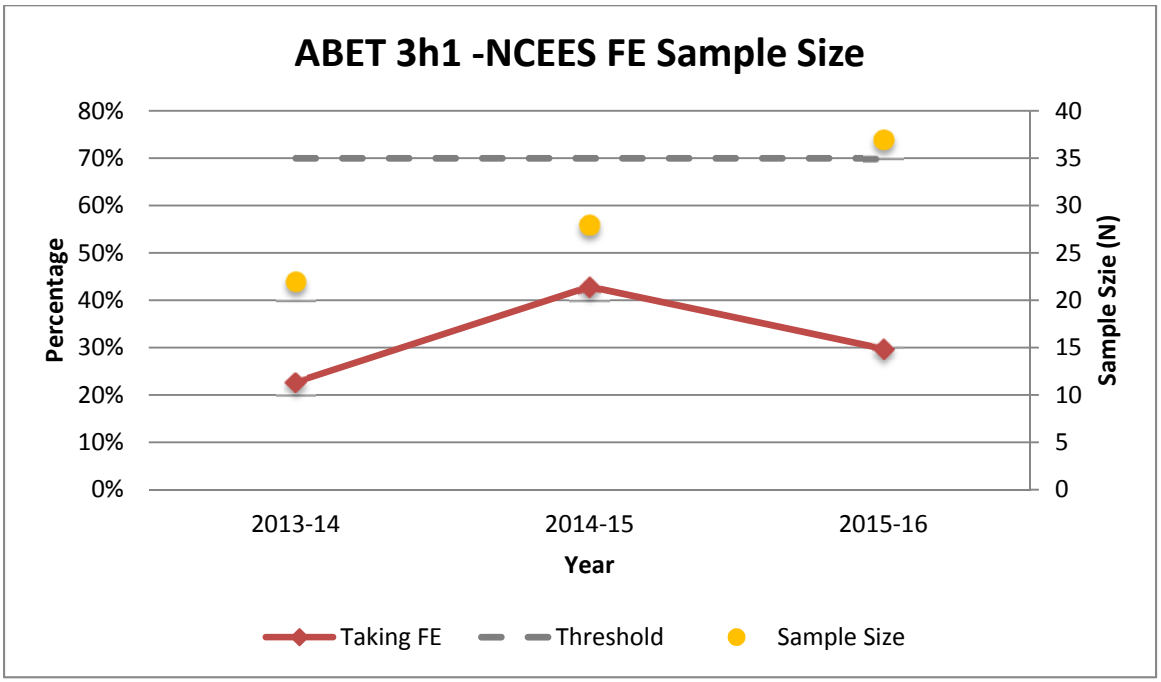


Figure 4-21. Percentage of Graduation Class That Took FE.

The second metric for SO 3h comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the number of students that take the test that are not flagged as "random guessers" on the MET practice FE exam. The practice FE exam data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-22. The graph is produced using the number of CWU students who take the practice FE exam. (All students in the class.) The score is the percentage of students who took the practice test seriously and were not flagged as "random guessers."

This metric is also examined annually.

The attainment threshold is 70%, or higher, of the students will take the MET practice FE exam seriously.

Figure 4-22 shows MET practice FE examinees who took the test seriously. Unfortunately, this is trending downward. Immediate action is required to push the score back up to 100%.

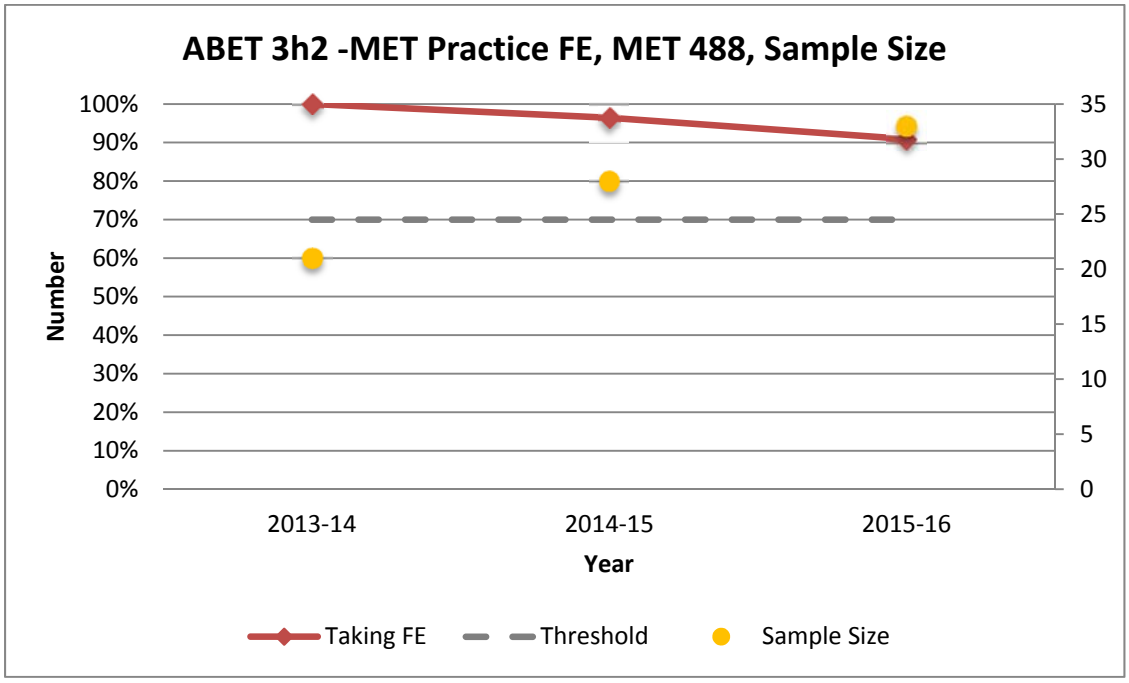


Figure 4-22. MET Practice FE Examinees (Percentage of class size).

Student Outcome: 3i "an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity"

The first metric for SO 3i is assessed using the bi-annual reports produced by the NCEES. The data comes from the Ethics and Professional Practice category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-23. The graph is produced using the NCEES ratio score – the performance of CWU students to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students who take the FE.

Figure 4-23 shows the CWU students' ratio scores for Ethics. The students are performing well and exceeding the threshold. If this continues, the MET faculty and IAB may consider increasing the threshold score.

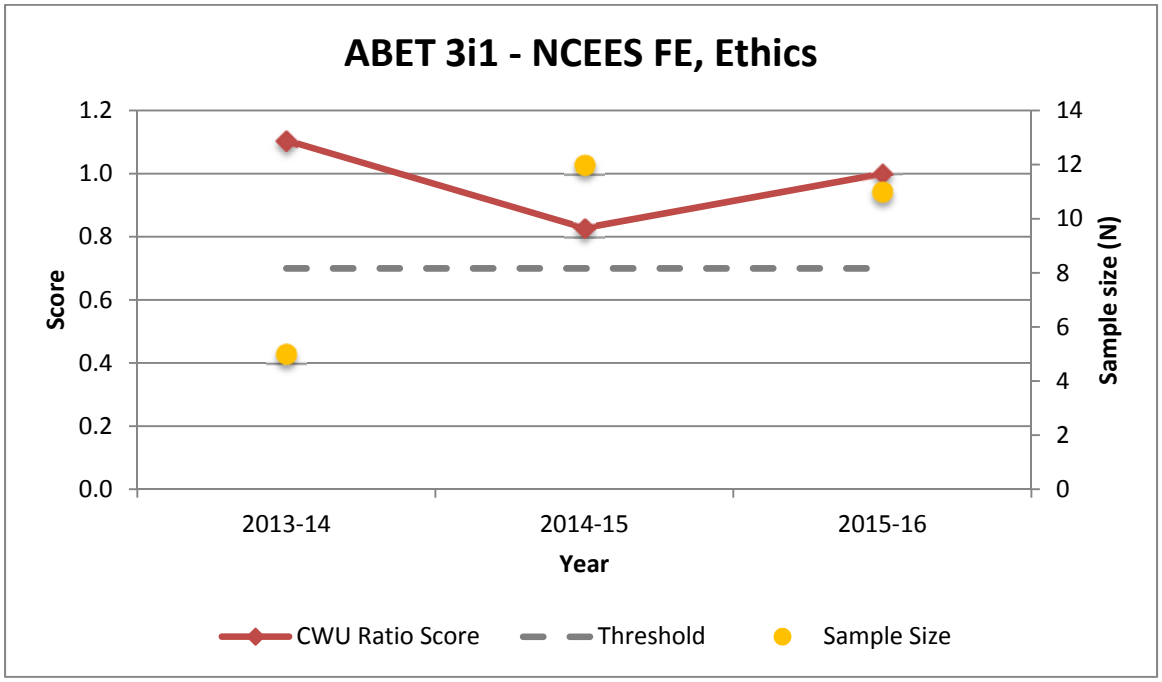


Figure 4-23. CWU Ratio Scores in Ethics.

The second metric for SO 3b comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Ethics category of the MET practice FE exam. The practice FE exam data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-24. The graph is produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students taking the MET practice FE exam.

Figure 4-24 shows CWU students' ratio scores for Ethics. The score for the most recent student group (2015-16) dipped perilously close to the threshold. Immediate action is required.

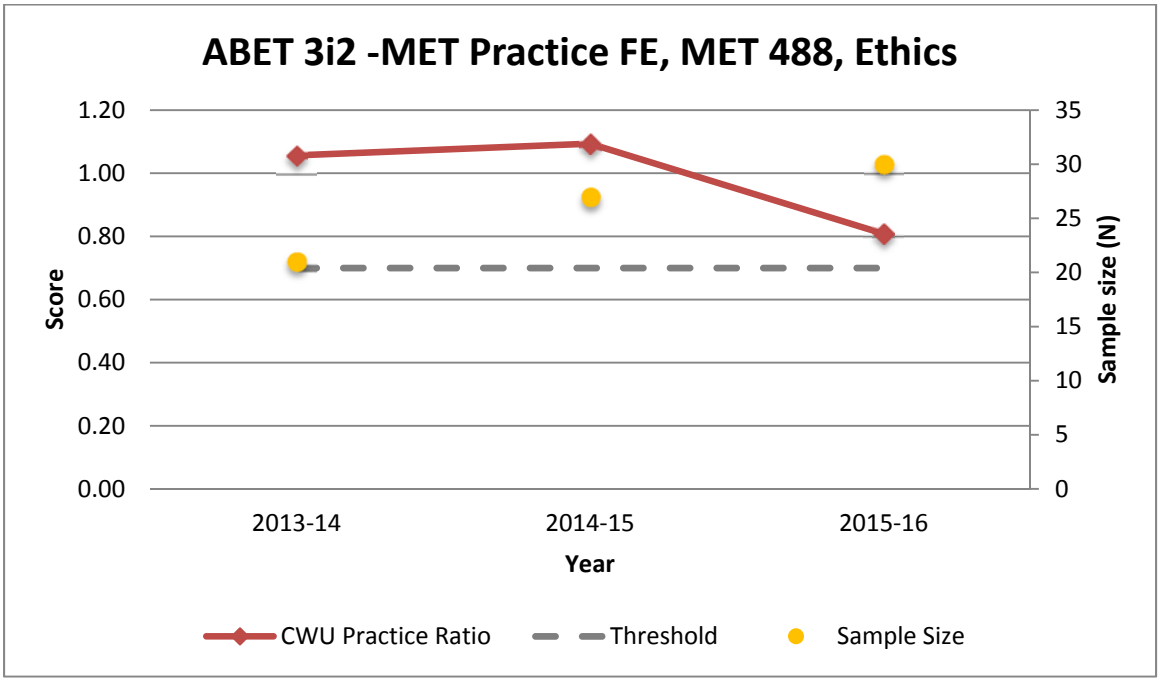


Figure 4-24. Practice FE Exam Ratio Score in Ethics.

Student Outcome: 3j "a knowledge of the impact of engineering technology solutions in a societal and global context"

The first metric for SO 3j is assessed using the bi-annual reports produced by the NCEES. The data come from the Ethics and Professional Practice category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-25. The graph is produced using the NCEES ratio score – the ratio of the performance of CWU to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students who take the FE.

Figure 4-25 shows CWU students' ratio scores for Professionalism. The students are maintaining performance above the threshold. No action is required at this time.

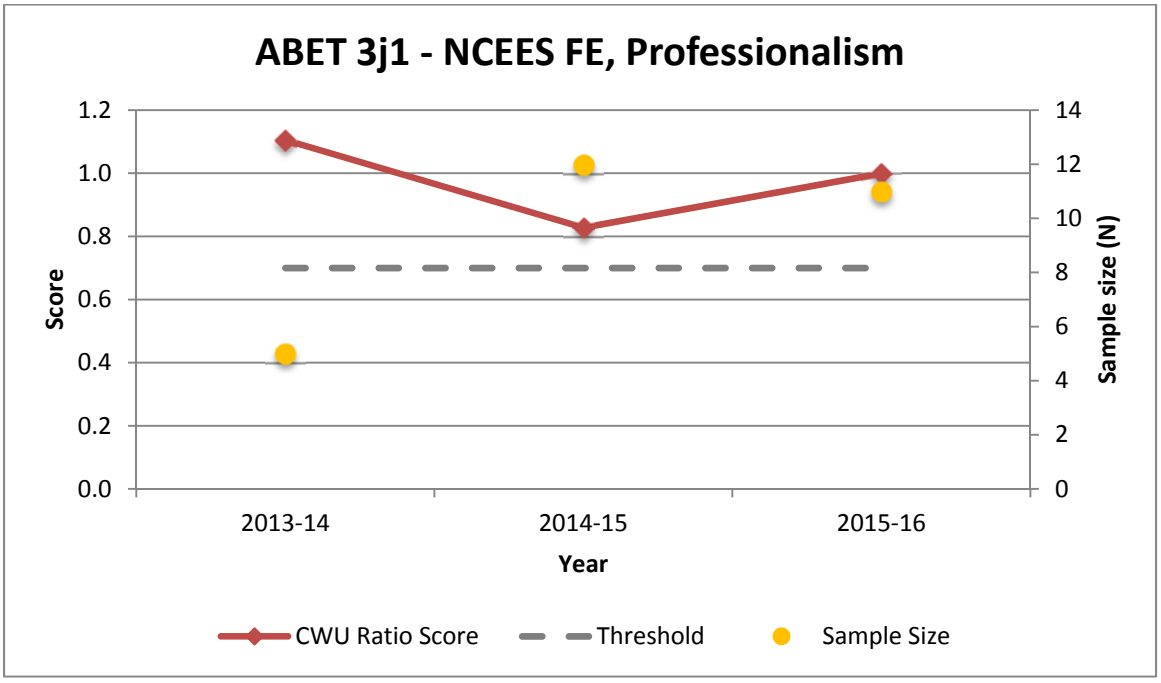


Figure 4-25. CWU Ratio Scores in Professionalism.

The second metric for SO 3j comes from the practice FE exam that every MET student takes as the final exam, for MET 488 (Professional Certification Exam Preparation course). The data come from the Ethics and Professional Practice category of the MET practice FE exam. The practice FE exam data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-26. The graph is produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students who take the MET practice FE exam.

Figure 4-26 shows CWU students' ratio scores for Professionalism. The score has dropped perilously close to the threshold. Immediate action is required.

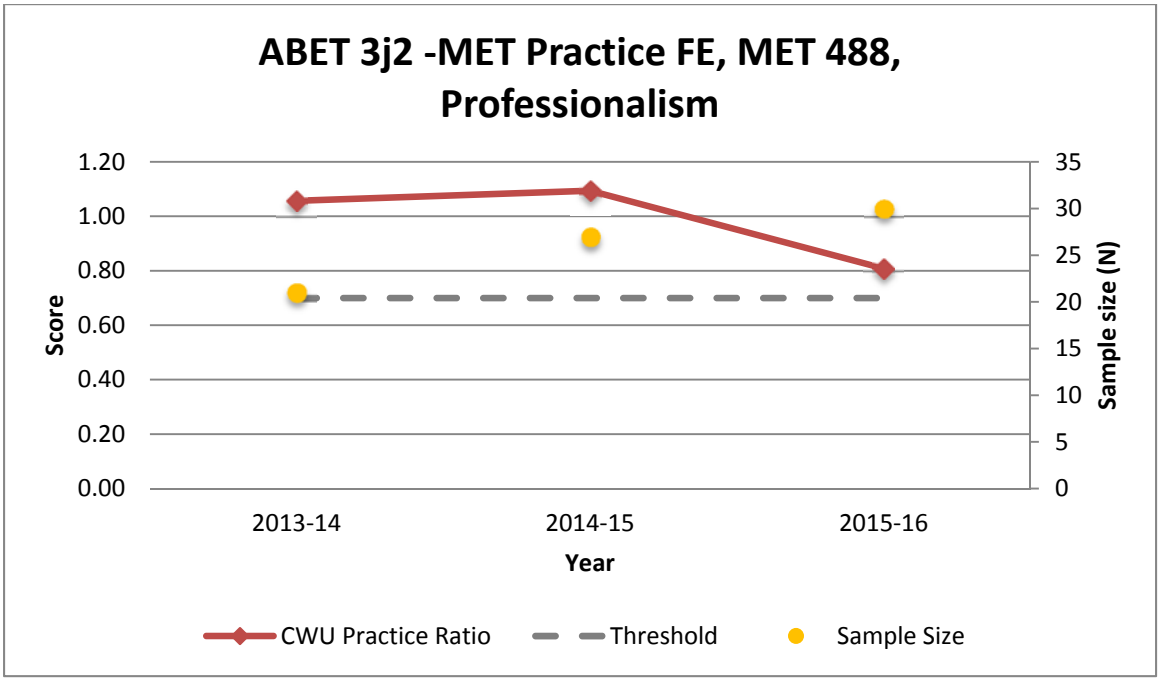


Figure 4-26. MET Practice FE Exam Ratio Score in Professionalism.

The third metric for SO 3j is assessed using the bi-annual reports produced by the NCEES. The data come from the Engineering Economics category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-27. The graph is produced using the NCEES ratio score – the ratio of the performance of CWU students to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students who take the FE exam.

Figure 4-03 shows that CWU students' ratio scores for Economics for the 2013-14 and 2015-16 student groups were above the threshold – but not nearly as strong as the 2014-15 students' performance. Some action is required to address this.

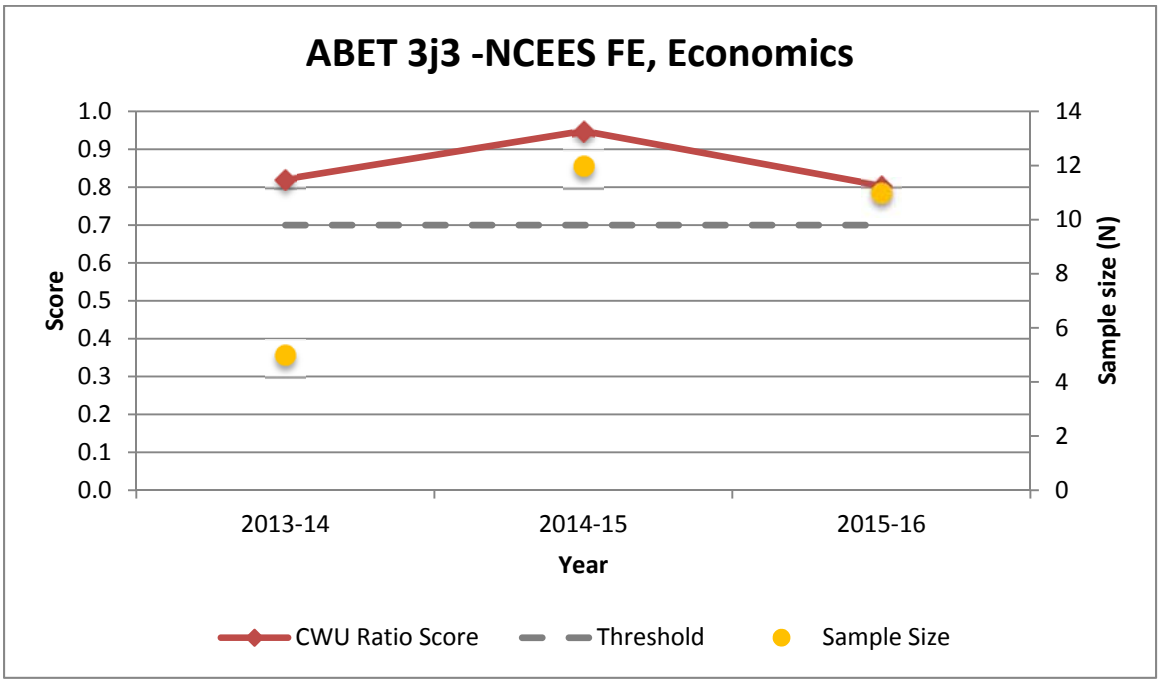


Figure 4-27. CWU Ratio Scores in Engineering Economics.

The fourth metric for SO 3j comes from the practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Engineering Economics category of the MET practice FE exam. The practice FE exam data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-28. The graph is produced using the CWU practice FE exam ratio score – the ratio of the performance of CWU students on the practice FE exam to the NCEES comparator performance in each category. These are average scores.

This metric is also examined annually.

The attainment threshold is a ratio score of 0.70, or higher, for the CWU students who take the MET practice FE exam.

Figure 4-28 shows CWU students' ratio scores for Engineering Economics. The score has dropped perilously close to the threshold. Immediate action is required.

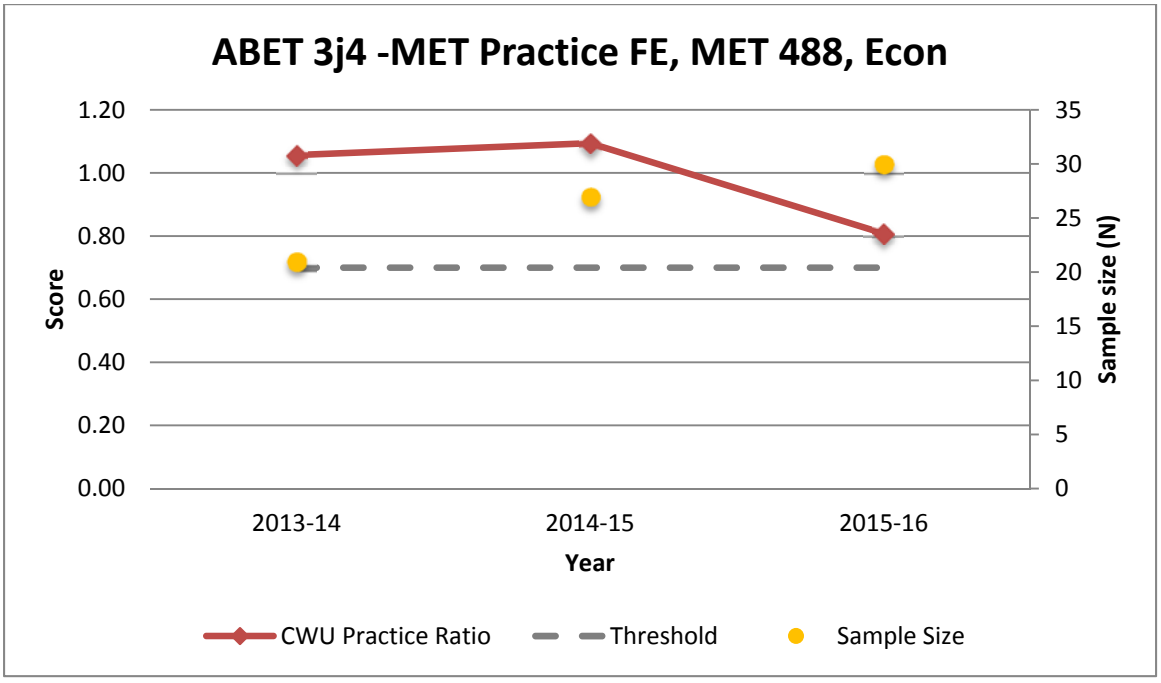


Figure 4-28. MET Practice FE Exam Ratio Score in Engineering Economics.

Student Outcome: 3k "a commitment to quality, timeliness, and continuous improvement"

The first metric for SO 3k comes from the Manufacturing Design Review (MDR) completed in the second quarter of the capstone experience (MET 489B). The direct measure is an assessment of the students' ability to manage their schedule, and manufacturing options to stay on schedule, for their senior project. Each student conducts a review in front of their peers during the quarter. They are assessed on their ability to manage the schedule of their project. The MDR rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-29.

This metric is also examined annually.

The attainment threshold is that students are performing at 70%, or higher, on the rubric score.

Figure 4-29 shows the ABET 3k MDR level of attainment. While these may not be very strong scores, all three student groups exceeded the threshold. This will need to be monitored – for possible corrective action should the next group of students fail to meet the threshold. If future student groups outperform the three student groups for which data have been compiled, the MET faculty and IAB may consider increasing the threshold score.

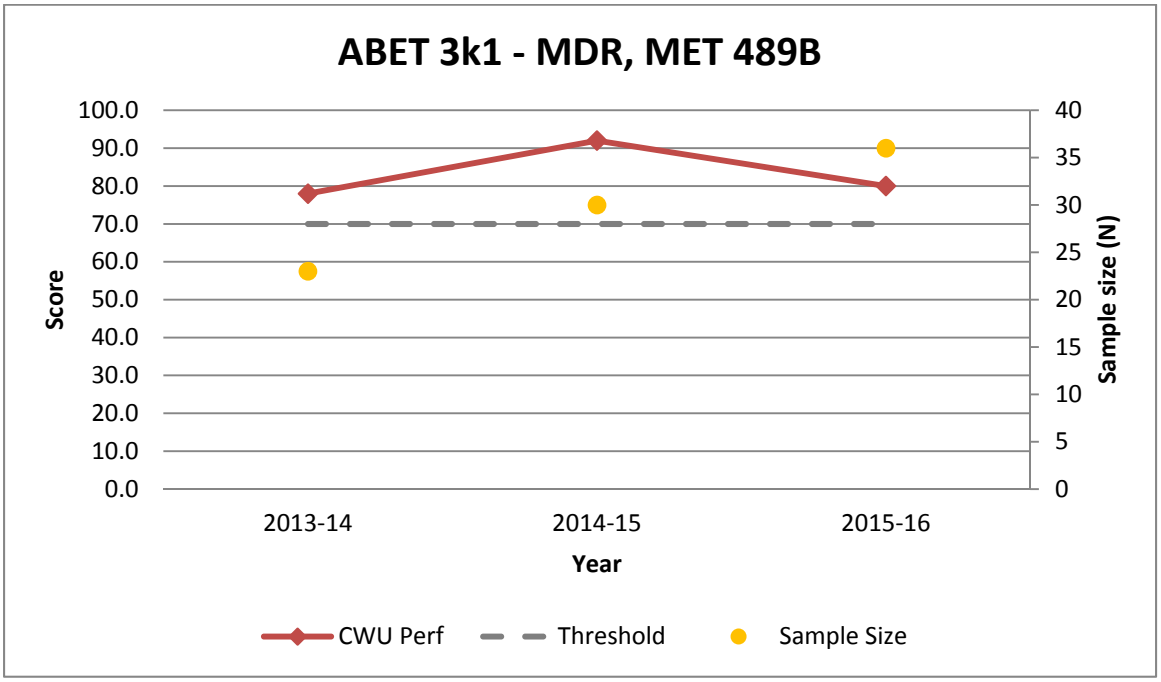


Figure 4-29. CWU ABET 3k Manufacturing Design Review Scores.

The second metric for SO 3k comes from the Test Design Review (TDR) completed in the final quarter of the capstone experience (MET 489C). The direct measure is an assessment of the students' ability to have their testing demonstration prepared and ready at the time of presenting on their senior project. Each student conducts a test review in front of their peers twice during the quarter. Each time they are assessed on their ability to be prepared and ready to go. The TDR rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure 4-30.

This metric is also examined annually.

The attainment threshold is that 70% of the students will receive a satisfactory or exemplary rubric score.

Figure 4-30 shows the ABET 3k TDR level of attainment. For 2013-14, there was only a single assessment, and the students did will – exceeding the threshold. In 2014-15, the MET faculty began conducting two assessments. Similarly, to findings discussed above for other SOs, the students continued to perform better on the first assessment than the second. This requires corrective action.

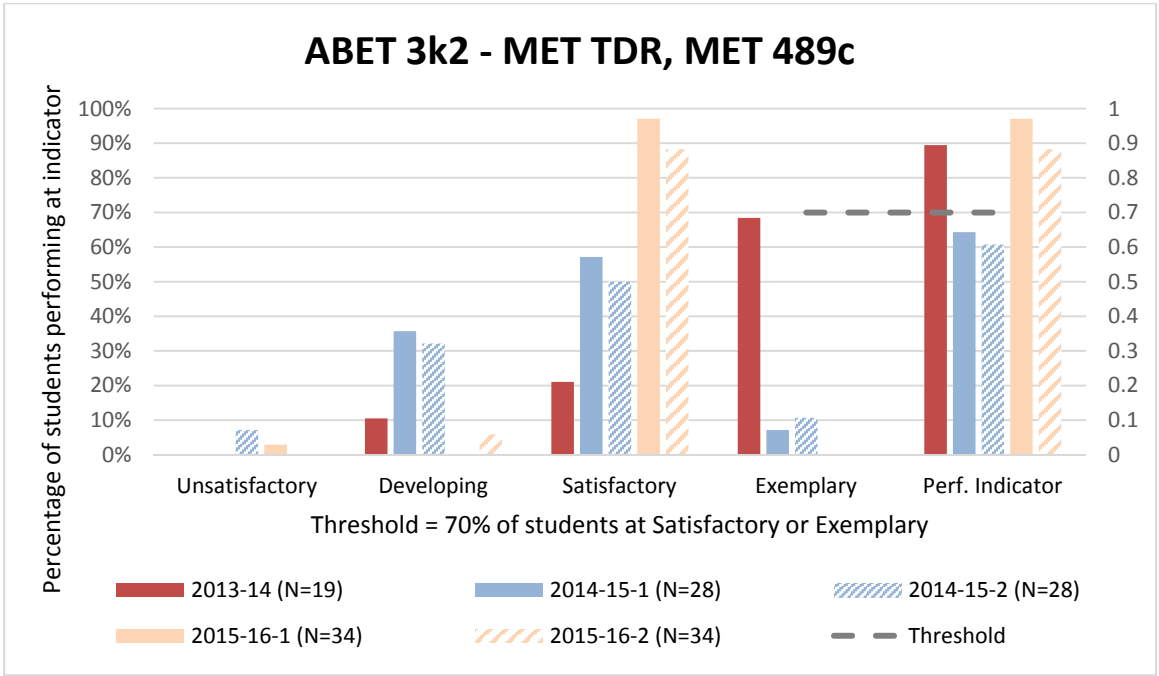


Figure 4-30. CWU ABET 3k Test Design Review Scores.

Student Outcome	Metric & Threshold	2013-14	2014-15	2015-16	Fall 2017 Action Items
3a	NCEES FE Exam Passage Rate 70%				• Examine 2016-17 data • Review threshold • Discuss possible corrective actions
	MET Practice FE Exam Passage Rate 44%				• Examine 2016-17 data • Corrective action if threshold not met
3b	NCEES FE Exam Ratio Scores .70 Statics, Dynamics, & Mechanics of Materials				• Examine 2016-17 data • Discuss increasing thresholds
	MET Practice FE Exam Ratio Score .70 Statics				• Examine 2016-17 data • Discuss increasing thresholds
	MET Practice FE Exam Ratio Score .70 Dynamics				• Examine 2016-17 data • Corrective action if threshold not met
	MET Practice FE Exam Ratio Score .70 Mechanics of Materials				• Examine 2016-17 data • Corrective action required
3c	NCEES FE Exam Ratio Scores .70 Controls				• Examine 2016-17 data • Discuss increasing thresholds
	MET Practice FE Exam Ratio Score .70 Controls				• Examine 2016-17 data • Discuss increasing thresholds
	Test Design Review First Assessment MET 489C 70%				• Examine 2016-17 data • Corrective action required
	Test Design Review Second Assessment MET 489C 70%	No second assessment			

Student Outcome	Metric & Threshold	2013-14	2014-15	2015-16	Fall 2017 Action Items
3d	RADD First Qtr. 70%	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	RADD Second Qtr. MET 489B 70%	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
3e	Teaming Score MET 418 70%	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
3f	NCEES FE Exam Ratio Score .70 Design	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	MET Practice FE Exam Ratio Score .70 Design	-	++	++	• Examine 2016-17 data • Discuss increasing threshold
	Test Design Review First Assessment MET 489C 70%	++	-	++	• Examine 2016-17 data • Possible corrective action
	Test Design Review Second Assessment MET 489C 70%	No second assessment	-	++	• Examine 2016-17 data • Possible corrective action
3g	PDR First Qtr. MET 489A	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	PDR Second Qtr. MET 489A	++	++	++	• Examine 2016-17 data • Monitor slight downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
	PDR Third Qtr. MET 489A First Assessment	++	-	++	• Examine 2016-17 data • Possible corrective action
	PDR Third Qtr. MET 489A Second Assessment	No second assessment	-	++	• Examine 2016-17 data • Possible corrective action
3h	NCEES # of Examinees	-	-	-	• Examine 2016-17 data

Student Outcome	Metric & Threshold	2013-14	2014-15	2015-16	Fall 2017 Action Items
					• Corrective action will be taken
	MET Practice FE Exam Sample Size	++	++	++	• Examine 2016-17 data • Monitor slight downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
3i	NCEES FE Exam Ratio Score .70 Ethics	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	MET Practice FE Exam Ratio Score .70 Ethics	++	++	++	• Examine 2016-17 data • Monitor sharp downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
3j	NCEES FE Exam Ratio Score .70 Professionalism	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	MET Practice FE Exam Ratio Score .70 Professionalism	++	++	++	• Examine 2016-17 data • Monitor sharp downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
	NCEES FE Exam Ratio Score .70 Economics	++	++	++	• Examine 2016-17 data • Monitor slight downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
	MET Practice FE Exam Ratio Score .70 Economics	++	++	++	• Examine 2016-17 data • Monitor sharp downward trend in score for possible corrective action • Discuss increasing threshold if score rebounds
3k	MDR First Qtr. 70%	++	++	++	• Examine 2016-17 data • Discuss increasing threshold
	TDR Final Qtr. First Assessment 70%	++	-	++	• Examine 2016-17 data • Possible corrective action

Student Outcome	Metric & Threshold	2013-14	2014-15	2015-16	Fall 2017 Action Items
	TDR Final Qtr. Second Assess 70%	No second assessment	-	++	• Examine 2016-17 data • Possible corrective action

Legend

- Failed to meet threshold

+ Meets threshold

++ Exceeds threshold

RADD = Requirement – Analysis – Design – Drawing
PDR = Proposal Design Review
MDR = Manufacturing Design Review
TDR = Test Design Review

B. Continuous Improvement

Program Level: Continuous improvement is part of an engineering process. To that end, as engineers, there has been a continuous improvement process for the Mechanical Engineering Technology (MET) program, albeit not as formal as is should have been.

Each year at the two IAB meetings, input is sought concerning what industry needs for job-ready students. Due to their input, an Engineering Ethics (MET 387) has been added to the required MET curriculum for 2017-18 Undergraduate Catalog. Input is also sought from alumni, but it tends to happen in an ad-hoc fashion. While this information is useful and can be applied to the program, it is not the preferred method of procuring feedback for continuous improvement. Additional input from the IAB, a few years ago, instigated the increase use of Excel spreadsheets and programming in the MET course work.

Another tool used by the program is the Fundamentals of Engineering (FE) practice test. A FE prep course (MET 488 – Professional Certification Exam Preparation) course was developed and implemented. A FE practice exam is given as the final for this course. In prior years, data from the practice exam indicated poor performance in cost analysis. This was used to integrate a cost analysis course (ETSC 301 – Engineering Project Cost Analysis) as a requirement, instead of as an elective, into the MET curriculum.

To simplify the administration of degree checkout for the Registrar's office and reduce workload for faculty advisors the degree 'option' was illuminated in favor of 'tracks'. Prior to 2013 the MET degree had 'options': a mechanical option and a manufacturing option. These 'options' were a list of specific electives the student took to receive one of the two options on their diploma. In consultation with the Industrial Advisory Board, it was determined that the 'Option' on the degree was not considered as relevant on a resume as the list of courses actually taken by a student. So, the 'options' became 'tracks.' The 'tracks' being a list of specific courses the students are advised to take for an emphasis in mechanical or manufacturing, but those specific courses are not required for graduation. Any course from the Technical Elective list can be used to satisfy the elective credit requirement. This had the additional benefit of reducing the need for substitution forms for elective courses if students missed a class when it was offered (most MET classes are offered only once a year).

Course Level: Individually, the faculty of MET were following ABET guidance as it relates to continuous improvement. This can be seen in CQI comments and changes in scores for various outcomes in the various courses were SO data is collected. It was up to the individual faculty member to decide if anything "needed" to be improved because there was no threshold to meet.

As an example, MET is in the process of modifying the machining course, MET 255, to better suit industry and administrative needs. The purpose of MET 255 is to

provide the student with the knowledge of how to make a part using machining techniques. By doing the hands-on approach, the student is able to experience what is feasible to machine and what is not. This, in turn, will aide them as they design components to solve engineering problems. Theoretically they will not be designing parts that cannot be manufactured because they "know" what can and cannot be machined. In the past, the student project was a single-hole punch. While a good exercise in teaching the various aspects of machining, it is not a very practical item. We are now converting to a c-clamp student project. This exposes the students to the foundry process as well as serving the need to provide foundry safety training. Providing the safety training early in the student's career, affords them the ability to take advantage of the foundry for future projects. By making these changes the faculty are continuing to meet the needs of the SOs.

The CWU MET program now has an initial threshold to achieve for each Student Outcomes (SO) and Program Criteria Outcomes and will follow the Plan – Do – Check – Act (PDCA) cycle of continuous improvement (see Figure 4-31).

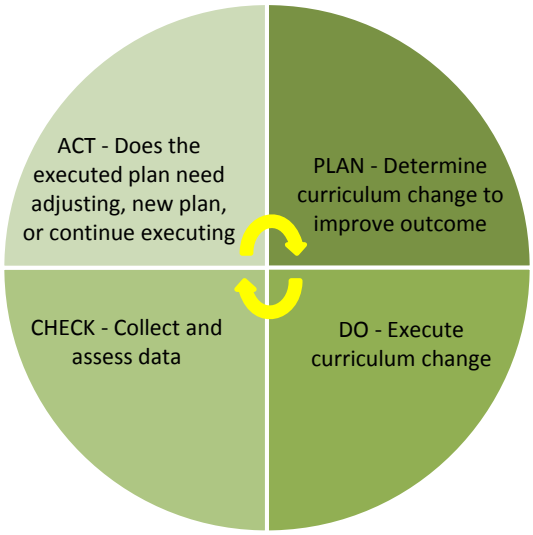


Figure 4-31. Plan, Do, Check, Act Cycle for reviewing ABET data.

The data and assessment path follows Figure 3-32. Rubric data (performance levels) produce the PI data. The PI is compared to the threshold and documented in the PDCA cycle and the CQI for each course. The review and assessment of the PI will happen every time the course is taught. PI issues will be discussed at regular program faculty meetings. The documentation of the PI discussion will be reflected in the MET Task List by outcome.

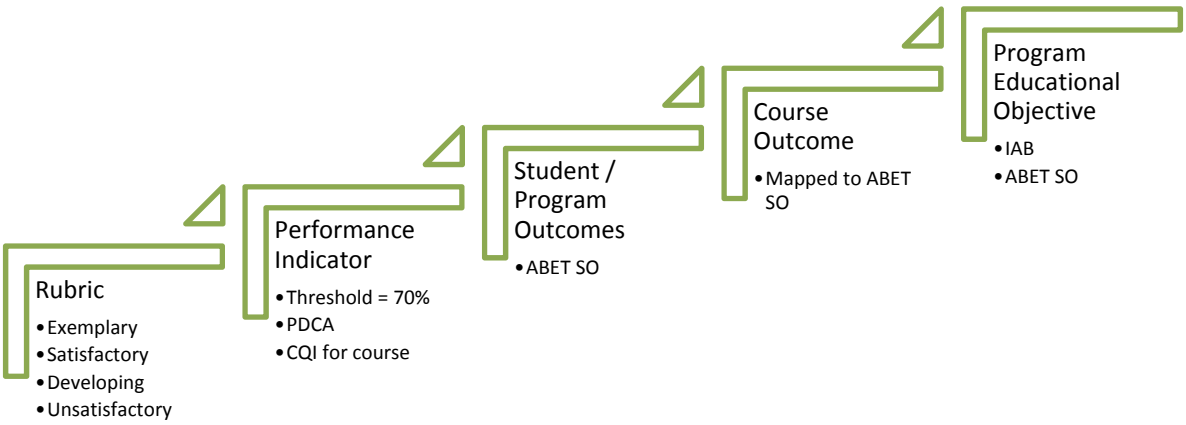


Figure 4-32. Progression of Reporting Information

Review of the SOs indicates that, predominantly, MET students are performing strongly and the program is sound. Statics and Dynamics (SO 3b) in the MET Practice FE exam are trending down. Also in the MET Practice FE exam, Mechanics of Materials (SO 3b & Program Criteria Mc) has not yet met the threshold. This will be addressed beginning 2017-18.

C. Additional Information

During the ABET team visit, outcome binders and assessment materials will be available in the display room.

CRITERION 5. CURRICULUM

A. Program Curriculum

1. Central Washington University (CWU) is on the quarter system. The Mechanical Engineering Technology (MET) program is achievable in 4 years if the student is calculus ready (see Figure 5-1 and Figure 5-2). Figure 5-1 provides an idealized plan for the student to follow to achieve the MET Mechanical Track in 4 years. Obviously if there are any hiccups in the plan or the student is not calculus ready, it will take longer to complete the degree. Figure 5-2 outlines the plan for the MET Manufacturing Track. Table 5-1 outlines all the course it takes to complete a degree at Central Washington University. This course list assumes the student started at CWU as a freshman. If the student is a transfer student with a Direct Transfer Agreement (DTA) degree and they have completed calculus, chemistry, physics, and an equivalent technical writing course, they can finish an MET degree at Central in two years. Figure 5-3 shows the plan for a transfer student on the MET Mechanical Track. And Figure 5-4 shows how a transfer student is able to complete the MET Manufacturing Track in 2 years.

MECHANICAL ENGINEERING TECHNOLOGY MECHANICAL TRACK (FRESHMAN)

2017- 18		2018 - 19		2019 - 20		2020 - 21	
FALL		**FALL**		**FALL**		**FALL**	
MATH	5	CS 101 (Skill f)	3	ETSC 311 (Statics)	4	MET 489A (Sr. Proj)	4
BR II.A	5	PHYS 181/181L	5	MET 314/314L (Thermo)	5	MET 418/418L (MechDesI)	5
ETSC160 (CAD)	4	BR II.B	5	ENG 310 (Tech Writ)	4	EET 221/221L	4
UNIV 101 (Skill a)	1	MET 351/351L (Metals)	5	ETSC 301 (Engr. Proj. Cost)	4	MET 411/411L (Energy Sys I)	5
Total	15	Total	18	Total	17	Total	18
WINTER		**WINTER**		**WINTER**		**WINTER**	
MATH 172 (Calc I - Skill c)	5	PHYS 182/182L	5	ETSC 312 (Mech. Mat.)	4	MET 489B (Sr. Proj)	4
ENG 101 (Skill b)	3	MATH 130 (Skill d)	5	MET 315/315L (Fluids)	5	MET 419/419L (MechDesII)	5
BR I.C	5	BR I.A	5	MET 382/483 (Composites)	4	MET 420 (FEA)	4
				MET 387 (Ethics)	2	MET 488 (FE)	2
Total	13	Total	15	Total	15	Total	15
SPRING		**SPRING**		**SPRING**		**SPRING**	
MATH 173 (Calc II)	5	PHYS 183/183L	5	MET 426/426L (App Str Mat)	5	MET 489C (Sr. Proj)	4
CHEM 181/181L (BR III.A)	5	ETSC 265 (SolidWorks)	4	MET 327/327L (Dyn)	5	BR I.B	5
ENG 102 (Skill b)	3	BR II.C	5	MET 316/316L (Heat Trns)	5	BR III.C or BR III.B	5
MET 255 (Mach.)	4	ETSC 241 (PLC)	4			COM 345 (Speaking)	4
Total	17	Total	18	Total	15	Total	18
SUMMER		**SUMMER**		**SUMMER**		**SUMMER**	
Foreign Lang. (Skill e)?							
Total	0	Total	0	Total	0	Total	0
Annual Total	45		51		47		51
		Course only taught that quarter of the year					
		Elective courses					

Figure 5-1. MET Mechanical Track, 4-year program.

MECHANICAL ENGINEERING TECHNOLOGY MANUFACTURING TRACK (FRESHMAN)

2017- 18		2018 - 19		2019 - 20		2020 - 21	
FALL		**FALL**		**FALL**		**FALL**	
MATH 153	5	CS 101 (Skill f)	3	ETSC 311 (Statics)	4	MET 489A (Sr. Proj)	4
BR II.B	5	PHYS 181/181L	5	MET 314/314L (Thermo)	5	MET 418/418L (MechDesI)	5
BR I.B	5	MATH 173 (Calc II)	5	BR III.C or BR III.B	5	MET 345 (Lean Mfg)	4
		MET 351/351L (Metals)	5	ETSC 301 (Engr. Proj. Cost)	4	COM 345 (Speaking)	4
Total	15	Total	18	Total	18	Total	17
WINTER		**WINTER**		**WINTER**		**WINTER**	
MATH 154	5	PHYS 182/182L	5	ETSC 312 (Mech. Mat.)	4	MET 489B (Sr. Proj)	4
ENG 101 (Skill b)	3	MATH 130 (Skill d or CS105)	5	MET 315/315L (Fluids)	5	MET 419/419L (MechDesII)	5
ETSC160 (CAD)	4	BR II.A	5	MET 355 (Adv. Mach.)	4	MET 382/483 (Composites)	4
BR I.C	5			MET 387 (Ethics)	2	MET 488 (FE)	2
Total	17	Total	15	Total	15	Total	15
SPRING		**SPRING**		**SPRING**		**SPRING**	
MATH 172 (Calc I - Skill c)	5	PHYS 183/183L	5	MET 426/426L (App Str Mat)	5	MET 489C (Sr. Proj)	4
CHEM 181/181L (BR III.A)	5	ENG 102 (Skill b)	3	MET 327/327L (Dyn)	5	PE Credit	1
MET 255 (Mach.)	4	ETSC 265 (SolidWorks)	4	ENG 310 (Tech Writ)	4	ETSC 241 (PLC)	4
		MET 257 (Casting)	4	MET 423 (CAD/CAM)	4	EET 221/221L	4
Total	14	Total	16	Total	18	Total	13
SUMMER		**SUMMER**		**SUMMER**		**SUMMER**	
Foreign Lang. (Skill e)?							
Total	0	Total	0	Total	0	Total	0
Annual Total	46		49		51		45
		Course only taught that quarter of the year					
		Elective courses					

Figure 5-2. MET Manufacturing Track, 4-year program.

MECHANICAL ENGINEERING TECHNOLOGY MECHANCIAL TRACK
(TRANSFER STUDENT)

Assumes completion of		**2017 - 18**		**2018 - 19**	
AA and the following:		**FALL**		**FALL**	
CHEM 181/181L	5	ETSC 311 (Statics)	4	MET 489A (Sr. Proj)	4
PHYS 181/181L	5	MET 314/314L (Thermo)	5	MET 418/418L (MechDesI)	5
MATH 172 (Calc I)	5	MET 351/351L (Metals)	5	EET 221/221L	4
		ETSC160 (CAD)	4	MET 411/411L (Energy Sys I)	5
		Total	18	Total	18
		WINTER		**WINTER**	
CHEM 181/181L	5	ETSC 312 (Mech. Mat.)	4	MET 489B (Sr. Proj)	4
PHYS 182/182L	5	MET 315/315L (Fluids)	5	MET 419/419L (MechDesII)	5
MATH 173 (Calc II)	5	MET 382/483 (Composites)	4	MET 420 (FEA)	4
		MET 387 (Ethics)	2	MET 488 (FE)	2
		Total	15	Total	15
		SPRING		**SPRING**	
PHYS 183/183L	5	MET 426/426L (App Str Mat)	5	MET 489C (Sr. Proj)	4
		MET 327/327L (Dyn)	5	ETSC 241 (PLC)	4
ENG 310 (Tech Writ)	4	ETSC 265 (SolidWorks)	4	COM 345 (Speaking)	4
		MET 255 (Mach.)	4	MET 316/316L (Heat Trns)	5
		Total	18	Total	17
		SUMMER		**SUMMER**	
		ETSC 301 (Engr. Proj. Cost)	4		
		Total	4		0
Annual Total			55		50
	Course only taught that quarter of the year				
	Elective courses				

Figure 5-3. MET Mechanical Track, 2-year program.

MECHANICAL ENGINEERING TECHNOLOGY MANUFACTURING TRACK (TRANSFER STUDENT)

Assumes completion of		2017 - 18		2018 - 19	
AA and the following:		**FALL**		**FALL**	
CHEM 181/181L	5	ETSC160 (CAD)	4	MET 489A (Sr. Proj)	3
PHYS 181/181L	4	MET 314/314L (Thermo)	5	MET 418/418L (MechDesI)	5
MATH 172 (Calc I)	5	MET 351/351L (Metals)	5	ETSC 301 (Engr. Proj. Cost)	4
		MET 255 (Mach.)	4	MET 345 (Lean Mfg)	4
		Total	18	Total	16
		WINTER		**WINTER**	
CHEM 181/181L	5	ETSC 265 (SolidWorks)	4	MET 489B (Sr. Proj)	3
PHYS 182/182L	4	MET 315/315L (Fluids)	5	MET 419/419L (MechDesII)	5
MATH 173 (Calc II)	5	MET 355 (Adv. Mach.)	4	MET 382/483 (Composites)	4
		ETSC 311 (Statics)	4	MET 488 (FE)	2
		MET 387 (Ethics)	2		
		Total	19	Total	14
		SPRING		**SPRING**	
PHYS 183/183L	4	MET 426/426L (App Str	5	MET 489C (Sr. Proj)	3
		MET 327/327L (Dyn)	5	MET 257 / ETSC 457 (Cast)	4
ENG 310 (Tech Writ)	4	ETSC 312 (Mech. Mat.)	4	COM 345 (Speaking)	4
		MET 423 (CAD/CAM)	4	EET 221/221L	4
		Total	18	Total	15
		SUMMER		**SUMMER**	
		Total	0	Total	0
Annual Total			55		45
	Course only taught that quarter of the year				
	Elective courses				

Figure 5-4. MET Manufacturing Track, 2-year program.

2. The alignment of the curriculum with the PEOs was first outlined in Criterion 2. As the CWU PEOs are supported by the course work depicted in Table 3-3 and Table 3-5. The majority of the outcomes supporting the objectives are in MET 418, 419, 488, 489A, 489B, 489C. MET 426 covers some of the program criteria. The two curriculum tracks support the two of the major branches of the engineering field: Mechanical and Manufacturing. The Industrial Advisory Board (IAB) has approved the PEOs and have not asked for curriculum changes. Therefore, the MET curriculum is sound and supports the PEOs.

3. The curriculum and its associated prerequisites support the attainment of the student outcomes (SO) by providing the students with the knowledge they need

to be successful as they progress through the curriculum. Currently, MET is not a limited entry program. The course prerequisites determine the program plan as opposed to the completion of program entry list of courses. The math and science prerequisites prepare the students for the beginning engineering courses: statics and mechanics of materials. Some of the other skill courses such as 3D modeling and machining, prepare students for upper division course work that rely on those capabilities.

4. Figure 5-5 shows the prerequisite map for the MET program. The two elective tracks are depicted as well (see the figure legend). Elective courses not associated with a Track are to satisfy student interest in a specific specialty. Some courses (i.e. MET 310, MET 357) also support other programs in the department. The upper rows that have F, W, and S at either end, are essentially the junior sequence. The bottom rows with F, W, and S at either end are the senior sequence. The course work listed above these rows are the prerequisites for junior and senior year.

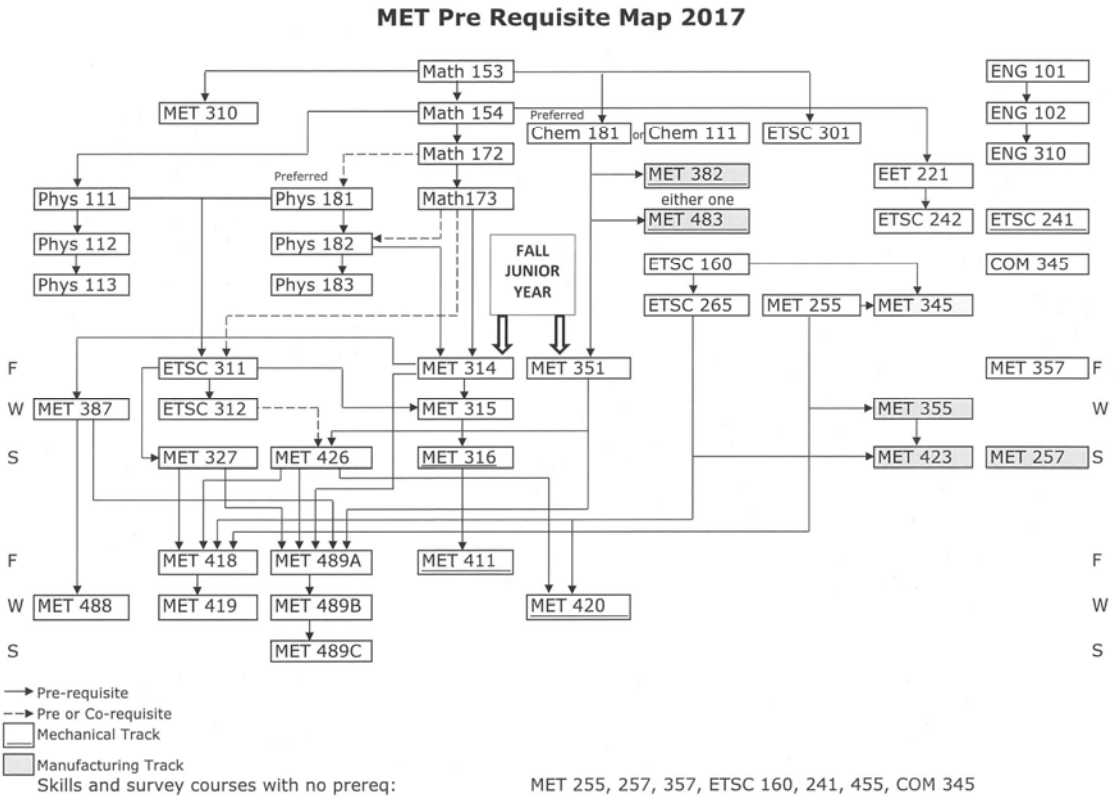


Figure 5-5. Prerequisite Map for Mechanical Engineering Technology Program.

Academic Advising is provided with Figure 5-1 through 5-5 to create an academic plan for each MET student.

5. For the three curricular areas specified in Table 5-1 (Math/Basic sciences, Discipline specific topics, & General education), the MET program meets the

hours and depth of study. The MET program is preparing graduates for jobs in engineering. Using the IAB as a sounding board, the curriculum for the MET program provides the training and expertise necessary to be successful in the engineering field.

The math and basic sciences represent approximately 19% of the programs course load. This is almost one-fifth of the students learning. Engineering is the application of math and science. This level of effort (hours and depth) provides the students with the prerequisite knowledge and ability to apply math and science concepts to problem solving. When velocity is given, or known, in a dynamics problem and the position or acceleration must be determined, the students knows integration will provide the position and differentiation will proved the acceleration.

The discipline specific courses make up the majority of the hours learning and also provides the knowledge required of practicing engineers. Discipline specific courses are approximately 55% of the student's courses. This is appropriate as this provides the depth of knowledge required for the engineering field. The Technical Electives provide the depth into a specific area of engineering, either mechanical or manufacturing.

The final curricular area, General Education (GenEd), provides approximately 26% of the students learning time. This is intended to provide the student with alternative (to their discipline specific) learning environments, broaden their perspective on issues, and provide them with knowledge of the world around them. Although an engineering student does not know it at the time, the writing courses they take in General Education will come in handy in the real world (and upper division course work – lots of labs to write). Writing is a big part of an engineer's job. Those courses provide the opportunity for them to practice and hone their writing skills (whether they like it or not).

6. The MET capstone experience helps the students attain the Student Outcomes (SO). Many of the SOs are assessed in the capstone experience. MET 489 (Senior Project) is a yearlong sequence to solve an engineering problem. The capstone experience consists of analysis (MET 489A), construction (MET 489B, and testing (MET 489C. These open-ended problems can be individual projects, team projects, industry sponsored, lab projects, or design challenges (i.e. ASME Design Challenge). Because of the variety of projects and the number of students involved, all three MET faculty members participate. One faculty member will be the lead instructor of the quarter and responsible for course work and grading. The students are divided into thirds and each faculty member is responsible for mentoring that group of students.

   In MET 489A the students must define the problem, provide requirements, and success criteria. They also complete the analyses and optimization of components in their design. Documentation, drawings, of their design are also worked on in this first quarter. They produce a proposal at the end of the quarter that includes a schedule, budget, and parts list for their project. They also deliver an "elevator speech" about their proposal to the IAB. The IAB provides input and feedback about their project. Student Outcomes 3d and 3g are assessed in MET 489A.

The construction phase, second quarter (MET 489B) consists of the students manufacturing and assembling their device. The students are not required to complete any or all the manufacturing themselves. Not manufacturing their own parts means their drawings have to be more complete and of higher caliber. They still have to maintain their schedule and budget. Any modification to the design is reflected in their drawings. The students are required to have a working device by the end of the quarter to move on. Student Outcomes 3d, 3g, and 3k are assess in MET 489B.

In the final phase of Senior Project (MET 489C) is the testing phase. They create a testing plan, conduct several tests, and participate in the Symposium of University Research and creative Expression (SOURCE). The students create a poster for a judged poster session at SOURCE. Besides the judges, many students and faculty pass through the symposium. Their final report is presented to their classmates and judged by their classmates. The top three or four candidates then present their projects to the IAB at the spring IAB meeting. The IAB selects a winner, who receives a prize. Student Outcomes 3c, 3f, 3g, 3k are assess in MET 489C.

7. Cooperative education (COOP) credits can be earned as technical elective credits for the MET program. A Learning Agreement must be completed (see Figure 5-1). It includes a minimum of three outcomes for the student and their associate activities. The students' supervisor must be cognizant of the students' educational outcomes and willing to support the effort to complete them. The student must also communicate with the professor of record on a routine basis. A COOP cannot be substituted or used to meet the capstone experience requirement (MET 489).

LEARNING AGREEMENT
Cooperative Education * Career Services * Central Washington University
400 E. University Way * Bouillon Hall 206 * MS 7499 * Ellensburg, WA 98926-7499
509-963-2405 * fax 509-963-1811 * www.cwu.edu/career

This agreement must be completed and approved by ALL signatories before registration can be completed. Additional requirements and instructions pertaining to this Agreement are in the Student Workbook. It is the student's responsibility to know the requirements. Academic departments may have additional requirements.
(Revised 12-2016)

Office Use Only: **Registration Date** _____ **Course** _____ **Course #** _____

****This form must be typed****

STUDENT INFORMATION

Name: (First, Middle I., Last) _____Major: _____

CWU I.D. Number:_____ Work Phone:_____ Evening Phone: _____ Cell Phone: _____

Mailing Address during Internship:_____ _____

City: _____ State: __ Country*: _____ Zip: _____ CWU email: _____SKYPE Address_____

Cumulative Credits: ___ (Must have 45 credits to be eligible for 290; 90 credits for 490; grad student for 590 or 690)

Current Cumulative GPA: _ Class Standing: Fresh ☐ Soph ☐ Jr ☐ Sr ☐ Post Bac ☐ Grad ☐

Quarter to Be Registered: _____ 20__ Expected Graduating Qtr/Yr: _____
→ **Are you an International Student with a F1 visa? Yes ☐ No ☐**
International students on a F1 visa must obtain the signature of the **International Student Advisor**
→ **Is your internship abroad? Yes ☐ No ☐ If so- complete the Education Abroad Application.** *Please take this completed agreement for signature to* ***Study Abroad & Exchange Programs*** *located in room 101 in the International Center if the experience will take place outside of the United States.*
→ **Have you signed the Student Cooperative Education/Internship Release Form?** Yes ☐ No ☐ Date _____
→ **Have you completed the Sexual Harassment Training? Yes ☐ No ☐ Attach Certificate of Completion to this form.**
http://www.cwu.edu/student-employment/required-student-training
→ **Have you purchased Liability Insurance through the University? (now required)** Yes ☐ No ☐
Insurance for non-medical settings and for medical settings Attach proof of insurance to this form.

PLACEMENT INFORMATION

Employing Agency: _____ Web URL: _____ Internship Position Title: _____

Business or Agency Type / Industry: Non-Profit ☐ For Profit ☐ Government ☐ Education ☐

Employer Mailing Address: (POB or Street) _____

City: _____ State: __ Zip: _____ Country: _____

Placement Address if Different: _____

Site Supervisor: _____ Title: _____ CWU Alumnus/a Yes ☐ No ☐
On-campus supervisors for unpaid internships are required to watch Hiring an Intern video.

Phone: _____ Cell Phone: _____ email: _____

Work Hrs Per Week: ___ Academic Hrs Per Week _____Number of Weeks: ___ Total Hrs: ___

Paid ☐ _Unpaid ☐ Wage Per Hr: _____ Other Compensation: (stipend, meals, lodging, mileage) _____

Starting Date: (mm/dd/yyyy) _____ Completion Date (mm/day/year) _____

→ (If an internship is not completed by the grade due date an "IP" (In Progress) grade can be used. IMPORTANT: Your degree will not be awarded with an IP grade; you will have to re-apply for a future graduation term and pay the re-application fee. PLEASE INITIAL THAT YOU UNDERSTAND _____

Figure 5-1. Page 1 of CWU COOP Learning Agreement.

EMERGENCY CONTACT INFORMATION

Name: _____ Relationship to Intern: _____

Emergency Contact Address: _____ City: _____ State: __ Zip: _____

Day Phone: _____ Evening Phone: _____ Cell Phone: _____ email: _____

Academic Learning Plan - FACULTY INSTRUCTOR REQUIREMENTS

Course Prefix: _____ Course Number: __ Number of Credits: __ Campus Loc _____

Faculty Instructor: _____ Department / Office Phone: _____

Faculty Instructor Email Address:_____ Department Fax Number:____

Academic Requirements to Be Completed: (Choose Weekly, Bi-Weekly, monthly, bi-monthly, mid quarter, end of quarter)

- ☐ **Term Paper / Project Due: _____**
- ☐ **Progress Reports Due: _____**
- ☐ **Assigned Reading: _____**
- ☐ **Other: _____**
- ☐ **Journal or Log Due: _____**
- ☐ **Final Report Due: _____**
- ☐ **Number of Email Contacts: __**
- ☐ **Is this a continuation of a previous Internship**

Estimated hours per week outside the internship to meet academic requirements: __
Faculty advisor or designee expects to contact student during placement as follows:

INTERNSHIP DESCRIPTION:

LEARNING OBJECTIVES & ACTIVITIES: (Describe what objectives you and your advisor want you to be able to learn by the end of the placement; then list what reading, writing, and on-the-job activities you will do to accomplish each objective. (Minimum of three objectives and activities.)

EXAMPLE of Good Objective – To obtain a better understanding of administrative processes at camp and how the organization is run.

EXAMPLE of Good Activities – Sit in on staff meetings as a division leader.
Help obtain and record info on campers' progress in daily & weekly reports.
Attend training sessions during the week prior to camp starting.

Objective –

Activities –

Objective –

Activities –

Objective –

Activities –

Figure 5-1. Page 2 of CWU COOP Learning Agreement.

Responsibilities of the Student

1. Maintain regular attendance at the site, notifying the site supervisor of anticipated absences
2. Abide by all state, federal, internship site and university rules and regulations
3. Inform immediately the work site supervisor and faculty advisor of any problems, concerns, and accidents/injuries.
4. Perform work in a timely and satisfactory manner.
5. Fulfill obligations of the Learning Agreement (including academic requirements and learning objectives) and training site pre-internship requirements.
6. **Complete the required Sexual Harassment Training provided by HR.**

Responsibilities of the University

1. Encourage the student's productive contribution to the overall mission of the Program site.
2. Certify the student's academic eligibility to participate in a Program.
3. Establish guidelines and standards for the conduct of students enrolled in its Program and to make these guidelines and standards available to the Program site
4. Designate a faculty member who will serve as advisor to the student, assist in setting learning objectives, MUST confer with the Program site personnel **twice** during the internship (ideally should connect at beginning and end of the internship), monitor the progress of the student intern, and evaluate the academic performance.
5. Maintain communication with the Program site and clarify any University policies and procedures.

Responsibilities of the Cooperative Education/Internship Site (Program Site)

1. Encourage and support the learning aspect of the student's Program.
2. Designate a professional staff person/employee to serve as an advisor/supervisor with responsibilities to help orient the student to the agency and its culture, to assist in the development of learning objectives, to confer regularly with the student and his/her faculty advisor, and to monitor the progress of the student.
3. Provide adequate supervision for the student and assign duties that are related to the student's area of interest.
4. Provide a safe space for the intern to complete necessary work functions, and make available necessary equipment and supplies.
5. Agree not to displace regular workers with students functioning in the Program role.
6. Notify the Career Services Internship Coordinator or your Internship Advisor of any changes in the student's work status, schedule or performance.
7. Allow the Internship Advisor or Internship Coordinator to conduct a pre-arranged phone conference or site visit to confer with the student and his/her supervisor.
8. **Provide the REQUIRED mid-term and final evaluations of the student's performance. Links for these will be emailed.**
9. Maintain general liability, professional liability, Workers Compensation coverage, as required by law and comply with Fair Labor Standards Act guidelines when providing unpaid internships in the "for-profit" sector.
10. Not discriminate on the basis of race, color, creed, religion, national origin, sex, sexual orientation, age, marital status, disability or status as a disabled veteran or Vietnam era veteran.
11. Regardless of direct or indirect services to clients, should the Program site have clients of vulnerable population pursuant to RCW 43.43.830-.845, Program Site agrees to obtain written permission from the Student Intern to perform the required criminal background check. Should negative information appear on the Students criminal report, Program site will be responsible for determining if placement will be allowed.

Insurance Coverage

Central Washington University does not have an obligation nor does it provide health, accident, or hospitalization insurance. Washington State laws do not allow the University to extend any of its professional or general liability coverage to students to cover their personal actions or negligence while performing work or volunteering at any Program site. Further, the use of a personal vehicle may be required by an intern for the benefit of the organization with whom they perform in the Program. Central Washington University provides no insurance for a student to operate his/her personal vehicle. Central Washington University has no liability for injury or property damage which may result from that use. The Cooperative Education Program is for the intern's personal gain and academic credits. Interns will not be entitled to any Labor and Industries or Unemployment Compensation benefits during or after the completion of the University Program.

Hold Harmless Clause

The Program Site and use of any and all of its facilities shall be undertaken by the Student at their own sole risk, and that Central Washington University shall not be liable for any claims, demands, injuries, damages, actions, or causes of actions, whatsoever by the Student or property arising out of or connected with the Program or with the use of any and all services, or facilities associated with the Program site, whether or not sponsored by Central Washington University.

Each party shall defend, indemnify and hold the other party, its officers, officials, employees and volunteers harmless from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of injuries and damages caused by each party's own negligence.

SIGNATURE BLOCK

We, the undersigned, agree with the validity of the Learning Agreement as proposed. The Employer and the University agree to provide the necessary advising, direction and supervision to ensure that the maximum educational benefit is achieved from the Student's field experience. The Student agrees to abide by the guidelines as outlined in the Student Workbook. The Site Supervisor will provide feedback on student performance. The Faculty Advisor will evaluate the accomplishment of the Student's Learning Plan and completion of the internship at the end of the grading period and will award a S/U grade for the credits.

Student: Print Name _____ **Signature** _____ **Date** _____

Site Supervisor : Print Name _____ **Signature** _____ **Date** _____

Department Faculty Instructor: Print Name _____ **Signature** _____ **Date** _____

Dept Chair/Program Director: Print Name _____ **Signature** _____ **Date** _____

Dean/Associate Dean: Print Name _____ **Signature** _____ **Date** _____

IF NECESSARY: **International Student Advisor:** _____ **Date** _____

IF NECESSARY: **Study Abroad & Exchange Programs:** _____ **Date** _____

Processed by Career Services _____ **Date** _____

(For Office Use Only):

Figure 5-1. Page 3 of CWU COOP Learning Agreement.

B. Course Syllabi

Please see Appendix A for example syllabi. All syllabi will be converted to the ABET format beginning in 2017-18.

C. Advisory Committee

The Central Washington University (CWU) Industrial Advisory Board (IAB) provides the Mechanical Engineering Technology (MET) program with the necessary connection and feedback from industry. Without the IAB, the MET program would not stay relevant to industry.

The IAB is composed to a diverse representation of industry that our graduates go to work. The Pacific Northwest has a lot of aerospace, but other industries are represented as well. Even within aerospace, our IAB is pretty diverse. The IAB memberships is shown in Table 5-2 along with their years of service and alumni status.

Table 5-2. Industrial Advisory Board Members.

Name	Title	Company	Member	Alumni
Julie Bennet	Boeing EMC, Lightning, and Antenna labs	Boeing	8 yrs.	No
Rosemary Brester	CEO/President	Hobart Machining Company	17 yrs.	No
Larry Brester	CEO/President	Hobart Machining Company	17 yrs.	No
Chuck Harmon III	Boeing P-8 Dynamic and Ground Loads	Boeing	9 yrs.	Yes
Amanda Hede	Design Engineer	Triumph Aviation	5 yrs.	Yes
David Kennedy	CWU Boeing Focal	Boeing	1 yr.	Yes
Patrick Kinney	Energy Engineer	University Mechanical	2 yrs.	Yes
Bradford Moravec	Boeing Chief Engineer Propulsion & Fuel Systems	Boeing	10 yrs.	No

The IAB meetings are held twice a year. Once in the fall and the second in the spring. Due to the boards input, the MET program has evolved over the years. Input from a few years ago, instigated the increase use of Excel spreadsheets and programming in

the MET course work. This is also the time that the students give their “elevator speech” about their proposal (capstone experience project). The IAB asks questions and provides a few minutes of feedback to each student. This is a wonderful opportunity for the students to experience “pitching” their idea and receiving “criticism” in a safe environment. The spring meeting is more about the interaction with the students. The IAB rank the representative presentations from the capstone experience course (MET 489).

Table 5-1 Curriculum

Mechanical Engineering Technology

Course (Department, Number, Title) List all courses in the program by term starting with first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Discipline Specific Topics	General Education	Other		
CWU General Education Program (Quarter System)							
CWU Basic Skills Requirements							
UNIV 101 – Academic Advising Seminar	R			*1*		*W17, Sp17*	
ENG 101 – Composition I: Critical reading	R			*4*		*W17, Sp17*	
ENG 102 – Composition II: Reasoning	R			*4*		*W17, Sp17*	
Math (pre-calculus or calculus)	R	5				*W17, Sp17*	
Computer Science Elective	R			*3*		*W17, Sp17*	
CWU Breadth Requirements							
Arts & Humanities I	R			*5*		*W17, Sp17*	
Arts & Humanities II	R			*4 or 5*		*W17, Sp17*	
Arts & Humanities III	R			*5*		*W17, Sp17*	
Social & Behavioral Sciences I	R			*5*		*W17, Sp17*	
Social & Behavioral Sciences II	R			*3, 4, or 5*		*W17, Sp17*	
Social & Behavioral Sciences III	R			*4 or 5*		*W17, Sp17*	
The Natural Sciences I	R	5				*W17, Sp17*	
The Natural Sciences II	R	4 or 5				*W17, Sp17*	
The Natural Sciences III	R	4 or 5				*W17, Sp17*	

Course (Department, Number, Title) List all courses in the program by term starting with first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Discipline Specific Topics	General Education	Other		
MET Requirements (117 credits)							
MATH 172 Calculus I	R	5				*W17, Sp17*	
MATH 173 Calculus II	R	5				*W17, Sp17*	
CHEM 181 General Chemistry I	SE	5				*W17, Sp17*	
OR							
CHEM 111 Introduction to Chemistry	SE	5				*W17, Sp17*	
(Students select one of the Physics sequences)							
PHYS 111 Introductory Physics I with Laboratory	SE	5				*W17, Sp17*	
PHYS 112 Introductory Physics II with Laboratory	SE	5				*W17, Sp17*	
PHYS 113 Introductory Physics III with Laboratory	SE	5				*Sp16, Sp17*	
OR							
PHYS 181 General Physics I with Laboratory	SE	5				*F16, W17*	
PHYS 182 General Physics II with Laboratory	SE	5				*W17, Sp17*	
PHYS 183 General Physics III with Laboratory	SE	5				*Sp16, Sp17*	
COM 345 Business and Professional Speaking	R		*4*			*W17, Sp17*	
EET 221 Basic Electricity with Laboratory	R		*4*			*F16, Sp17*	*30*
ENG 310 Technical Writing	R		*4*			*W17, Sp17*	
ETSC 301 Engineering Project Cost Analysis	R		*4*			*F16, W17*	*30*
ETSC 160 Computer-Aided Design and Drafting	R		*4*			*W17, Sp17*	*18*
ETSC 265 Three-dimensional Modeling	R		*4*			*F16, Sp17*	*18*
MET 255 Machining	R		*4*			*F16, Sp17*	*12*
ETSC 311 Statics	R		*4*			*F16, W17*	*30*

Course (Department, Number, Title) List all courses in the program by term starting with first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Discipline Specific Topics	General Education	Other		
ETSC 312 Strength of Materials	R		*4*			*W17, Sp17*	*30*
MET 327 Technical Dynamics with Laboratory	R		*5*			*Sp16, Sp17*	*30*
MET 426 Applications in Strength of Materials with Lab	R		*5*			*Sp16, Sp17*	*30*
MET 351 Metallurgy/Materials and Processes	R		*4*			*F15, F16*	*30*
MET 314 Applied Thermodynamics with Laboratory	R		*5*			*F15, F16*	*30*
MET 315 Fluid Dynamics with Laboratory	R		*5*			*W16, W17*	*30*
MET 387 Engineering Ethics	R		*2*			*New W18*	*N/A*
MET 418 Mechanical Design I with Laboratory	R		*5*			*F15, F16*	*30*
MET 489A Senior Project I	R		*4*			*F15, F16*	*30*
MET 419 Mechanical Design II with Laboratory	R		*5*			*W16, W17*	*30*
MET 488 Professional Certification Exam Preparation	R		*2*			*W16, W17*	*30*
MET 489B Senior Project II	R		*4*			*W16, W17*	*30*
MET 489C Senior Project III	R		*4*			*Sp16, Sp17*	*30*
MET Technical Electives (20 credits)	SE		*20*			*W17, Sp17*	

Course (Department, Number, Title) List all courses in the program by term starting with first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Discipline Specific Topics	General Education	Other		
Add rows as needed to show all courses in the curriculum.							
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE	~185						
PERCENT OF TOTAL		*~19%*	*~55%*	*~26%*			

1. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the average enrollment in each element.
2. Required courses are required of all students in the program, elective courses are optional for students, and selected electives are courses where students must take one or more courses from a specified group.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

CRITERION 6. FACULTY

A. Faculty Qualifications

The primary full time faculty for the MET program are Dr. Craig Johnson, Mr. Roger Beardsley and Mr. Charles Pringle. All core courses, particularly 400 level, are taught by one of the three full-time tenured professors. Of these faculty, Dr. Johnson, Mr. Beardsley and Mr. Pringle are tenured. Mr. Bramble and Mr. Capovilla are adjunct faculty (Non-Tenure Track). Both Dr. Johnson and Mr. Beardsley have their P.E. Licenses in Washington State (Dr. Johnson is also registered in New Jersey). Mr. Pringle holds an EIT certificate. Table 6-1 has further details about faculty.

Dr. Johnson has expertise in materials science, along with holding a high school teaching credential. He is also the MET program coordinator, the Foundry program coordinator (with one of only five American Foundry Society student chapters west of the Rocky Mountains), and a Foundry Education Foundation Key Professor. Most of Dr. Johnson's classes are materials related (Metallurgy, Casting Processes, Applied Strength of Materials, Plastics, Ceramics, and Composites) with some design related courses (Senior Project 1 & 2). Dr. Johnson has been a faculty member at CWU since 1996. He has also taught at Washington State University and worked at Rockwell International. 100% of his courses are in the MET curriculum, though some courses (i.e., Casting & Advanced Casting) are also part of the Industrial Technology curriculum. He has also taught many of the other MET topics in his 21+ years at CWU.

Mr. Beardsley teaches many of the MET courses related to energy (Dynamics, Thermodynamics, Fluid Mechanics, Heat Transfer, Energy Systems) along with design courses (Senior Project 3). He began teaching at Central in 2006. He worked previously as a Manufacturing Engineer at Varian Associates (Palo Alto, CA), Fluke Corporation (Everett, WA), and as a co-founder and principal process designer at the Roslyn Brewing Company, a microbrewery. 100% of Mr. Beardsley's courses are within the MET curriculum, with the exception of one spring quarter continuing education course (IET360 Brewing Technology) which is outside of normal workload planning.

Mr. Pringle joined the CWU faculty in September 2008, and teaches core MET courses (Machine Design 1 and 2, Senior Project 2 and 3, Finite Element Analysis, Lean Manufacturing). Prior to joining the faculty, Mr. Pringle worked as a design and manufacturing engineer in industry and as staff engineer in the CWU Facilities Department improving the energy efficiency of the campus.

The collective skill set of these primary faculty cover the range of MET topics with a depth of specialization and also some significant overlap.

B. Faculty Workload

The faculty of CWU was unionized in 2006. Workloads and other workload issues are governed by the Collective Bargaining Agreement (CBA) and the Faculty Code, with the CBA taking precedence in the event of a conflict. A full-time load is defined as 45 workload units (WLU) per year. Each WLU is equivalent to one lecture contact hour. A 2-hour lab is also considered two WLU (but only one credit for students). Research and Service tasks (such as program coordination, department & college committees etc.) are also given WLU credit. In general, a typical full time tenure track instructor may have 36 WLU assigned to teaching, with the remaining 9 WLU split between research and service categories. Adjunct faculty generally do not have WLU assigned for research or service. Details of the WLU assignments for each MET program instructor are given in Table 6-2.

C. Faculty Size

The faculty size is sufficient for continued operation of the program, where attainment of student outcomes in order to meet the program educational objectives can be achieved on an annual cycle.

D. Professional Development

Within the Engineering Technologies, Safety, and Construction (ETSC) department, faculty members are encouraged to attend at least one professional society conference each year, and many faculty members attend more than one. This is true for both tenured/tenure track and non-tenure track faculty. In addition, there are opportunities for attending appropriate off-campus training seminars.
Funding for tenured and tenure track faculty professional development is in the form of annual funding of $700 per faculty member from the provost's office (per the CBA), with an additional $300 per College of Education and Professional Studies (CEPS) policy from the Dean (an additional $1000 may be available for travel to conferences based on request). If a faculty member is presenting a peer reviewed paper at the conference/seminar, if applied for, the office of the Dean of Graduate Studies will provide an additional $300 in funding. Beyond this $2000 - $2300 of annual funding, the ETSC department also contributes funding from discretionary fund accounts, and industry funding provided through the CWU foundation accounts may also be available. For non-tenure track faculty, most funding comes from the department discretionary funds or foundation accounts.

Typical professional development activities in recent years include the ASEE annual conference, American Foundry Society Annual Conference, ABET Faculty Workshop, and ASME Essential Teaching Seminar. Some of the professional development activities participated in by Dr. Johnson are listed in Table 6-3. Professional development activities that Mr. Beardsley completed recently are listed in Table 6-4. Mr. Pringle's professional development activities are listed in Table 6-5.

Table 6-3. Listing of Dr. Johnson's Professional Development Activities

Date	Activity
2016 November	Attended MatEdu Educators Workshop
2016 November	Attended FEF College Industry Conference
2016 March	Attended and presented at PNW-ASEE conference.
2015 June	Attended and presented at ASEE National Conference.
2015 November	Attended MatEdu Educators Workshop
2015 November	Attended FEF College Industry Conference
2015 March	Attended and presented at PNW-ASEE conference.
2015	NSF proposal, no award.
2014 November	Attended MatEdu Educators Workshop
2014 November	Attended FEF College Industry Conference
2014 June	Attended and presented at ASEE National Conference.
2014	NSF proposal, no award.

Table 6-4. Listing of Mr. Beardsley's Professional Development Activities.

Date	Activity
2017 May	SOURCE Symposium; presentation on Embedded Energy of Materials and Products
2017 April	Pacific Northwest Engineering Student Conference, Hosted by CWU ASME/SME club
2016 August	Mechanical Contracting Faculty Event, Sponsored by MCA - WW
2016 April	Pacific Northwest Engineering Student Conference, Tacoma Community College
2015 June	ASEE Annual Conference, Seattle WA; 2 Presentations & 2 Papers published
2013 June	ASEE Annual Conference, Atlanta, GA; Presentation and Paper published
2011 June	ASEE Annual Conference, Vancouver BC; Presentation and Paper published
2015-2017	Advisor for weekly meetings of ASME/SME student club

Table 6-5. Listing of Mr. Pringle's Professional Development Activities.

Date	Activity
2017 April	ABET Self-Study Report Development Workshop
2017 April	ABET Symposium
2017 April	Advanced Program Assessment Workshop
2017 March	Accepted to present at ITEEA in Texas, no funding to attend.
2016 October	Attended and presented at ATMEA National Conference.
2016 October	ABET Fundamentals of Program Review Workshop
2016 August	Lean Bronze Certificate
2016 March	Attended and presented at PNW-ASEE conference.
2016 March	Certificate of Completion of AutoDesk FEA training.
2015-16	Attend 1 or 2 SME Chapter 39 meetings in Seattle.
2015 June	Attended and presented at ASEE National Conference.
2013 June	Attended and presented at ASEE National Conference.
2016-17	Attend 1 or 2 SME Chapter 39 meetings in Seattle.

E. Authority and Responsibility of Faculty

The teaching faculty collectively is the major force governing the curriculum of the university. The faculty are instrumental in creating, modifying, and evaluating their courses. Faculty ideas for changes or additions to existing programs, or creation of new programs such as minors, majors or specializations, can come from the IAB, personal experiences, consultation and interactions with industry, and professional development opportunities such as conferences or workshops. Course/program creation, modification, and deletion follows a standard set of procedures established by university curricular policies prescribed under "CWUP 5-50 Curriculum Policies and Procedures." Curriculum changes are discussed by the MET faculty prior to initiation of the change. One of the MET faculty will then initiate curriculum changes through ETSC Department Chair and the College Dean. The changes are reviewed and approved by Registrar Services. In the case of a new program creation or program modification proposals, it is subject to examination by the provost/ vice president for academic and student life. The Approved proposals are then reviewed by the Faculty Senate curriculum committee, and posted for 14-day campus review. Some are subject to further review by the higher education coordinating board and the board of trustees.

Each faculty member is responsible for the evaluation of student outcomes within their specific courses. The program faculty defines the program educational objectives and student outcomes. The faculty uses input from various constituents of the program such as the IAC, students, employers, and alumni. However, the final definition of these is determined by the program faculty. 54

More details about the curriculum change process can be accessed on the CWU Faculty Senate website: http://www.cwu.edu/faculty-senate/curriculum-and-general-education-forms .

Table 6-1. Faculty Qualifications

Mechanical Engineering Technology

Faculty Name	Highest Degree Earned- Field and Year	Rank [1]	Type of Academic Appointment [2] T, TT, NTT	FT or PT [3]	Years of Experience			Professional Registration / Certification	Level of Activity [4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Dr. Craig Johnson, PE	PhD, Materials/ME	P	T	FT	3	23	20	PE	H	M	M
Roger Beardsley, PE	MSET 2006	ASC	T	FT	24	9	9	PE	M	M	L
Charles Pringle, EIT	MSET 2007	ASC	T	FT	16	8	8	EIT	M	M	L
Ted Bramble	MSET	A	NTT	FT	1	6	5	CSWA	L	L	L
Greg Lyman	MSET 2012	AST	TT	FT	10	2	2	N/A	H	H	L
Dr. Darren Olson	PhD	ASC	TT	FT	3	19	8	N/A	H	H	L
Dr. Michael Whelan	PhD	ASC	T	FT	5	31	9	PE	H	M	L
Scott Calahan	MA	P	T	FT	3	24	16	N/A	H	H	L
Dennis Capovilla	BS Aerospace	ASC	NTT	PT	28	8	8	N/A	L	L	L

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: TT = Tenure Track T = Tenured NTT = Non-Tenure Track
3. At the institution
4. The level of activity, high, medium or low, should reflect an average over the year prior to the visit plus the two previous years.

Table 6-2. Faculty Workload Summary

Mechanical Engineering Technology

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Craig Johnson, PE, PhD	FT	Fall 2016: MET 351 (4 cr.); MET 495A (3 cr.) Winter 2017: MET 382 (4 cr.); MET 495B (3 cr.) Spring 2017: MET 257 (4 cr.); MET 426 (4 cr.)	80%	13%	6%	100%
Roger Beardsley, PE	FT	Fall 2016: MET 314 (5 cr.); MET 411 (5 cr.) Winter 2017: MET 315 (5 cr.); MET 488 (2 cr.) Spring 2017: MET 316 (5 cr.); MET 327 (5 cr.)	80%	13%	6%	100%
Charles Pringle, EIT	FT	Fall 2016: MET 345 (4 cr.); MET 418 (5 cr.) Winter 2017: MET 419 (5 cr.); MET 420 (4 cr.) Spring 2017: MET 345 (4 cr.); MET 495C (3 cr.)	80%	13%	6%	100%

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the Self-Study Report is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.

CRITERION 7. FACILITIES[1]

This Interim Report is focused on addressing the weaknesses presented to the MET program during the previous ABET evaluation cycle. No weaknesses were found for Criterion 7.

CRITERION 8. INSTITUTIONAL SUPPORT

This Interim Report is focused on addressing the weaknesses presented to the MET program during the previous ABET evaluation cycle. No weaknesses were found for Criterion 7.

PROGRAM CRITERIA

The Mechanical Engineering Technology (MET) program criteria are the specific ABET criteria for MET or similarly named baccalaureate degrees. Below are the Student Outcomes (SO) for the ABET MET program criteria. Central Washington University (CWU) will use 'M' to designate the MET program criteria. The alphabetic letter associated with the 'M' designator corresponds to the ABET program criteria.

MET Program Criteria Outcome: Ma "geometric dimensioning and tolerancing; computer aided drafting and design; and a basic knowledge and familiarity with industry codes, specifications, and standards;"

The first metric for SO Ma is assessed using the bi-annual reports produced by the NCCES. The data comes from the Computational Tools category of the NCEES report. The NCEES data is dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-01. The graph is produced using the NCEES Ratio Score. The NCEES Ratio Score is the ratio of the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is compiled annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-01 shows CWU ratio scores for Computational Tools. These scores are demonstrating a drastic downward trend. It would seem action is required, but the computational tools score on the MET practice FE exam are trending upward.

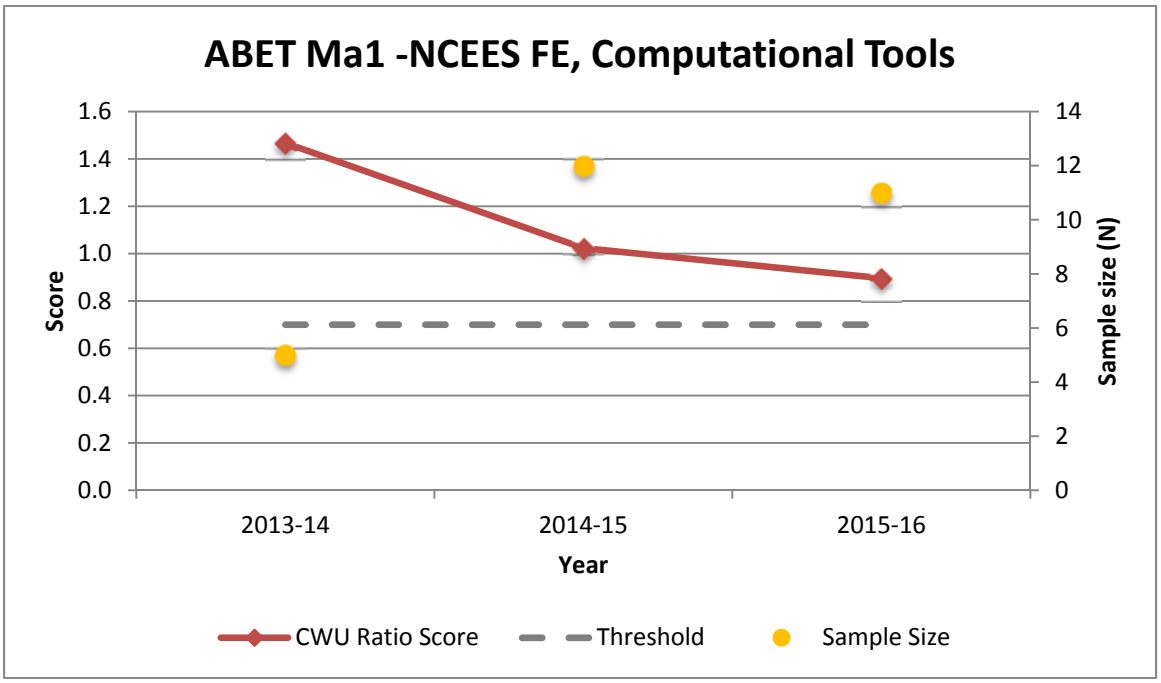


Figure PC-01. CWU Ratio Scores in Computational Tools.

The second metric for SO Ma comes from the practice FE exam that every MET student takes as the final for MET 488 (Professional Certification Exam Preparation course). The data comes from the Computational Tools category of the MET Practice FE Exam. The Practice FE Exam data is dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-02. The graph is produced using the CWU Practice Ratio Score. The CWU Practice Ratio Score is the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is compiled annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be 0.70 or higher.
Figure PC-02 shows CWU ratio scores for Computational Tools. While the NCEES exam data is trending downward, this score is trending upward. No action is recommended at this time.

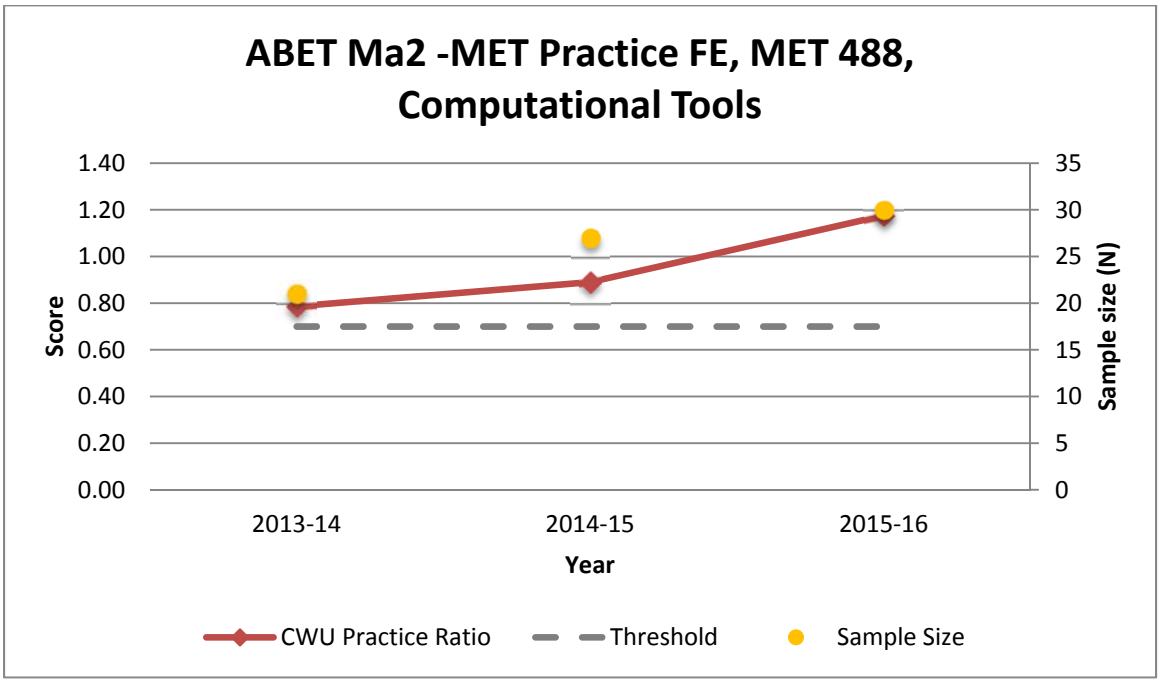


Figure PC-02. MET Practice FE Exam Ratio Score in Computational Tools.

The third metric for SO Ma comes from the Requirement, Analysis, Design, and Drawing (RADD) completed in the first quarter of the capstone experience (MET 489A). The direct measure is an assessment of the students' ability to produce an ANSI Y14.5 drawing for their senior project. Each student conducts a review in front of their peers. They are assessed on their ability to produce an ANSI y14.5 drawing for their senior project. The RADD rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure PC-03.
This metric is also examined annually.
The attainment threshold is the students' average will be 70%, or higher.
Figure PC-03 shows the SO Ma RADD level of attainment. The students have improved and are maintaining a score above the threshold. No action required.

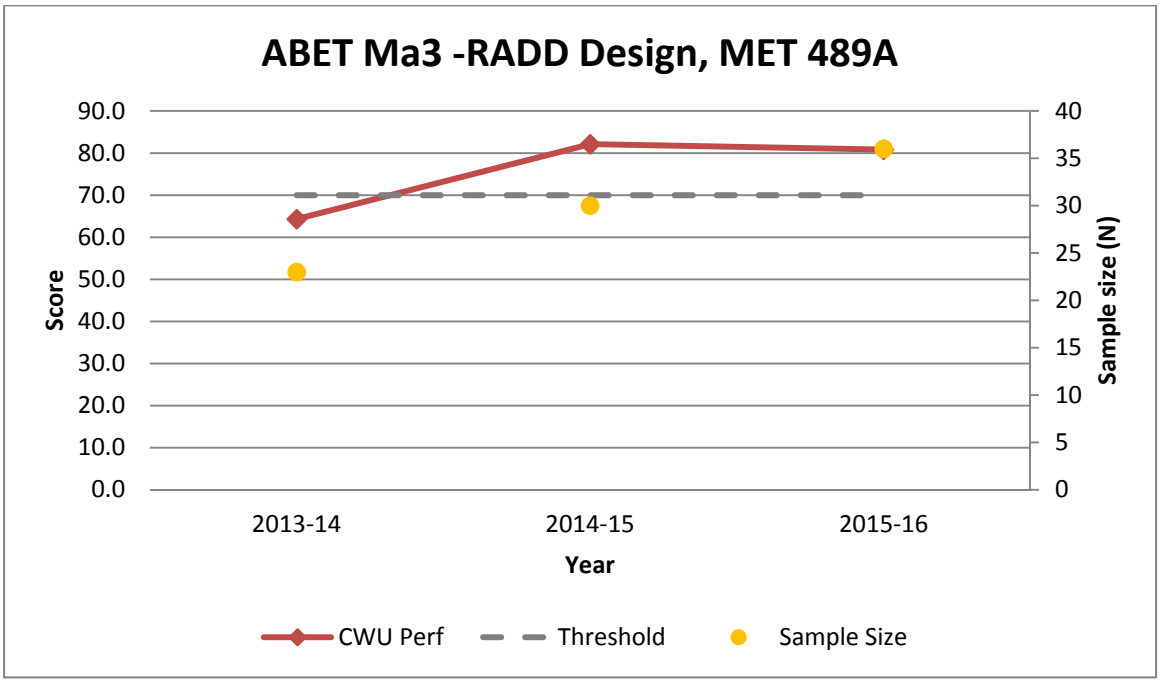


Figure PC-03. Drawing scores for RADD in MET 489A.

The forth metric for SO Ma comes from the Requirement, Analysis, Design, and Drawing (RADD) completed in the second quarter of the capstone experience (MET 489B). The direct measure is an assessment of the students' ability to produce an ANSI Y14.5 drawing for their senior project. Each student conducts a review in front of their peers. They are assessed on their ability to produce an ANSI y14.5 drawing for their senior project. The RADD rubric data are dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure PC-04.
This metric is also examined annually.
The attainment threshold is the students' average will be 70%, or higher.
Figure PC-04 shows the SO Ma RADD level of attainment. The students have seemed to have learned from the first quarter and are maintaining a score above the threshold. No action required.

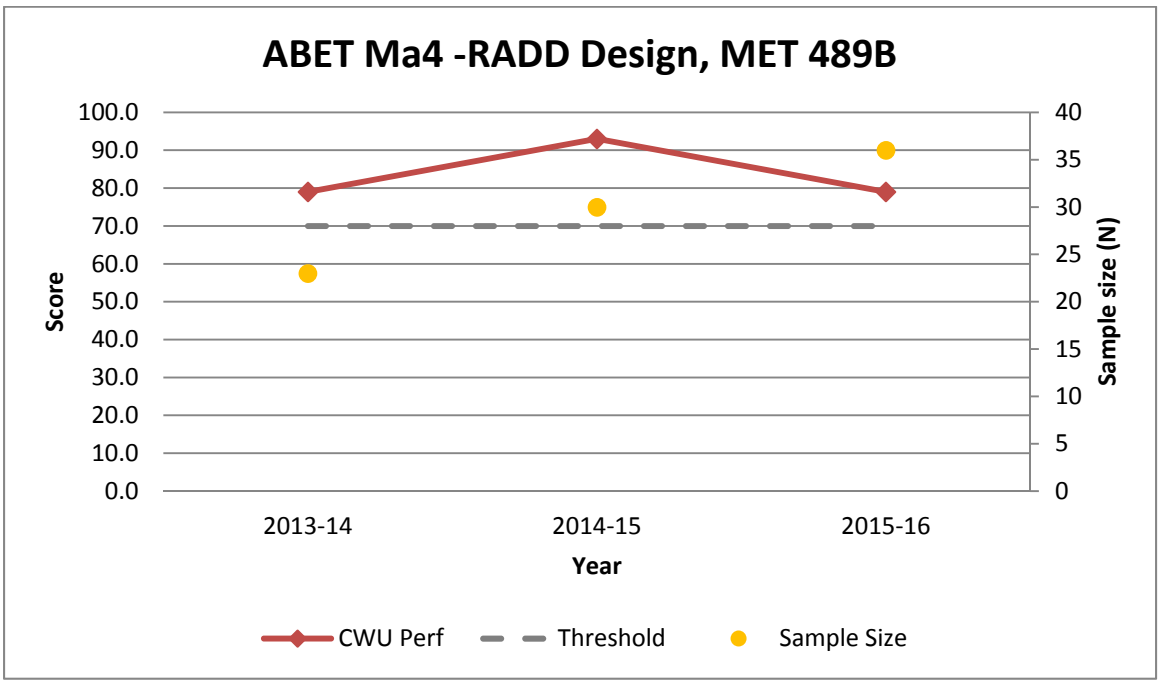


Figure PC-04. Drawing scores for RADD in MET 489B.

MET Program Criteria Outcome: Mb "selection, set-up, and calibration of instrumentation and the preparation of laboratory reports and systems documentation associated with the development, installation, or maintenance of mechanical components and systems;"

The first metric for SO Mb is assessed using the bi-annual reports produced by the NCEES. The data come from the Measurements Instrumentation and Controls category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-05. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-05 shows CWU ratio scores for Measurements Instrumentation and Controls. The students are sea-sawing, but staying above the threshold. No action is required at this time.

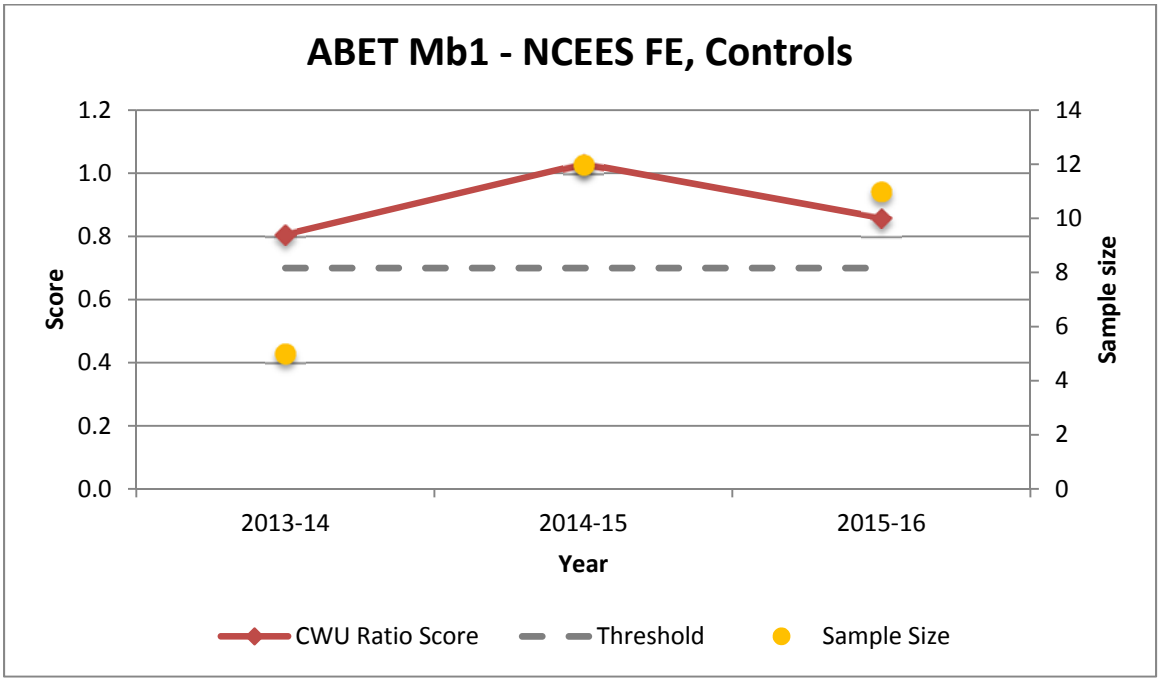


Figure PC-05. CWU Ratio Scores in Measurements Instrumentation and Controls.

The second metric for SO Mb comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Measurements Instrumentation and Controls category of the MET practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-06. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-06 shows CWU ratio scores for Measurements Instrumentation and Controls. All three classes exceed the threshold; however, the 2015-6 class performed worse than the other two classes. It will bear monitoring to determine whether corrective action is required to raise the score. Should the 2016-17 students fail to meet the threshold, corrective action will be necessary.

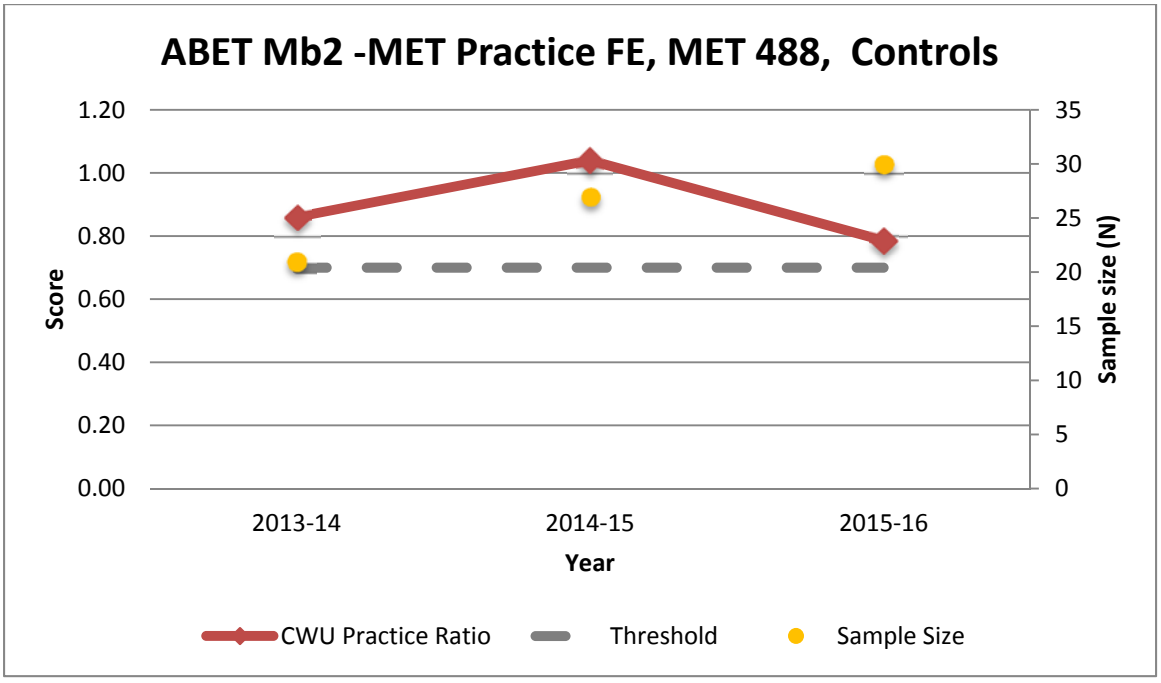


Figure PC-06. MET Practice FE Exam Ratio Score in Measurements Instrumentation and Controls.

MET Program Criteria Outcome: Mc "basic engineering mechanics"

The first metric for SO Mc is assessed using the bi-annual reports produced by the NCEES. The data come from the Mechanics of Materials category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-07. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-07 shows CWU ratio scores for Mechanics of Materials. All three classes have exceeded the .70 threshold. No action is required at this time.

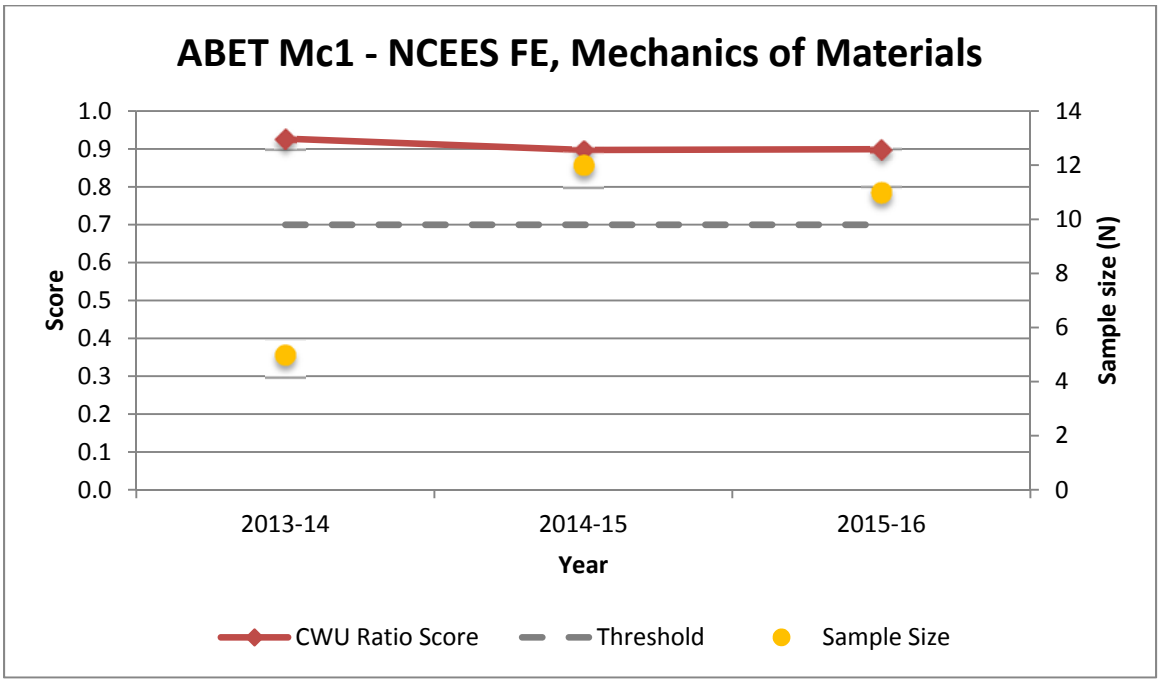


Figure PC-07. CWU Ratio Scores in Mechanics of Materials.

The second metric for SO Mc comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Mechanics of Materials category of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-08. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-08 shows CWU ratio scores for Controls. Some action is required. While the trend is upward, the students are still below the threshold.

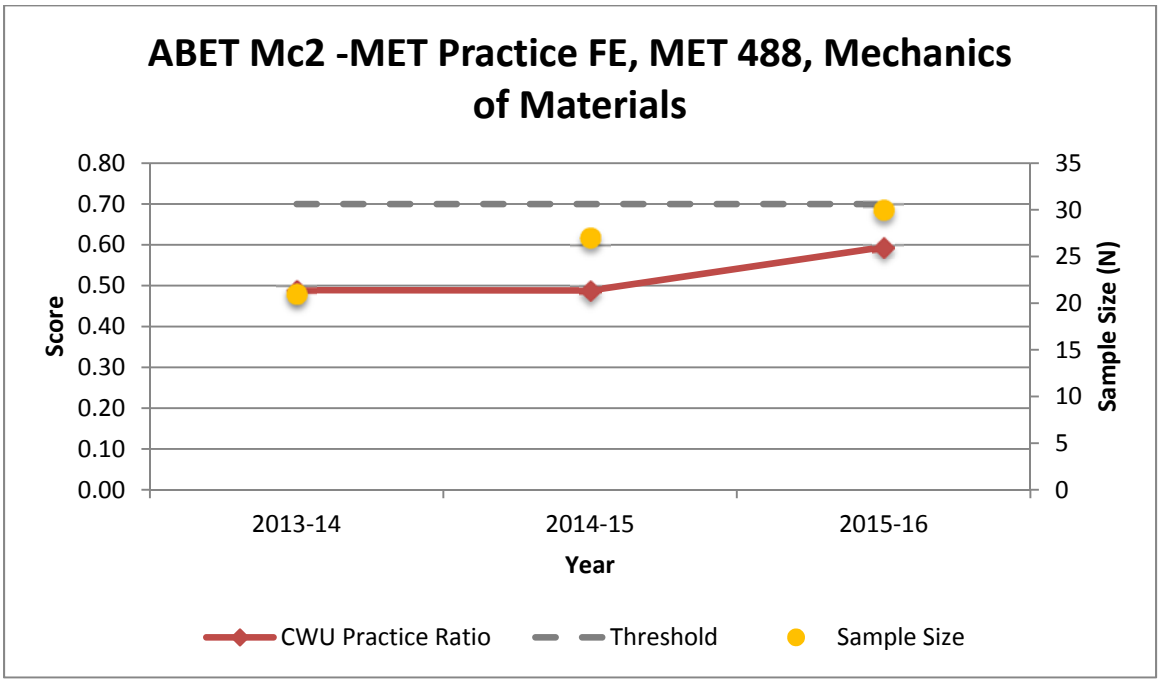


Figure PC-08. MET Practice FE Exam Ratio Score in Mechanics of Materials.

The third metric for SO Mc is assessed using the bi-annual reports produced by the NCEES. The data come from the Statics category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-09. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-09 shows CWU ratio scores for Statics. All three classes have exceeded the .70 threshold. No action is required at this time.

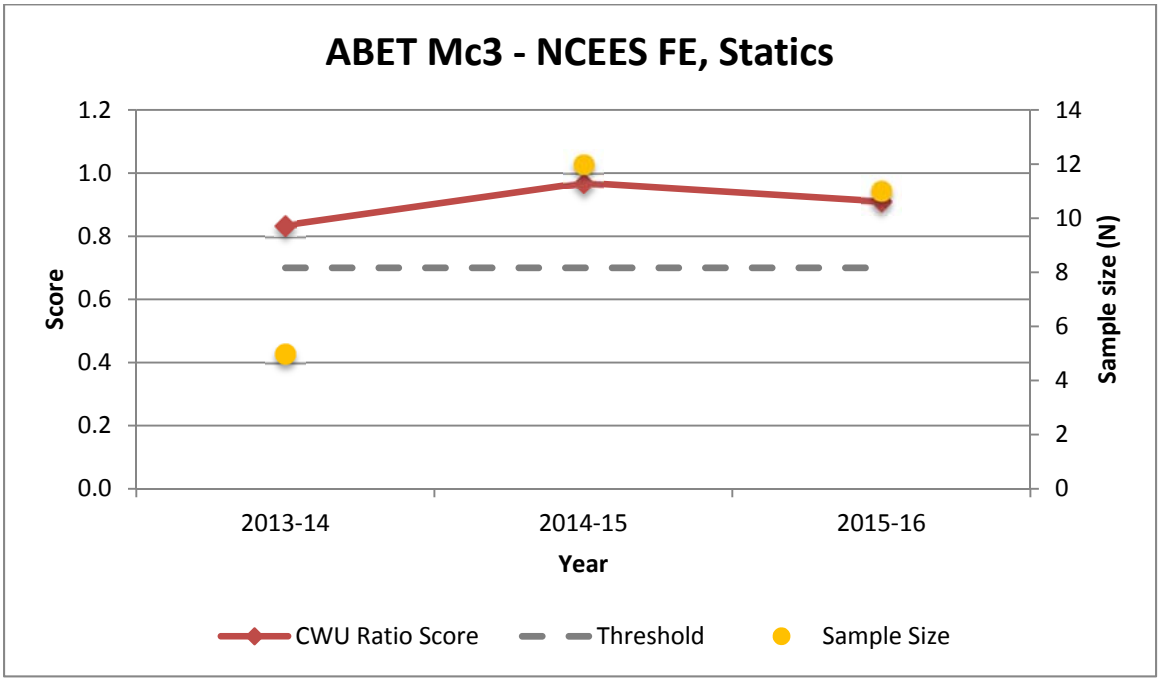


Figure PC-09. CWU Ratio Scores in Statics.

MET Program Criteria Outcome: Md "differential and integral calculus"

The first metric for SO Md is assessed using the bi-annual reports produced by the NCEES. The data come from the Mathematics category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-10. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-10 shows CWU ratio scores for Mathematics. All three classes have exceeded the .70 threshold, but action may be required depending on the 2016-17 scores.

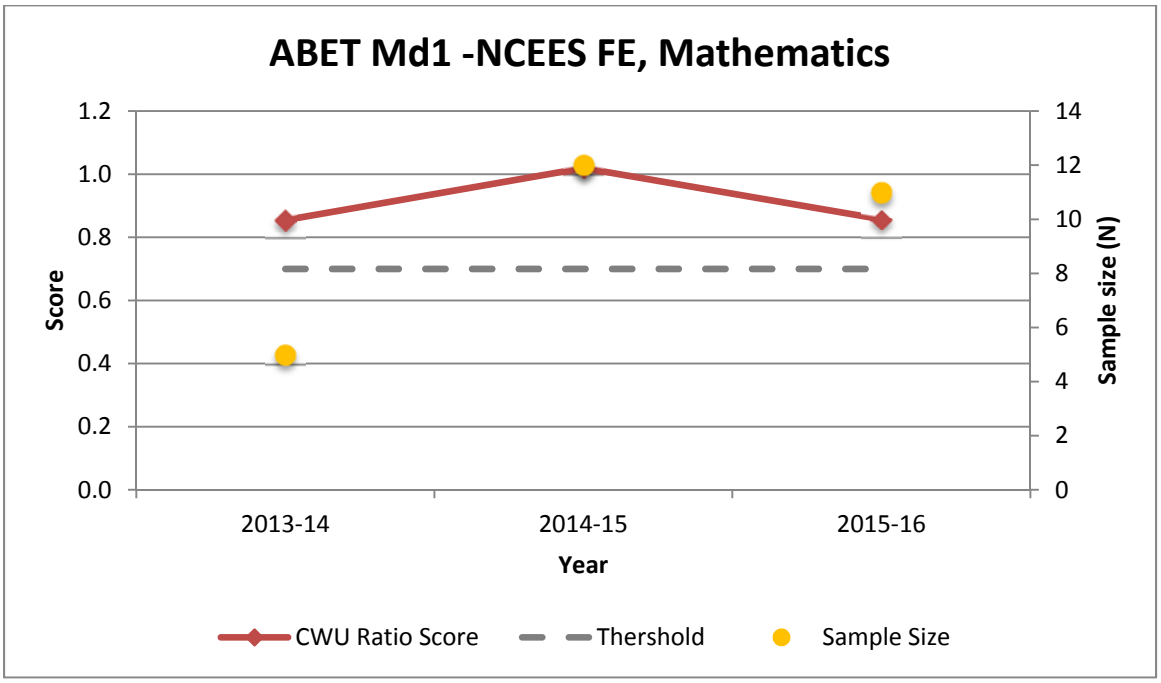


Figure PC-10. CWU Ratio Scores in Mathematics.

The second metric for SO Md comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Mathematics category of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-11. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-11 shows CWU ratio scores for Mathematics. The students are doing well. No action is required.

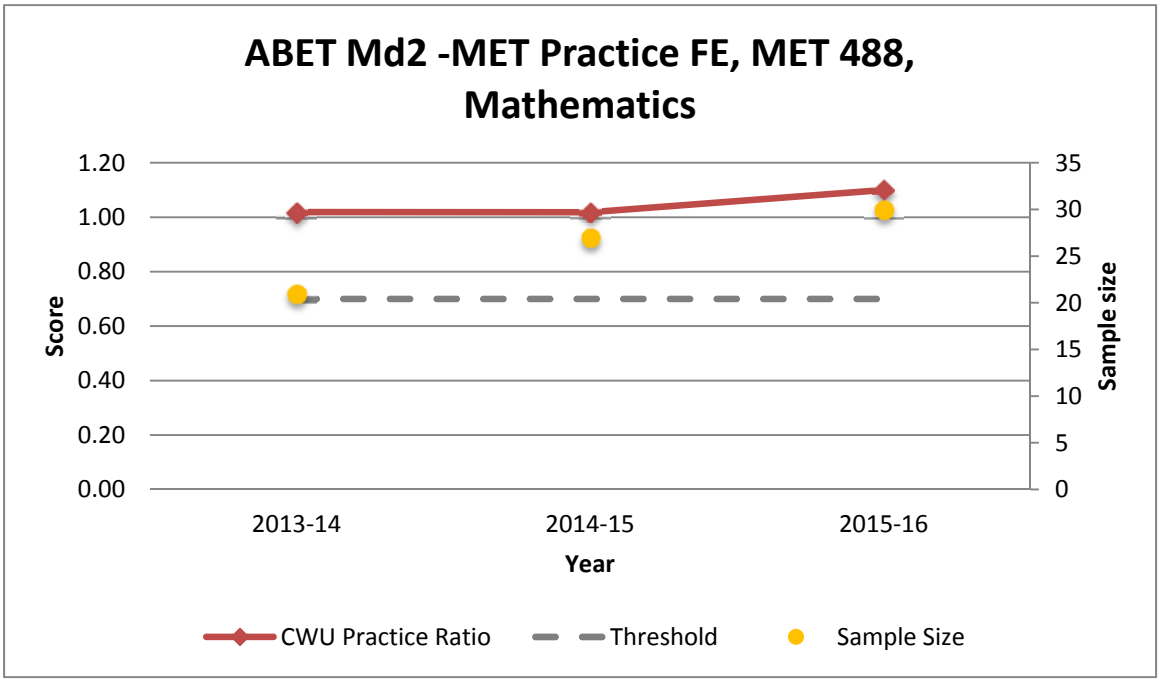


Figure PC-11. MET Practice FE Exam Ratio Score in Mathematics.

The third metric for SO Md is assessed using the bi-annual reports produced by the NCEES. The data come from the Probability and Statistics category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-12. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-12 shows CWU ratio scores for Probability and Statistics. All three classes have exceeded the .70 threshold, but action may be required depending on the 2016-17 scores.

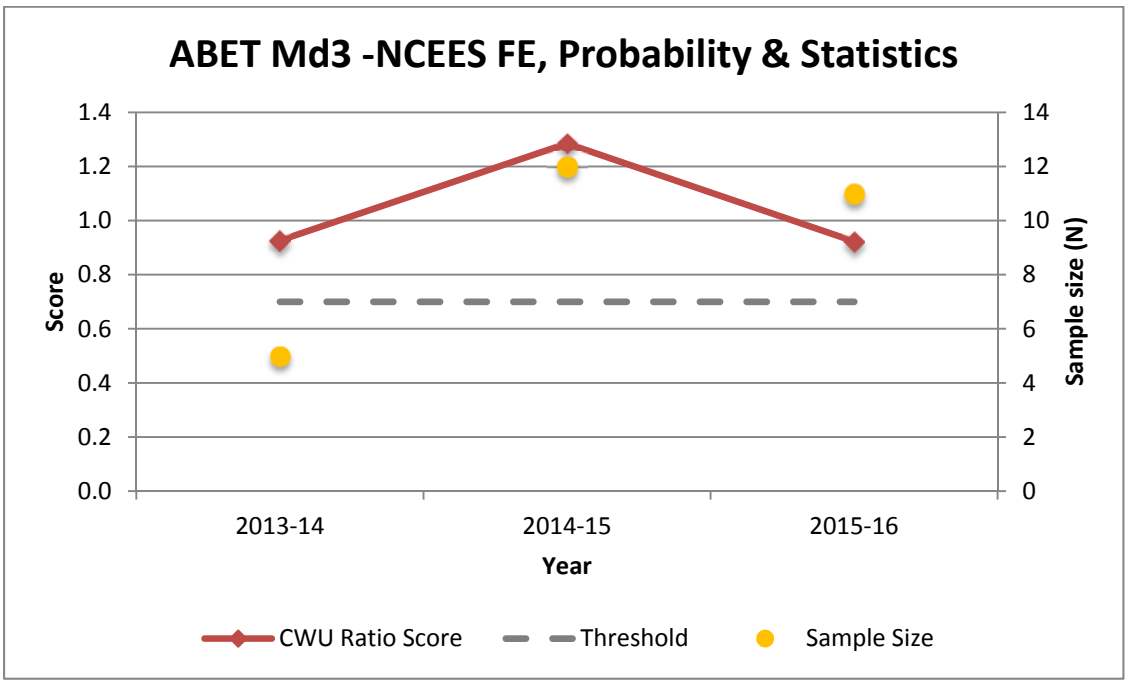


Figure PC-12. CWU Ratio Scores in Probability and Statistics.

The forth metric for SO Md comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Probability and Statistics category of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-12. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-12 shows CWU ratio scores for Probability and Statistics. The scores are headed in the correct direction, but continue to monitor.

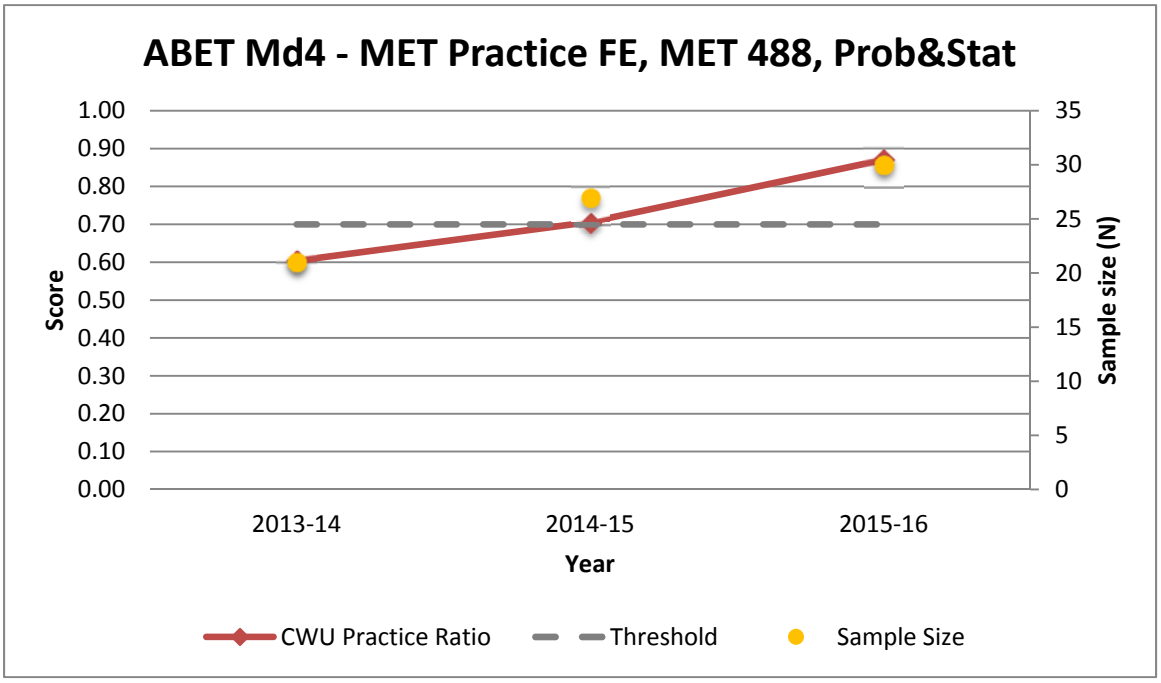


Figure PC-12. MET Practice FE Exam Ratio Score in Probability and Statistics.

MET Program Criteria Outcome: Me "manufacturing processes; material science and selection; solid mechanics (such as statics, dynamics, strength of materials, etc.) and mechanical system design"

The first metric for SO Me is assessed using the bi-annual reports produced by the NCEES. The data come from the Material Properties and Processing category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-13. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-13 shows CWU ratio scores for Material Properties and Processing. All three classes have exceeded the .70 threshold. No action is required at this time.

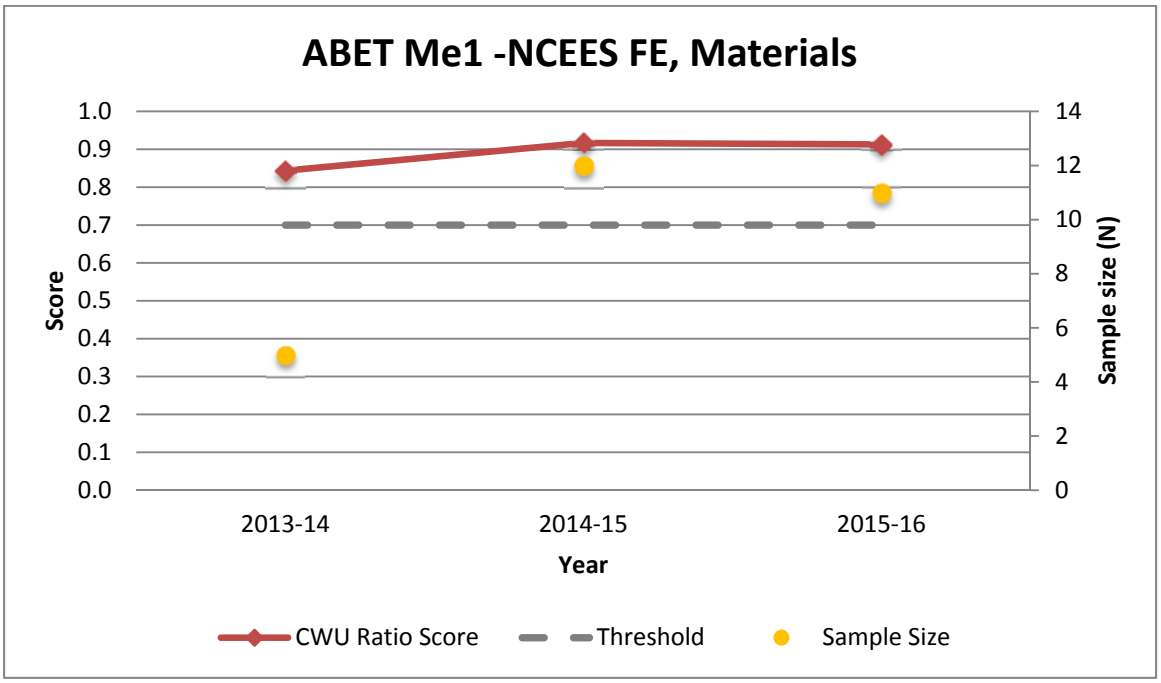


Figure PC-13. CWU Ratio Scores in Material Properties and Processing.

The second metric for SO Me comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Material Properties and Processing category of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-14. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-14 shows CWU ratio scores for Material Properties and Processing. These scores require immediate action.

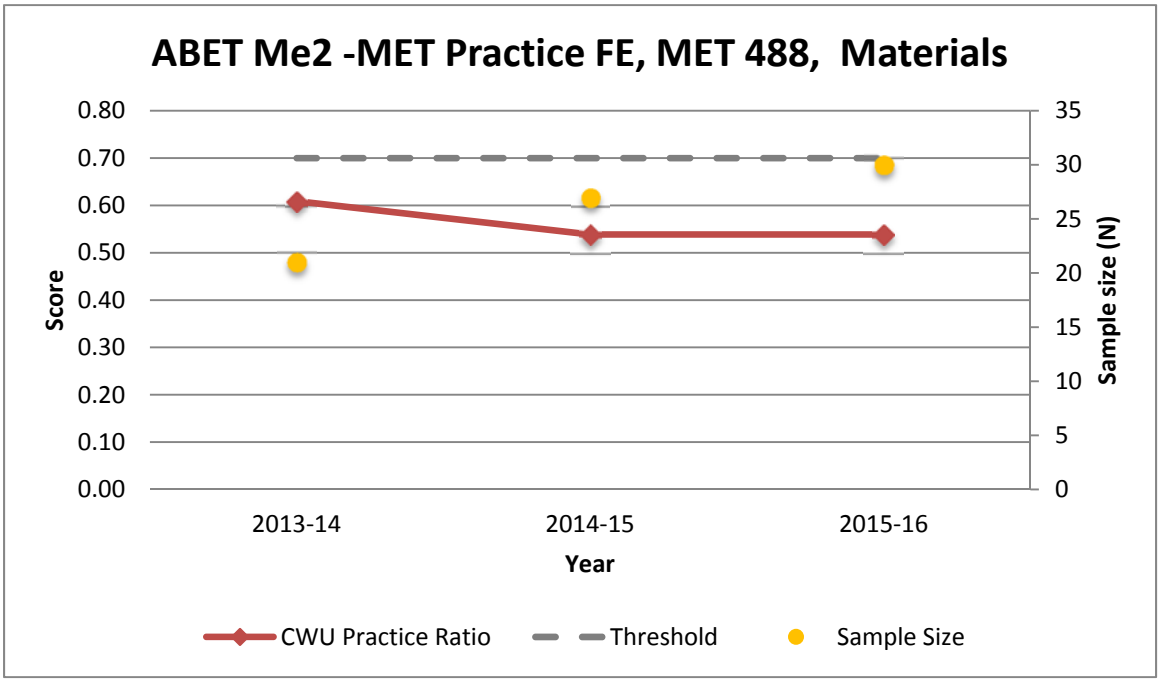


Figure PC-14. MET Practice FE Exam Ratio Score in Material Properties and Processing.

The third metric for SO Me comes from the Material Assessment completed in the MET 426 (Applications in Strength of Materials) course. The direct measure is an assessment of the students' knowledge in material properties (i.e. determining the Modulus of Elasticity) using an FE style question. Each student is assessed during the quarter. They are assessed using a test question on an exam during the quarter. The data is dropped into an Excel workbook that aggregates the data to produce the graph shown in Figure PC-15.
This metric is also examined annually.
The attainment threshold is the students will receive a 70%, or higher, score. Figure PC-15 shows the SO Ma Material Assessment level of attainment. The students are performing well. No action necessary.

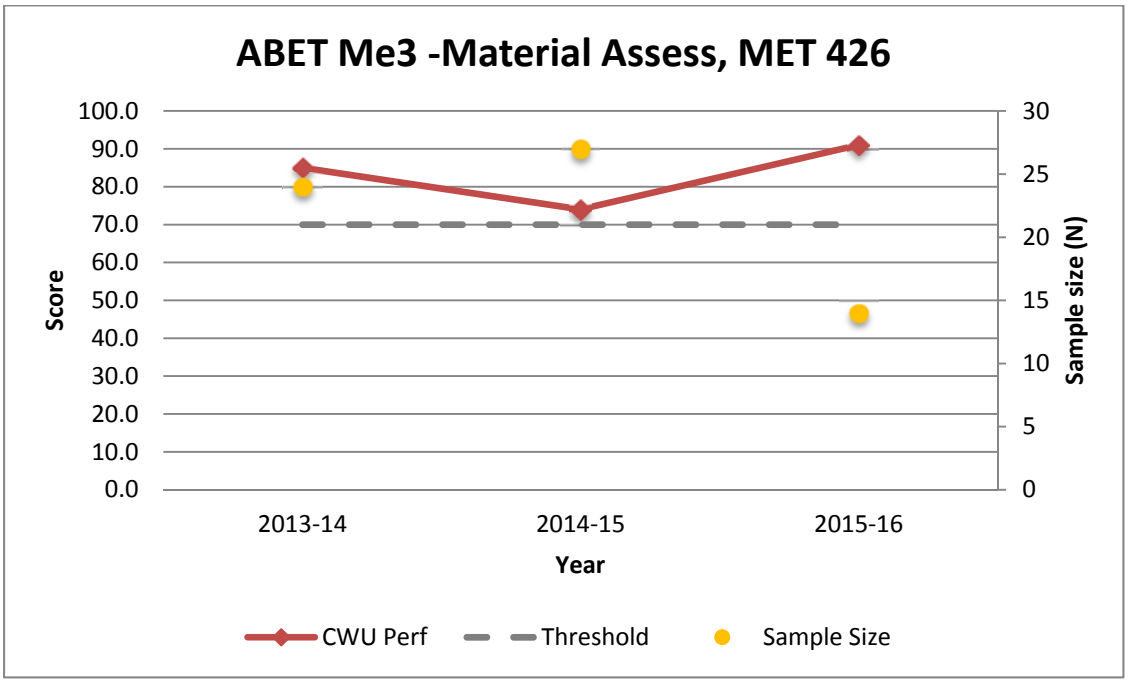
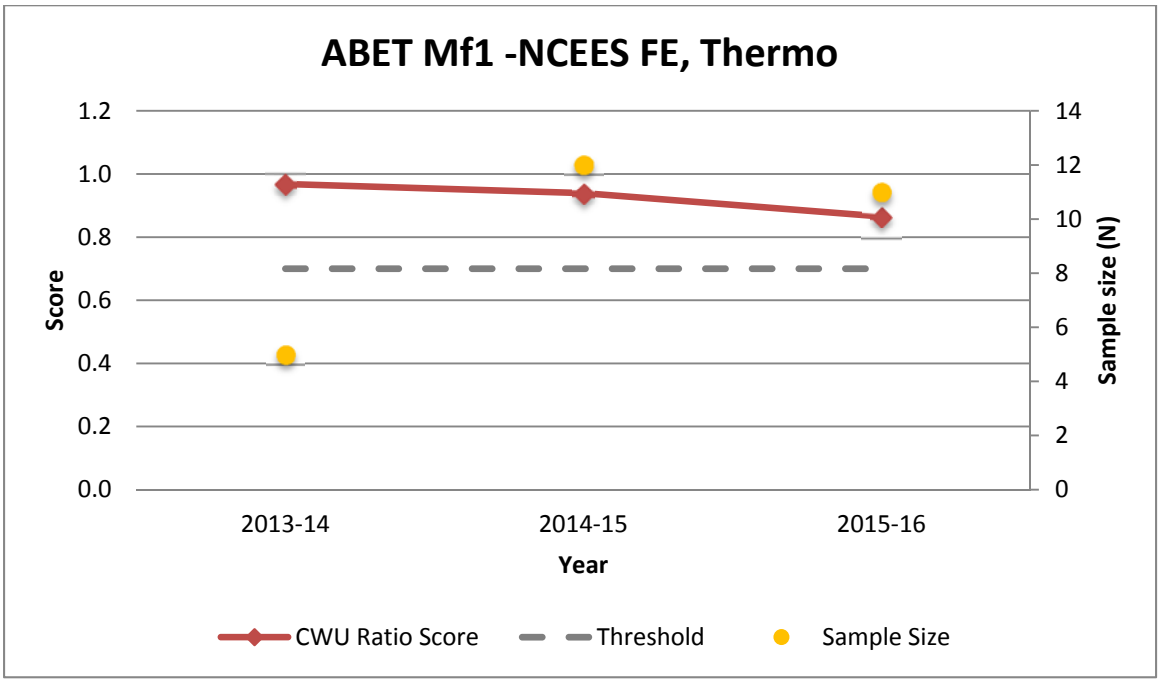


Figure PC-15.

MET Program Criteria Outcome: Mf "thermal sciences, such as thermodynamics, fluid mechanics, heat transfer, etc.;"

The first metric for SO Mf is assessed using the bi-annual reports produced by the NCEES. The data come from the Thermodynamics, Fluid Mechanics, and Heat Transfer categories of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-16, Figure PC-17, and Figure PC-18. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-16 shows CWU ratio scores for Thermodynamics. These scores will require some action to reverse this downward trend.
Figure PC-17 shows CWU ratio scores for Fluid Mechanics. The fluid mechanics scores are acceptable. No action is required.
Figure PC-17 shows CWU ratio scores for Heat Transfer. These scores are good as well. No action is required.



FigurePC-16. CWU Ratio Scores in Thermodynamics.

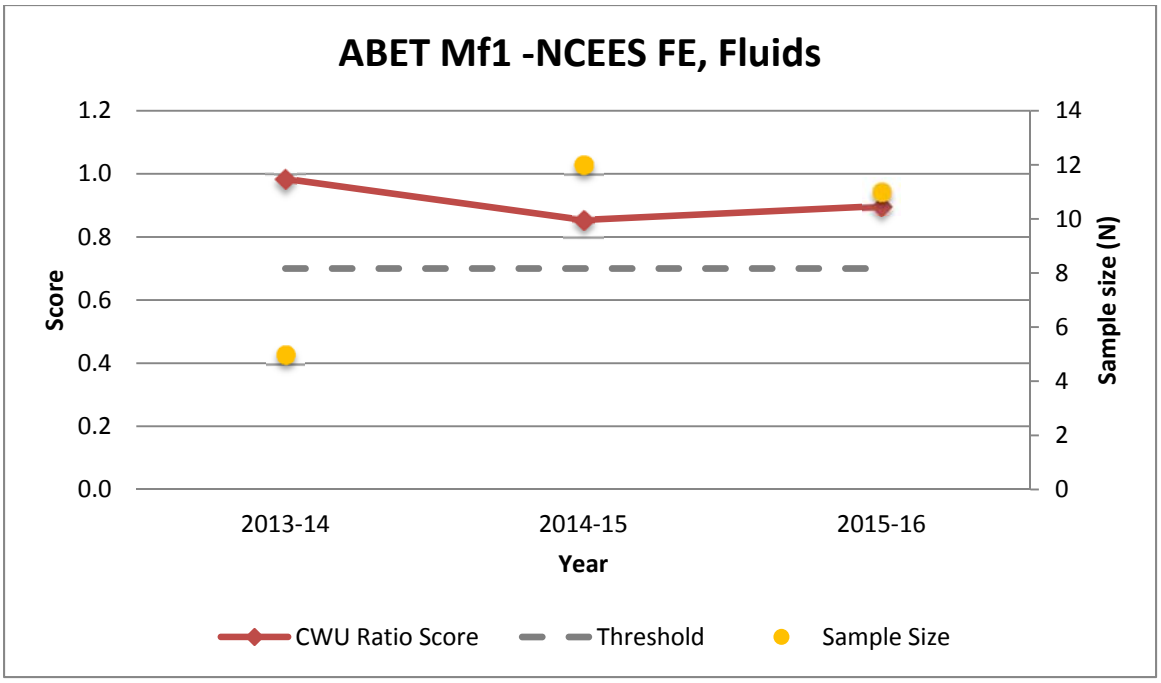


Figure PC-17. CWU Ratio Scores in Fluid Mechanics.

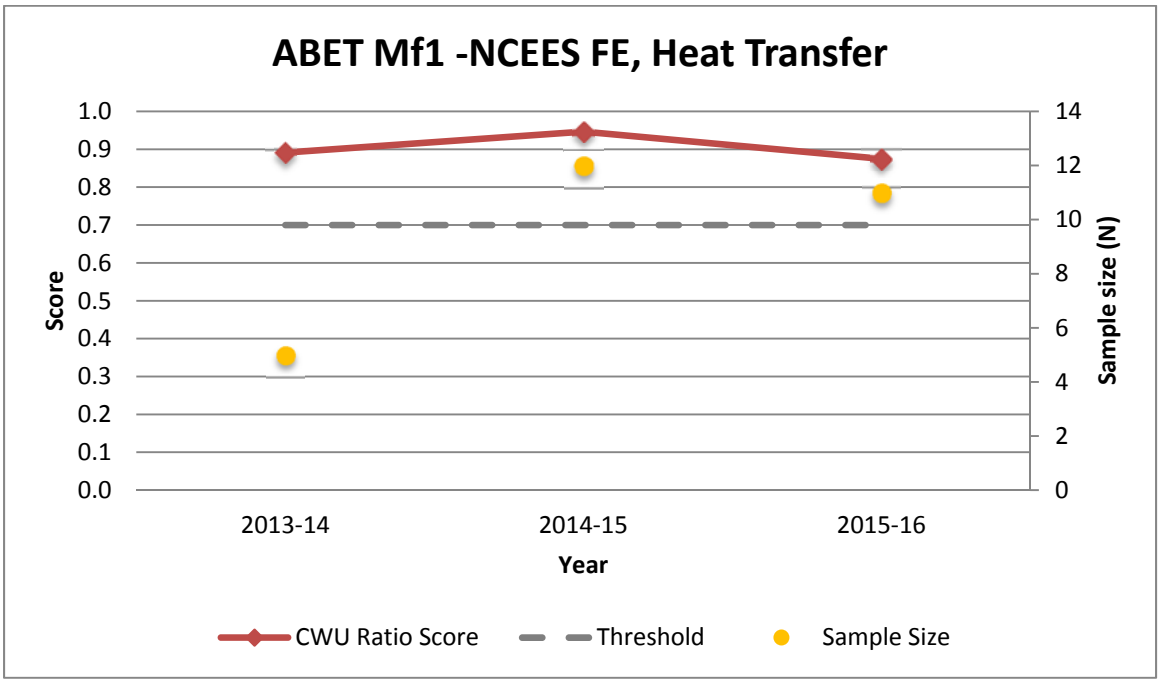


Figure PC-18. CWU Ratio Scores in Heat Transfer.

The second metric for SO Ma comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Thermodynamics, Fluid Mechanics, and Heat Transfer categories of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-19, Figure PC-20, and Figure PC-21. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-19 shows CWU ratio scores for Thermodynamics. These scores will require no action at this time.
Figure PC-20 shows CWU ratio scores for Fluid Mechanics. Do not require any action at this time either.
Figure PC-21 shows CWU ratio scores for Heat Transfer. These scores are excellent. No action required.

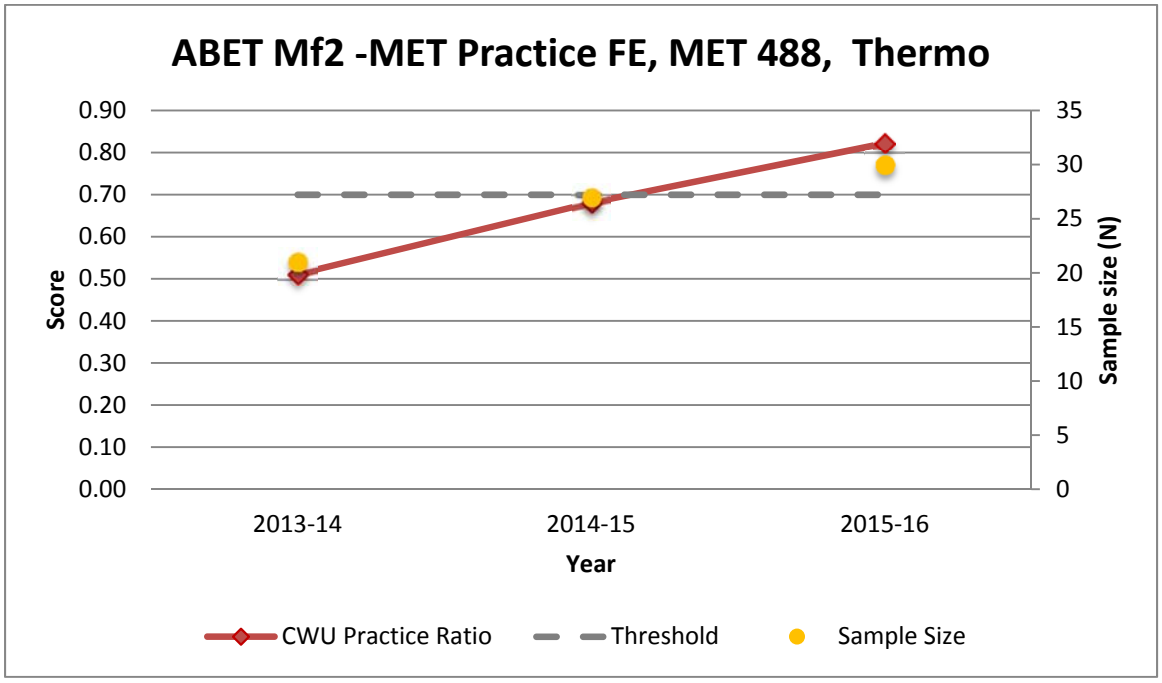


Figure PC-19. MET Practice FE Exam Ratio Score in Thermodynamics.

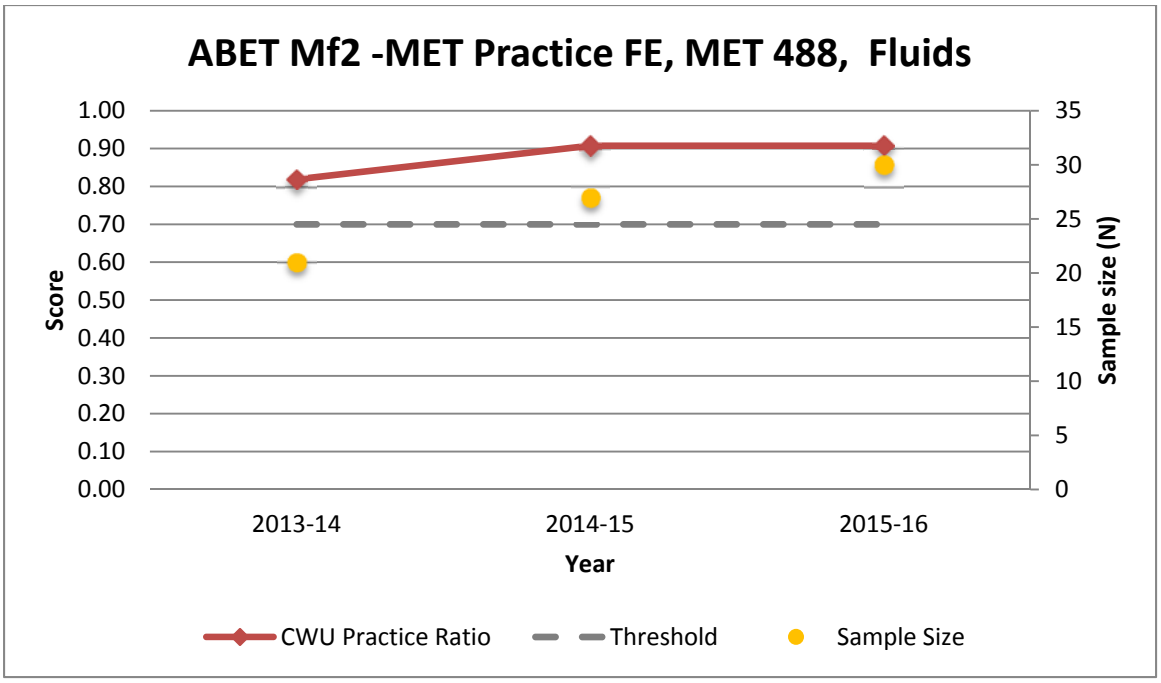


Figure PC-20. MET Practice FE Exam Ratio Score in Fluid Mechanics.

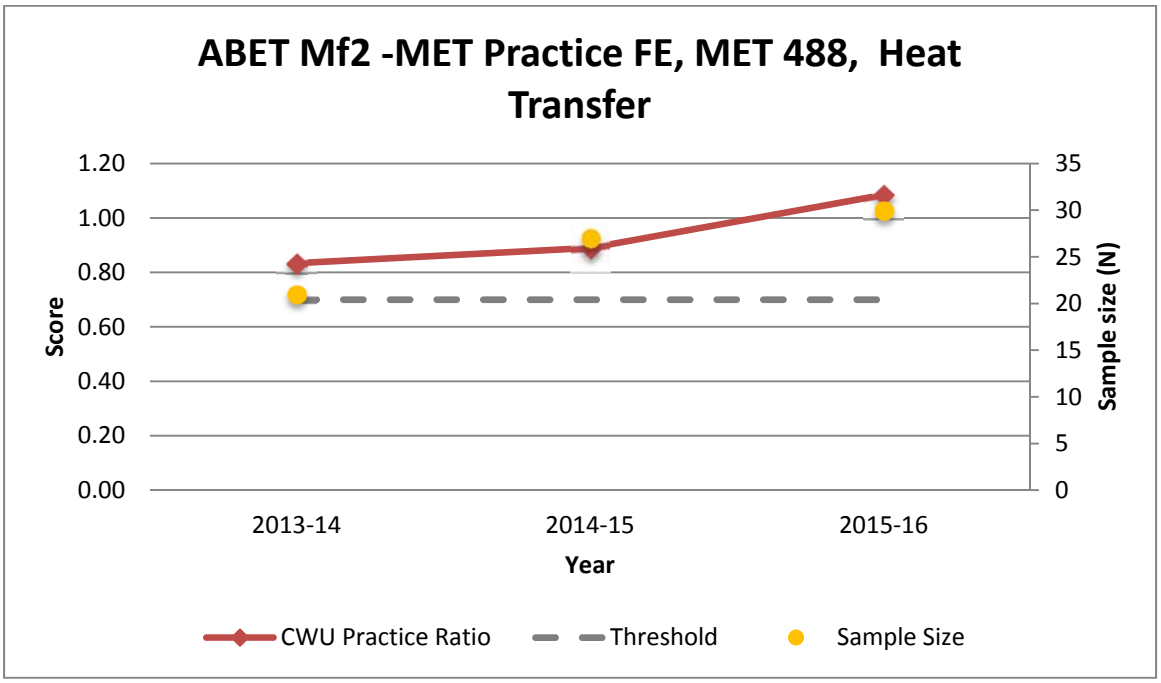


Figure PC-21. MET Practice FE Exam Ratio Score in Heat Transfer.

MET Program Criteria Outcome: Mg "electrical circuits (ac and dc), and electronic controls"

The first metric for SO Mg is assessed using the bi-annual reports produced by the NCEES. The data come from the Electricity and Magnetism category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-22. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-22 shows CWU ratio scores for Electricity and Magnetism. These scores indicate that direct action is required.

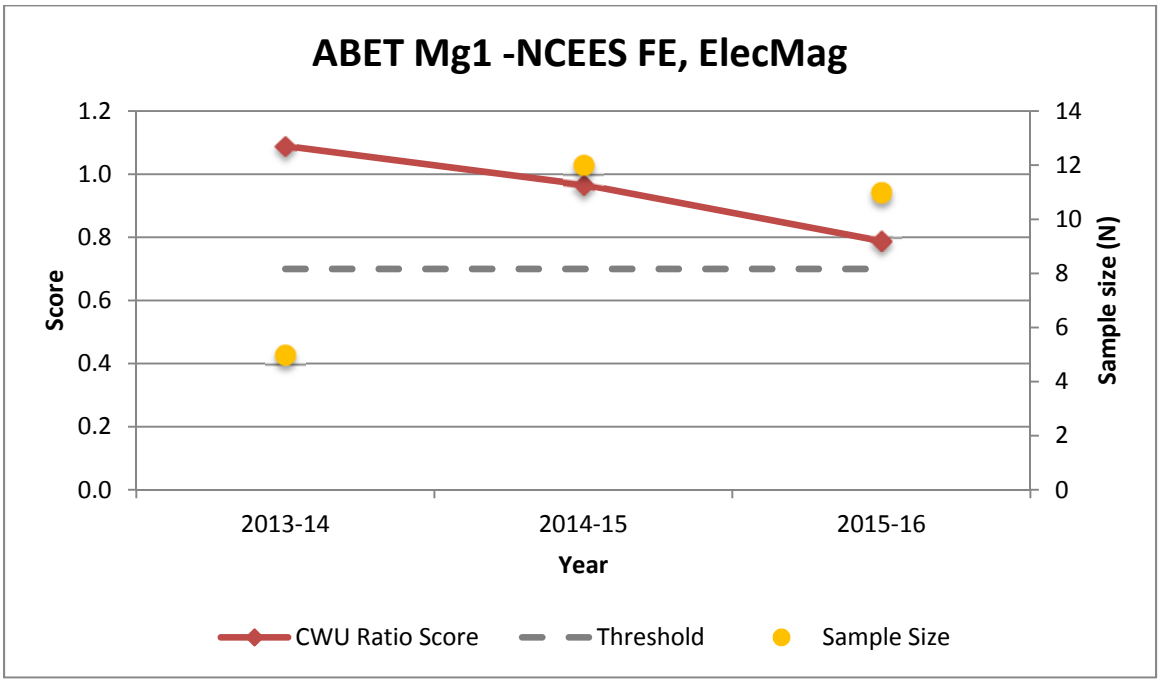


Figure PC-22. CWU Ratio Scores in Electricity and Magnetism.

The second metric for SO Ma comes from the MET Practice FE exam that every MET student takes as the final exam for MET 488 (Professional Certification Exam Preparation course). The data come from the Electricity and Magnetism category of the MET Practice FE exam. The practice exam data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-23. The graph is produced using the CWU Practice Ratio Score – the ratio of the performance of CWU students on the practice exam to the NCEES comparator performance in each category. These are average scores.
This metric is examined annually.
The attainment threshold is the ratio score for the CWU students taking the MET Practice FE will be .70 or higher.
Figure PC-23 shows CWU ratio scores for Electricity and Magnetism. As long as the scores stay up, no action is required.

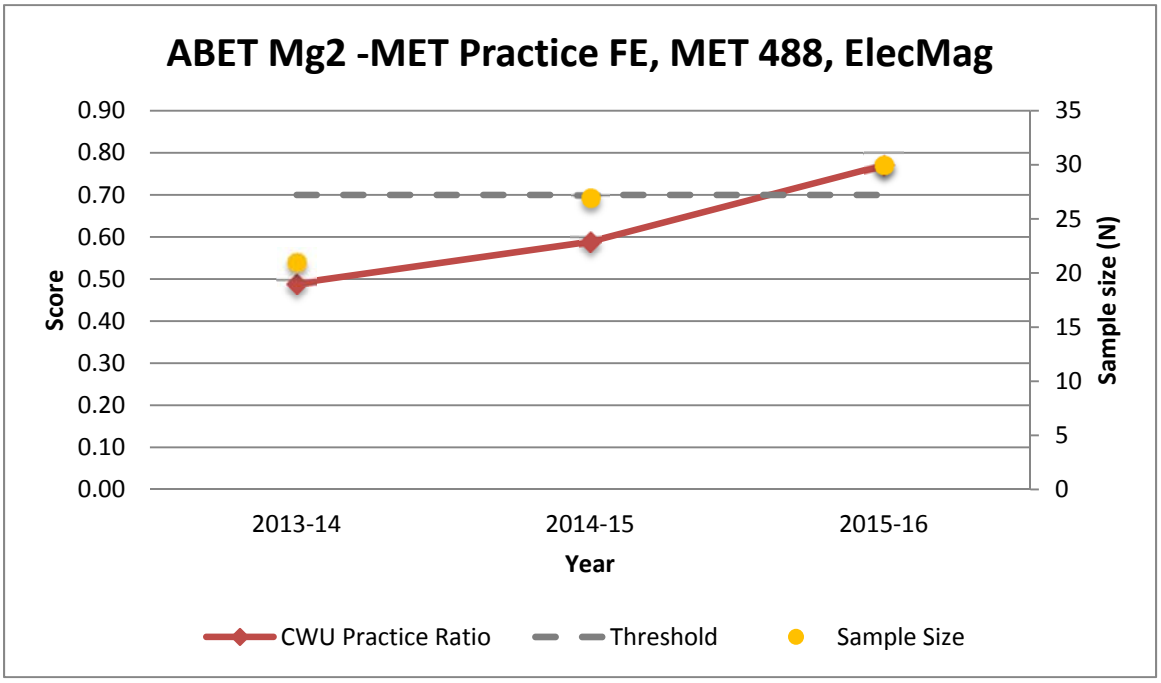


Figure PC-23. MET Practice FE Exam Ratio Score in Electricity and Magnetism.

The third metric for SO Mg is assessed using the bi-annual reports produced by the NCEES. The data come from the Measurements Instrumentation and Controls category of the NCEES report. The NCEES data are dropped into an Excel workbook that aggregates the data to produce the graph seen in Figure PC-24. The graph is produced using the NCEES ratio score – the performance of CWU to the NCEES comparator performance in each category. These are average scores.
This metric is also examined annually.
The attainment threshold is the ratio score for the CWU students that take the FE will be 0.70 or higher.
Figure PC-24 shows CWU ratio scores for Measurements Instrumentation and Controls. These scores bear watching. Depending on which way the scores go in 2017-18 will dictate whether action is required or not.

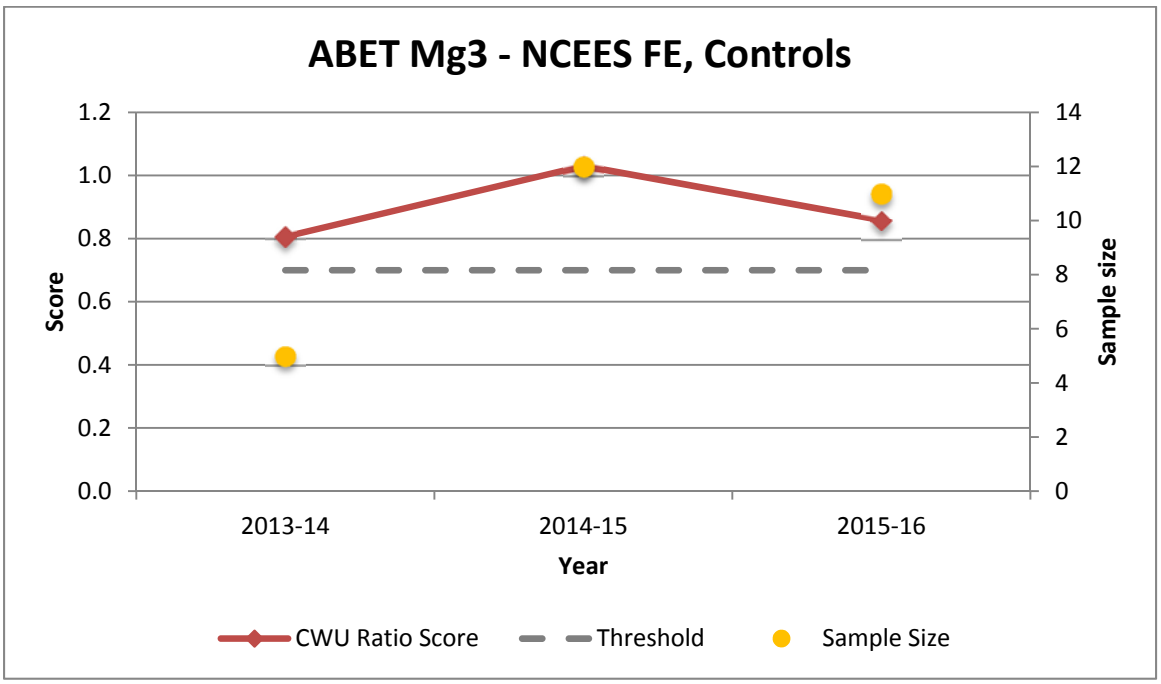


Figure PC-24. CWU Ratio Scores in Measurements Instrumentation and Controls.

MET Program Criteria Outcome: Mh “application of industry codes, specifications, and standards; and using technical communications, oral and written, typical of those required to prepare and present proposals, reports, and specifications”

During the visit, more information will be made available.

APPENDIX A – COURSE SYLLABI

APPENDIX B – FACULTY VITAE

APPENDIX C – EQUIPMENT

APPENDIX D – INSTITUTIONAL SUMMARY

1. The Institution

a. Name and address of the institution.

Central Washington University (CWU)
400 E University
Ellensburg, WA 98926

b. Name and title of the chief executive officer of the institution.

Dr. James Gaudino, President

c. Name and title of the person submitting the Self-Study Report.

Charles Pringle EIT, Associate Professor
Mechanical Engineering Technology Program

d. Name the organizations by which the institution is now accredited, and the dates of the initial and most recent accreditation evaluations.

CWU is accredited by the Northwest Commission on Colleges and Universities (NWCCU) since 1918. The most recent evaluation was the 2014 mid-cycle review. In addition, there are several individual programs accredited by a variety of agencies. The following list provides some examples:

- Engineering Technology Accreditation Commission of ABET
- American Council for Construction Education (ACCE)
- American Dietetic Association Commission on Accreditation for Dietetics Education (CADE-ADA)
- Association to Advance Collegiate Schools of Business (AACSB)
- Committee on Accreditation of Educational Programs for the EMS-Profession (CoAEMSP)
- Public Education Standards Board (PESB)
- Academy of Nutrition and Dietetics Accreditation Council for Education in Nutrition and Dietetics (ACEND)
- Academy of Nutrition and Dietetics (AND)

2. Type of Control

Central was established in 1890 as Washington State Normal School by the first legislature to fulfill the intent of the 1889 Enabling Act for Statehood. Mr. Benjamin Franklin Barge was the first principal of the school, which was founded to educate

future elementary and junior high teachers. In 1891, doors opened for classes. Ellensburg Normal School became Central

Washington College of Education in 1937, Central Washington State College in 1961 and Central Washington University in 1977.
Central Washington University is one of six state-supported institutions offering baccalaureate and graduate degrees. The University is governed by an eight-member Board of Trustees, seven of whom are appointed for six-year terms by the governor of Washington State with the consent of the state Senate, and one student trustee, appointed annually. Responsibility for the day-to-day operations is entrusted to the university president, who is the chief executive officer. Other University administration consists of a Provost/Vice President of Academic and Student Life, Vice President for Business and Financial Affairs, Vice President of Operations and Director of Athletics. There is also a Dean of Library, Office of Continuing Education, Undergraduate and Graduate Studies, Science Honors Research Program and William O. Douglas Honors College. The University consists of four academic colleges:

- College of Arts and Humanities
- College of Business
- College of the Sciences
- College of Education and Professional Studies

The Deans are the administrative head of the colleges. The Department Chairperson is an elected position within the department with the term of appointment being four years. The Department Chairperson directs the activities of the department, subject to approval of the College Dean. The responsibilities of the Chairperson are defined in Article 12 of the CWU Collective Bargaining Agreement (CBA).

3. Educational Unit

The Mechanical Engineering Technology program is one of six programs administered within the Engineering Technologies, Safety and Construction Department (ETSC), which is one of eight departments within the College of Education and Professional Studies (CEPS), one of four colleges in Central Washington University.

University President: Dr. James Gaudino (January 2009)
University Provost: Dr. Katherine Frank (July 2016)
Dean of CEPS: Dr. Paul Ballard (April 2015)
ETSC Department Chair: Dr. Sathyanarayanan Rajendran (September 2017)
MET Program Co-coordinators: Dr. Craig Johnson & Mr. Roger Beardsley

4. Academic Support Units

Chemistry Department Chair:	Dr. Anthony Diaz
Communications Dept. Chair:	Dr. Marji Morgan
English Department Chair:	Dr. George Drake
Math Department Chair:	Dr. Stuart Boersma
Physics Department Chair:	Dr. Andy Piacsek

5. Non-academic Support Units

Business and Financial Affairs, Vice President, Mr. Joel Klucking
Career Services, Director, Ms. Vicki Sannuto
Library, Dean, Dr. Patricia Cutright
Operations, Vice President, Mr. Joseph K Han.
Registrar Services, Registrar, Ms. Lindsey Brown
Student Success, Dean (interim) Mr. Richard DeShields
University Advancement, Executive Director, Mr. Scott Wade

6. Credit Unit

CWU is on the quarter system, 10 weeks of classes per quarter, with a total of between 51 and 53 instructional days each quarter including 4 days of finals. One credit represents one lecture hour or two laboratory hours per week, along with the resulting time outside of class required to complete assignments. One academic year consists of three academic quarters; 156 total days including 144 class days (28.8 weeks) and 12 days of finals, exclusive of summer quarter offerings. Summer quarter has 6 week and 9 week sessions. Details are available in the CWU Academic Calendar available on the Registrar web page.

7. Tables

Complete the following tables for the program undergoing evaluation.

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering Technology

Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
		1st	2nd	3rd	4th	5th & above			Associates	Bachelors	Masters	Doctorates
2016-17	FT	8	27	31	17	10	93		N/A	[1]	N/A	N/A
	PT	0	1	0	0	2	3					
2015-16	FT	26	39	33	16	14	128		N/A	35	N/A	N/A
	PT	0	1	0	0	3	4					
2014-15	FT	17	21	26	28	11	103		N/A	26	N/A	N/A
	PT	0	1	0	1	0	2					
2013-14	FT	6	19	36	11	16	88		N/A	21	N/A	N/A
	PT	0	0	0	0	0	0					
2012-13	FT	11	29	17	10	18	85		N/A	21	N/A	N/A
	PT	2	2	0	0	2	6					

1. Current year Degrees Awarded totals are still being conferred. Will update this number upon site visit.

FT--full time
PT--part time

Table D-2. Personnel

Mechanical Engineering Technology

Year[1]: 2017

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[2]	2		0.35
Faculty (tenure-track)[3]	3		3
Other Faculty (excluding student Assistants)	1	1	1.25
Student Teaching Assistants[4]	0		0
Technicians/Specialists	2		1
Office/Clerical Employees	1		.25
Others[5]			

Report data for the program being evaluated.

1. Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

2. Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

3. For faculty members, 1 FTE equals what your institution defines as a full-time load.

4. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc.

5. Specify any other category considered appropriate, or leave blank.

Signature Attesting to Compliance

By signing below, I attest to the following:

That the CWU Mechanical Engineering Technology Program has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Technology Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual*.

Paul Ballard

Dean's Name (As indicated on the RFE)

Signature

6.29.17

Date