ABET
Self-Study Report

for the

Mechanical Engineering Program

at

California State University Maritime Academy

Vallejo, CA

01 July 2019

CONFIDENTIAL

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BACKGROUND INFORMATION

A. Contact Information

List name, mailing address, telephone number, fax number, and e-mail address for the primary pre-visit contact person for the program.

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B. Program History

Include the year implemented and the date of the last general review. Summarize major program changes with an emphasis on changes occurring since the last general review.

In 1929, the California State Assembly established the California Nautical School in Tiburon, California with programs in maritime navigation and engineering to support the merchant marine operations on the west cost for the United States of America. In 1939, the school changed its name to the California Maritime Academy - three years after passage of the Merchant Marine Act which directed the creation and maintenance of an adequate merchant marine to support United States international and domestic commerce and to meet the needs for national defense. In 1941, the current location, Morrow Cove in Vallejo, California became home to the California Maritime Academy.

The Mechanical Engineering (ME) program at the California Maritime Academy (Cal Maritime) was established in the late 1980s. It was first visited and evaluated for initial accreditation in 1995 by ABET/EAC. However, the program received a "not to accredit." As a result of this action the program went through substantial and major revisions from 1995 through 2002. The program was re-visited in Fall 2002 and received initial accreditation until Fall 2008. The next visit took place in Fall 2008 which resulted in an "Interim Report" and continued accreditation until 2011. The subsequent interim report that was submitted in 2010 resulted in continued accreditation until 2014. The general visit that had been scheduled in Fall 2014 was moved one year early to synchronize the ME accreditation cycle with the Engineering Technology program at Cal Maritime. During our last general visit in Fall 2013 the ME program received accreditation until Fall 2019.

In 2015, the name of the campus was officially changed from the California Maritime Academy to California State University Maritime Academy, with "Cal Maritime" as its designated shortened name. Since its commencement, Cal Maritime's academic departments reported to one

Academic Dean; one of the recent actions undertaken by the institution concerns the reorganization of its academic units into three separate schools. The three schools are named as the “School of Engineering”, the “School of Maritime Transportation, Logistics, and Management (MTLM)”, and the “School of Letters and Sciences (L&S)”. The goals of the multi-school model were: i) to plan for the development of new academic programs, ii) to inspire these new schools with clearer identities, focused visions and greater responsiveness to new fields of study, iii) to improve the quality of leadership with more specialized knowledge, iv) to increase support for faculty scholarship, v) to provide greater support for diversity, majors, operations, and educational needs, and vi) to create a more efficient overall operational framework that would be energized by certain decentralizations. The current Mechanical Engineering, Marine Engineering Technology, and Facilities Engineering Technology programs fall into the “School of Engineering”.

C. Options

List and describe any options, tracks, concentrations, etc. included in the program.

C.1. Coast Guard License Option (License Option)

The Coast Guard license option, hereafter called License Option, is designed for students who wish to use their engineering degree as a licensed marine engineer. The curriculum consists of the core ME courses, and additional courses intended to provide additional training for a marine engineer, much of which is required to obtain the merchant marine Third Assistant Engineer’s license. Students are required to obtain experience at sea through three summer cruises, two of them aboard the Training Ship Golden Bear, and one aboard a commercial vessel. Most of the courses required for the license, including all Engineering Plant Operations (EPO) courses are taught by the Engineering Technology Department.

In addition, students in the license option must pass a qualifying examination, administered by the U.S. Coast Guard, to obtain a Third Assistant Engineer, Steam, Motor and Gas Turbine Vessels, Unlimited Horsepower license.

This is clearly a very demanding option. Nonetheless, most of the ME students at Cal Maritime choose this option. For these students, sailing is the reason they choose to study at Cal Maritime, and this option serves them well.

C.2. ME Non-License Option (ME Option)

The ME Non-License Option, hereafter called ME Option, is intended for students who are not specifically interested in pursuing a career in the merchant marine as a licensed engineer. Students take the core ME courses, which combine traditional engineering courses with practical training. One cruise experience is required. This practical training and the cruise experience distinguish Cal Maritime from many other engineering schools and is excellent preparation for anyone entering the engineering profession. In addition to one cruise, two summer internships with industry are required in the ME Option.

D. Program Delivery Modes

Describe the delivery modes used by this program, e.g., days, evenings, weekends, cooperative education, traditional lecture/laboratory, off-campus, distance education, web-based, etc.

During the academic year, courses in the ME program are offered as an on-campus day program. The curriculum has traditional lecture and laboratory courses offered weekdays from Monday through Friday during 15-week semesters. The majority of the courses are offered during the Fall and Spring semesters. There are occasional evening classes students may elect to register for, but this is an exception rather than the norm.

The majority of students enrolled at Cal Maritime are full-time students. First courses begin at 07:00 on Tuesdays and Thursdays and 08:00 on other weekdays. The last classes are completed by 21:50. There are occasional, one-time certification courses that occur over weekends, but this typically amounts to less than five days throughout the program.

All ME students are required to complete one cruise, consisting of approximately sixty days at sea, aboard the Training Ship Golden Bear (TSGB) during the summer. Onboard, the students are a part of the engineering watch, performing day work and completing maintenance as the training ship visits various domestic and international ports. During this time the students follow the traditional engineering watch schedule typical on sea-going vessels. In addition, the students complete coursework on board.

License Option students are also required to complete two additional cruises, each consisting of a minimum of 60 days at sea. The first is aboard a commercial ship, while the second is again aboard the TSGB. Again, the students serve as part of the engineering watch, performing day work and completing maintenance as the training ship visits various domestic and international ports. During this time the students follow the traditional engineering watch schedule typical on sea-going vessels.

ME Option students are also required to complete two eight-week internship programs in engineering industry. During their internship, students follow the scheduling requirements of the host organization.

E. Program Locations

Include all locations where the program or a portion of the program is regularly offered (this would also include dual degrees, international partnerships, etc.).

During the academic year, the majority of the program’s curriculum is offered on the Cal Maritime campus located in Vallejo, CA. Some courses are also offered aboard the TSGB that is also located by our campus in Vallejo, CA during the academic year.

All licensed ME students participate in a practical training cruise on the TSGB during the summer between their freshman and sophomore academic year. This activity includes a minimum 60 days on board the vessel as it travels to various domestic and international ports.

During the summer between their sophomore and junior academic year, licensed ME students participate on commercial cruise, which entails sailing for approximately 60 days on a commercial vessel. This commercial cruise may take them to various domestic and international ports. Non-licensed ME students participate in an eight-week co-op/internship experience at an off-campus industrial location.

During the summer between their junior and senior academic year, licensed ME students participate as the leadership team of the second training cruise aboard the TSGB. During this minimum 60-day cruise, the TSGB travels to various domestic and international ports. Non-licensed ME students participate in a second eight-week co-op/internship experience at an off-campus industrial location.

F. Public Disclosure

Provide information concerning all the places where the Program Education Objectives (PEOs), Student Outcomes (SOs), annual student enrollment and graduation data is posted or made accessible to the public. If this information is posted to the Web, please provide the URLs.

The Program Education Objectives (PEO), Student Outcomes (SO) can be found on the Web at:
https://www.csum.edu/web/academics/programs3

General information about the Mechanical Engineering program can be found on the Web at:
https://www.csum.edu/web/academics/schools/me

Student enrollment data can be found on the Web at:
https://www.csum.edu/web/ir/home/enrollment-and-demographics

Graduation data can be found on the Web at:
https://www.csum.edu/web/ir/home/retention-and-graduation

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

Summarize the Deficiencies, Weaknesses, or Concerns remaining from the most recent ABET Final Statement. Describe the actions taken to address them, including effective dates of actions, if applicable. If this is an initial accreditation, it should be so indicated.

The ME program had no Deficiencies, Weaknesses, or Concerns in the last ABET Final Statement in 2014 as a result of the Fall 2013 visit.

GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions

Summarize the requirements and process for accepting new students into the program.

New student (e.g. freshman) admission for the Cal Maritime Mechanical Engineering program follow not only the basic student admission criteria for the California State University (CSU) system, but also additional requirements because the program is considered impacted. The admissions requirements, both general and impacted are discussed.

A.1. Basic Student Admissions for First Time Freshmen

First time freshmen will qualify for admission if they are a high school graduate and have completed with a grade of C- or better the following required courses:

- 2 years of social science including 1 year of US history
- 4 years of English
- 3 years of Math (a 4th year is highly recommended)
- 2 years of laboratory science
- 2 years of a language other than English
- 1 year of visual and performing arts
- 1 year of electives from the categories above beyond the stated minimums

and meet the scholarship and test requirements.

The scholarship and test requirements are based on an eligibility index. The eligibility index is given by the following formula. An eligibility index score is calculated based on the grade point average required courses taken in grades 10-12 and best test scores (SAT or ACT). The minimum index tables for California resident and non-residents can be found at the following website: https://www2.calstate.edu/apply/eligibility-index. The applicant's high school Grade Point Average (GPA) is multiplied by 800. This is added to critical reading and math scores from the Scholastic Achievement Test (SAT) reasoning test.

GPA x 800 + Combination of SAT Math and SAT Reading scores = SAT Index

For the students using the ACT, the GPA is multiplied by 200 and then added to ten times the ACT composite score to obtain the index.

GPA x 200 + (ACT composite x 10) = ACT Index

For persons who are California high school graduates (or residents of California for tuition purposes) the minimum eligibility index is 2900 SAT (694 with ACT). Applicants with a 3.0 GPA or higher can be admitted without an SAT or ACT score although it is highly recommended to take either test.

For persons who neither graduated from a California high school nor are a resident of California for tuition purposes, the minimum eligibility index is 3502 SAT (842 with ACT). Non-resident applicants with a 3.61 GPA or higher can be admitted without an SAT or ACT score although it is highly recommended to take either test. Graduates from secondary schools in foreign countries must be evaluated to have academic preparation and abilities equivalent to applicants eligible under these criteria. CSU campuses with impacted programs require SAT or ACT scores of all applicants for freshman admission.

A.2. Elevated "Impaction" Admission Requirements and Processes

Impaction is declared for academic programs in the California State University (CSU) when the number of applications meeting minimum CSU admission eligibility requirements exceeds the available space in the program. Elevated admission requirements combined with a competitive admission processes allow for a controlled number of admissions offers and helps balance the number of enrolling students with the number of available spaces. Competitive admission decisions are generally made based on highest admission eligibility index scores as described above for freshmen.

The following items are required:

- All applicants must have received either an SAT Math score of at least 570 or ACT Math score of 23
- The most recent math course (at least the immediate pre-requisite to calculus) must have been passed with a C- or better within five years of the application date.
- All other basic CSU eligibility requirements must be met.

The following items are recommended:

- Completion of a high-school course in physics
- Completion of four years of high school math
- Submission of a resume including the applicant's background connected to engineering, leadership and/or the maritime industry

To provide some quantitative measure of the incoming freshman classes during the review period, Table 1.1 shows the minimum and average composite ACT and SAT scores for those students.

Table 1.1. Standardized exam statistics for freshman admissions during the review period.

Academic Year	Composite ACT Min	Composite ACT Ave	Composite SAT Min	Composite SAT Ave	New students enrolled
2013-2014	19	24.9	1040	1244	41
2014-2015	20	25.6	1050	1240	33
2015-2016	18	24.5	940	1202	59
2016-2017	20	26.0	1100	1275	35
2017-2018	56	18	870	1221	56
2018-2019	20	25.1	1100	1296	38

B. Evaluating Student Performance

Summarize the process by which student performance is evaluated and student progress is monitored. Include information on how the program ensures and documents that students are meeting prerequisites and how it handles the situation when a prerequisite has not been met.

The full Academic Regulations and Policies for Cal Maritime can be found in the Catalog, which can be found online (Link to Academic Regulations and Policies in the Online Catalog). This section will highlight the polices that address the prompt.

Once enrolled on campus, students are evaluated on a course-by-course basis. The evaluation method is carried out by the faculty based on the grading policy described in the course syllabus. All required engineering courses use a letter grading scheme (A-F). The required grade for passing is generally D- or better although there are two major exceptions. In the math courses, the completion of pre-requisite courses with C- or better is required. Other courses are designated as demonstrating competency for requirements for the US Coast Guard (USCG) Standard of Training, Certification, and Watchkeeping for Seafarers (STCW). By the requirements of these standards, students must pass the class with a grade of C- or better.

Records of student progress at Cal Maritime are maintained through the Registrar’s Office. The office monitors and records student performance and progress. In addition, it maintains the student data in the PeopleSoft Enterprise Student Administration software package. The software allows students to register for, add, or drop courses, monitor their grade point average (GPA), and review their academic progress. The software is also used by faculty to upload final grades into student records. The software provides degree progress reports and unofficial transcripts from which students and advisors can monitor students’ progress through the program.

The university has also implemented the SmartPlanner in its PeopleSoft package. It is an interactive online eAdvising tool that interfaces with our student information system (PeopleSoft Campus Solutions) to allow students to proactively plan their courses. This tool gives students a visual representation of their academic status and can be used when meeting with advisors each semester to plan an appropriate path to their degree. SmartPlanner also allows the university to use the course planning information to determine demand for specific courses and to respond accordingly. The intent is to aid students in completing their degree in appropriate time while also providing the campus with course demand information for enrollment planning.

Cal Maritime recently implemented an EAB student success application locally named “The Passport”. With The Passport, advisors and faculty have the ability to look at a dashboard that quickly and succinctly summarizes a student’s progress and helps to identify areas that need to be focused for academic success. Major benefits of the platform include student progress tracking, advising notes, critical path alerts, predictive analytics, student risk level determination, case management, and historical trends. Additional applications that are utilized are progress report campaigns, advising appointments through live calendars, appointment reminders, and tutoring activity usage.

The monitoring of student academic process is ensured by academic advising provided by faculty as discussed later in Section D. Every semester, it is mandatory for the students to meet with their academic advisor during a designated advising period prior to registration for the next semester. Advising meetings are ensured by placing a registration hold that can only be released by faculty after having an advising meeting. During this meeting, the academic advisor checks the student progress and discusses all the prerequisites and co-requisites with the students. All faculty members follow the curriculum sheets (Link to webpage) and flow chart that is specifically developed for the faculty to keep track of all prerequisites and co-requisites for all the courses. Students may also consult the university advisors (discussed in Section D) for questions about their academic career path.

Pre-requisites and co-requisites are programmed into PeopleSoft by the Registrar’s Office. PeopleSoft will not allow a student to register for a course if the pre-requisites and co-requisites are not met. The only way a student is allowed to enroll in the course without having completed the prerequisite is with a “Waiver of Prerequisite Request”. The form requires the student to provide a compelling reason for the waiver and must be approved by the instructor (via add code), the major department chair of the student, and the major department chair of the course in which the student is trying to add.

Students are required to complete their degree program with a minimum cumulative grade point average of 2.0 in the three following areas: overall (all college level units at any institution including Cal Maritime), campus (all units completed at Cal Maritime), and major (all units designated in the major). Students are placed on academic probation if they have either:

- An overall, campus, or major cumulative GPA of less than 2.0, or
- Two semesters in a three-semester period with a semester GPA of less than 2.0

Students on academic probation are required to take a minimum of 12 units and a maximum of 15 units in consultation with their academic advisors to improve their GPA. In the probationary period students must:

- Complete a minimum of 12 units
- None of the grades can be a D, F, NC, or WU

- Earn a 2.00 semester grade point average or raise their cumulative grade point average to above 2.00

Students may repeat courses only if they earned grades lower than a C-. Up to 16 semester units may be repeated with "grade forgiveness." Grade forgiveness occurs when a student repeats a course and the new grade replaces the former grade in terms of the calculation of the student's grade point average; although no longer used in the grade point average, the previous grade remains on the transcript. Students may repeat an individual course for grade forgiveness no more than two times. Grade forgiveness shall not be applicable to courses for which the original grade was the result of a finding of academic dishonesty. Cal Maritime may permit students to repeat an additional 12 semester units with "grade averaging." In such instances the repeat grade shall not replace the original grade for grade point average calculation; instead both grades shall be calculated into the student's grade point average.

Students who have exceeded the 16-unit limit on grade forgiveness are placed on administrative academic probation. While under administrative academic probation, students must:

- Repeat as many classes as practical
- Pass all classes at the appropriate grade level
- Show progress toward the degree

Students who are on administrative academic probation and fail another course are disqualified from the institution.

Students repeating a course at another accredited college are expected to adhere to Cal Maritime's course transfer requirements. When a course is repeated elsewhere, the student will be given credit toward meeting the graduation requirement and the overall grade point average will be affected; however, the Cal Maritime grade point average will not be affected.

If students are unable to meet the terms of their probation, they are subject to academic disqualification. Additionally, a student who receives a grade of F, WU, or IC in a course for the third time at Cal Maritime will be academically disqualified.

Students may contest academic disqualification by appealing to the Dean of Engineering if they feel that there are extenuating circumstances that contributed to poor academic performance. This appeal must be made with 10 business days of the notification of academic disqualification. Appeals will be reviewed by the department chair, Dean of Engineering, and provost within 10 business days of receipt of the appeal.

Students that are academically disqualified may normally seek readmission after at least one full semester has passed. Students have the option of remediating a specific course grade of "D" or "F" through the Open University system available to members of the public. Students readmitted after academic disqualification will continue on probation and must meet all the criteria outlined above.

In addition to the GPA-driven academic probation mechanism, instructors (especially in lower-division courses) are able to provide unofficial early alert grades, which are used to identify students at risk of failing a course (defined as having D or lower grade in the course at the time). This triggers a letter from the Dean to the student warning them that they might fail and instructing them to seek help from their advisor and the course instructor. In addition, the university advisors reach out the students to have a meeting and discuss their situation. This early notification process has been implemented to improve retention rates of Cal Maritime students in all majors.

Students who have achieved academic excellence at Cal Maritime are honored and recognized through the following programs:

- President's List.
- Dean's List.
- Honors at graduation.
- Nomination to Pi Tau Sigma (Mechanical Engineering Honor Society).

The description and requirements of the above programs can be found in the Cal Maritime Catalog (http://catalog.csum.edu/) under "Academic Regulations and Policies."

C. Transfer Students and Transfer Courses

Summarize the requirements and process for accepting transfer students and transfer credit. Include any state-mandated articulation requirements that impact the program.

Transfer admission for the Cal Maritime Mechanical Engineering program follow not only the basic student admission criteria for the California State University (CSU) system, but also additional requirements because the program is considered impacted. A transfer student is anyone who comes with 30 or more semester units. The admissions requirements, both general and impacted, as well as the transfer articulation policies are discussed. To provide a sense of scale, the number of transfers into the Mechanical Engineering program are shown below in Table 1.2.

Table 1.2. Transfer students during the past six academic years

Fall Semester	Distinct Transfer Students
2013	13
2014	11
2015	9
2016	14
2017	5
2018	9

C.1. Basic Student Admission for Transfer Students

Lower-division transfer students are students who have graduated from high school and later attended a regionally accredited college but bring a total of fewer than 60 transferrable college semester units.

The basic admission requirements for lower-division transfer students are:

- Completion of a college-level English course and college-level math with grades of C- or better.
- Total college GPA must be at least 2.00
- All basic admission requirements for first-time freshmen must also be met.

The elevated impaction admissions requirements for lower-division transfer students are:

- One of the following must be met:
  - A college-level math course that is a pre-requisite course to calculus must have been passed with a C- or better within five years of the application term to be eligible for consideration along with either an SAT Math score of at least 550 from the pre-February, 2016 SAT, a score to be determined from the "new" SAT, or ACT Math score of 23
  - A college-level calculus course must have been passed with a C-or better within five years of the application term.
- All other CSU eligibility requirements must be met

The following items are recommended for lower-division transfer students:

- A college-level physics course (calculus-based with lab or engineering physics with lab) passed with a C- or better within five years of the application term
- A college-level chemistry course (with lab) passed with a C- or better
- A college-level calculus III course must have been passed with a C- or better within five years of the application term.
- An engineering properties of materials course must be passed with a C- or better.
- An engineering statics course must be passed with a C- or better.
- An engineering computer programming course with a C- or better
- A college U.S. History course (CSU GE equivalent course) must be passed with a C- or better.
- A lower-division humanities elective course (CSU GE area C2) with a C- or better.
- Submission of a resume including the applicant's background connected to engineering, leadership and/or the maritime industry

Upper-division transfer students are students who graduated from high school and later attended a regionally accredited college before bringing a total of 60 or more transferrable college semester units. The basic admission requirements for these transfer students are:

- Completion of a college-level English course, critical thinking course, and college-level math course, and oral communication course with grades of C- or greater
- Total college GPA must be at least 2.00.

The elevated impaction admissions requirements for upper-division transfer students are:

- A college-level physics course (calculus-based with lab or engineering physics with a lab) must have been passed with a C- or better within five years of the application
- A college chemistry course (with lab) must have been passed with a C- or better.
- A college-level calculus III course must have been passed with a C- or better within five years of the application term.
- An engineering properties of materials course must be passed with a C- or better.
- An engineering statics course must have been passed with a C- or better.
- An engineering computer programming course must have been passed with a C- or better
- A college U.S. History course (CSU GE equivalent course) must have been passed with a C- or better.
- A lower-division humanities elective course (CSU GE area C2) must have been passed with a C- or better.
- All other CSU eligibility requirements must be met.

The following item is recommended for upper-division transfer students:

- Submission of a resume including the applicant's background connected to engineering, leadership and/or the maritime industry

C.2. Transfer Articulation Policies

To be accepted for transfer credit, college courses must be taken at a regionally accredited institution, and the student must have received at least C- in the course. Engineering courses transferred for credit must have been approved by the Chair of the Mechanical Engineering or Engineering Technology Departments as well as the Registrar’s Office. Transfer courses that are older than 10 years will not be accepted. Because of the highly sequenced nature of our US Coast Guard licensed degree programs and Cal Maritime’s small size, transfer students in the Mechanical Engineering License Option program require a minimum of 3 years to complete their graduation requirements.

D. Advising and Career Guidance

Summarize the process for advising and providing career guidance to students. Include information on how often students are advised, who provides the advising (program faculty, departmental, college or university advisor).

The Mechanical Engineering program starts guiding students as soon as they arrive on campus. A faculty academic advisor is assigned to each student at the beginning of the student’s academic program. Freshman students go through a five-day orientation program right before the start of their first semester where they are introduced to all aspects of the academy’s life. This includes a one-hour meeting with the Dean of the School of Engineering and the Mechanical Engineering faculty. During this meeting, the faculty members introduce themselves and tell students about their areas of teaching and expertise. They also discuss program objectives and outcomes, curriculum structure, options and concentrations, student performance, the heavy semester load, survival skills and time management, and faculty advisor roles. The students are also given the curriculum sheets which list the course requirements for each option. The sheet is an important advising tool in showing students their semester as well as summer loads and their respective course offerings. A curriculum flow chart, which visually shows the prerequisite framework of the program, is shared with students to help them determine critical paths for their academic goals. In addition, students in their first year at Cal Maritime are enrolled in ENG 110 Introduction to Engineering & Technology. Part of this course is dedicated to familiarizing students with the processes at Cal Maritime, including the curriculum, program requirements, study habits, and using campus software applications (e.g. PeopleSoft, The Passport, and Brightspace).

Students are required to consult with their academic advisors (who are program faculty) in the following cases: during registration each semester, when adding or dropping courses, when taking an overload (over 20 units), or in the event that they have been placed on academic probation or administrative academic probation. Registration for courses is done through PeopleSoft and the students are given class priority enrollment appointments and guidelines through the Office of the Registrar. Before registration begins, students have a mandatory academic advising hold, blocking the registration process. Students are required to see their academic advisors so that the hold can be removed, and they can proceed with registration. This ensures that students meet with their advisors once a semester at a minimum. Additionally, advisors attempt to monitor and meet regularly with students that face academic challenges to assist the students with a recovery plan from their situation.

Students also have the opportunity to work with university advisors. Cal Maritime's university advisors promote student success by helping students to navigate University requirements, policies, forms, and deadlines, while educating them about other programs and opportunities that are available to assist with student success. The advisors are responsible for academically advising students, focusing predominantly on at-risk and probation students. Students who are on academic probation or administrative academic probation are required to meet with a university advisor throughout the term to review their academic progress. The university advisors collaborate with faculty advisors for major and general education course advisement and work with students to develop a plan, including support services, to ensure completion of all university requirements for graduation in a timely manner.

Career Services continues to be a great asset to ME students by assisting engineering students in finding full time jobs and summer internships. This is achieved through their partnerships with employers as well as working with the faculty and the students. Career Services holds fall and spring career fairs, workshops, trainings, and other engineering focused Career related meetings and training to prepare engineering graduates for job placement. Examples of these training workshops are:

- Job-preparedness
- Resume preparation and business letter writing
- Interviewing and job search strategies
- Dress-for-success seminars
- Business and cruise ship etiquette

- One-on-one job search counseling
- Mock, video-taped interviews

Career Services is an important partner if the placement of our engineering graduates after graduation.

E. Work in Lieu of Courses

Summarize the requirements and process for awarding credit for work in lieu of courses. This could include such things as life experience, Advanced Placement, dual enrollment, test out, military experience, etc.

Cal Maritime students have two options to receive credit in lieu of a course: i) challenging a particular course or ii) credit by an exam, such as Advanced Placement. Generally, these are rarely used. Courses that contain STCW and domestic licensure elements may only be satisfied by completing the course in which they are embedded. The process for obtaining credit, quoted from the catalog, is below.

E.1. Course Challenge

Students may receive credit for courses (grade: CR) by passing challenge examinations developed at Cal Maritime. The following rules apply:

1. Students must demonstrate substantial knowledge and background in the areas they are challenging.
2. Approval must be obtained for each challenge from the instructor and department chair. Applications are available in the Student Records Office.
3. The instructor must be presented with a receipt for the required fee, which must be paid prior to the challenge examination.
4. A course may be challenged only once.
5. Challenges will not be approved for courses in which any grade has been assigned, including “F”, “IC”, “WU”, or “W.”
6. Challenges will not be approved for courses in which a student is currently registered, or in a semester in which a student has dropped the course to be challenged.
7. Challenges are not allowed in certain cases, such as the GWE Exam and certain STCW classes.

E.2. Credit by Examination

Cal Maritime grants credit to those students who pass certain examinations that have been approved. These include the Advanced Placement (AP) examination of the College Board, College Level Examination Program (CLEP), International Baccalaureate (IB), and the CSU English Equivalency Examination (EEE).

F. Graduation Requirements

Summarize the graduation requirements for the program and the process for ensuring and documenting that each graduate completes all graduation requirements for the program. If applicable, describe the process for how course deviations are handled to ensure that graduation requirements are met. State the name of the degree awarded (Master of Science in Safety Sciences, Bachelor of Technology, Bachelor of Science in Computer Science, Bachelor of Science in Electrical Engineering, etc.)

Graduates from the Cal Maritime Mechanical Engineering program receive a Bachelor of Science in Mechanical Engineering. The student record in PeopleSoft is the primary tool used to ensure and document that each graduate has completed all requirements. In the Academic Advising Report, these requirements are broken down into requirements of the major, other Cal Maritime requirements, Math and Science requirements, American History and Government requirements, and Humanities and Social Science requirements. The student must have earned an overall, campus, and major GPA of 2.0 or better.

The student, academic advisors and academic administrators can access the Academic Advisement Report at any time. This is particularly useful when a student is registering for a new semester. The academic advisor can look at the academic advisement report and see how the student is progressing. Prior to the student's senior year, the Registrar's Office communicates with all students who anticipate graduating before the beginning of the next academic year and reviews the student's record to ensure that all degree requirements are met.

License Option students must earn their USCG Third Assistant Engineer's License prior to being awarded their degree. There are several requirements. The student must have demonstrated all STCW competencies in their courses. The student must have completed the appropriate number of sea-time hours through course work, sailing aboard the Training Ship Golden Bear, and sailing as an engineer commercially. The USCG License Programs Office maintains all records associated with STCW compliance and domestic licensure. Lastly, the student must pass the Coast Guard Exams. The exam, administered by the US Coast Guard, consists of seven exams in Steam Engines I and II, Diesel Engines I and II, Electricity, Safety, and General Subjects, in which the student must score 70% or better.

Additionally, the CSU Graduate Writing Assessment Requirement (GWAR) requires that all CSU students demonstrate competence in written communication before they are granted a baccalaureate degree. At Cal Maritime, students that have achieved junior standing, and have completed EGL 100 (English Composition) and at least 60 units, must either take EGL 300 (Advanced Writing) or challenge the course by taking the Graduate Writing Exam (GWE). Students who pass the GWE will receive credit for EGL 300.

Enrollment (Table 1.3) and graduate (Table 1.4) data are provided below to provide perspective about the student population through graduation. Note that FTES (Full Time Equivalent Students) is a statistic calculated where 1 FTES equals 30 semester units in a year. Since the ME students take significantly more than 30 semester units per year (counting summer programs) the FTES is higher than the head-count of full-time students.

Table 1.3. Mechanical program enrollment trends for the past six academic years

		Full Time		Part Time	
		Students	FTES	Student	FTES
Fall 2013	Female (F)	20	22.2	2	1.3
Fall 2013	Male (M)	182	213.9	9	5.5
Spring 2014	Female (F)	21	30.2	-	-
Spring 2014	Male (M)	179	275.1	2	1.3
Fall 2014	Female (F)	17	19.8	1	0.2
Fall 2014	Male (M)	168	198.6	8	4.7
Spring 2015	Female (F)	17	19.5	1	0.7
Spring 2015	Male (M)	160	190.7	7	4.5
Fall 2015	Female (F)	19	21.9	1	0.7
Fall 2015	Male (M)	187	217.0	5	2.5
Spring 2016	Female (F)	19	22.7	2	0.7
Spring 2016	Male (M)	174	207.2	4	2.1
Fall 2016	Female (F)	21	25.3	-	-
Fall 2016	Male (M)	168	191.0	9	4.3
Spring 2017	Female (F)	19	21.3	-	-
Spring 2017	Male (M)	154	178.1	8	5
Fall 2017	Female (F)	24	28.6	-	-
Fall 2017	Male (M)	166	190.7	5	3
Spring 2018	Female (F)	23	27.9	-	-
Spring 2018	Male (M)	166	200.0	1	0.5
Fall 2018	Female (F)	21	22.6	1	0.3
Fall 2018	Male (M)	168	201.9	7	4.3
Spring 2019	Female (F)	19	22.6	1	0.5
Spring 2019	Male (M)	163	189.8	4	1.5

Table 1.4. Number of Mechanical Engineering program graduates during the past six years. *Note that the 2018-2019 value does not include Summer 2019 graduates.

Academic Year	Distinct Graduates
2013-2014	29
2014-2015	32
2015-2016	48
2016-2017	34
2017-2018	36
2018-2019	36*

G. Transcripts of Recent Graduates

The program will provide transcripts from some of the most recent graduates to the visiting team along with any needed explanation of how the transcripts are to be interpreted. ***These transcripts will be requested separately by the Team Chair.*** *State how the program and any program options are designated on the transcript. (See 2019-2020APPM, Section I.E.3.a.)*

The transcripts of the recent Mechanical Engineering program graduates will be provided to the Team Chair. On the transcript, students in the Mechanical Engineering major will be identified as Plan: Mechanical Engineering. They should also have a Sub-Plan which indicates 1) their option (CG License Option or ME Option) and 2) stem (Energy or Design). A full discussion can be found in Section C. Options in the Background Information. The courses that constitute the three elective series called a stem, is presented as the elective courses in the Plan of Study in Criterion 5.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

Provide the institutional mission statement.

California State University Maritime Academy's mission is to:

- Provide each student with a college education combining intellectual learning, applied technology, leadership development, and global awareness.
- Provide the highest quality licensed officers and other personnel for the merchant marine and national maritime industries.
- Provide continuing education opportunities for those in the transportation and related industries.
- Be an information and technology resource center for the transportation and related industries.

B. Program Educational Objectives

List the program educational objectives and state where they may be found by the general public as required by APPM Section I.A.6.a.

Mechanical engineering graduates of the California State University Maritime Academy working in the engineering profession will:

A. Be well educated professionals who utilize their intellectual learning, applied technology experience, leadership skills and global awareness in successful careers, and continue to improve their skills through lifelong learning and advanced studies;

B. Effectively practice as professional engineers, managers, and leaders in the maritime and energy industries and a wide variety other fields, and as licensed engineers in the merchant marine;

C. Successfully combine fundamental engineering knowledge, core leadership skills and the practical experience gained at the Academy to turn ideas into reality for the benefit of society;

D. Be influential members of multidisciplinary teams, creatively and effectively contributing to the design, development, and objective evaluation of engineering components, systems, and products, and clearly communicating the work in an appropriate manner to their customers and colleagues; and

E. Personally assume and actively encourage peers to uphold the professional, ethical, social and environmental responsibilities of their profession.

The Mechanical Engineering Program Educational Objectives may be found on the University web page (https://www.csum.edu/web/academics/programs3).

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

Describe how the program educational objectives are consistent with the mission of the institution.

The Program Educational Objectives (PEO) are consistent with the mission of Cal Maritime. Both the first bullet in the mission statement and the first program educational objective (A) invoke the four "compass points" of the California Maritime Academy: intellectual learning, applied technology, leadership development, and global awareness.

The second PEO (B) is also parallel to the second mission bullet, in that both seek to create graduates who are the "highest quality licensed officers" (mission statement) and practicing "professional engineers, managers, and leaders".

The other PEOs (C, D and E) are more specific to the quality of the engineering graduates, but also reflect the core "compass points" of intellectual learning, applied technology, leadership development, and global awareness as specified in the institutional mission statement.

D. Program Constituencies

List the program constituencies. Describe how the program educational objectives meet the needs of these constituencies.

The ME program identifies its significant constituencies as its students, faculty, alumni, the engineering profession and prospective employers, and the Cal Maritime Advisory Council.

Based upon surveys and contact between faculty and alumni, we find our ME graduates in a variety of fields. Many do sail with the merchant marine, at least for a few years, but it is common to see graduates change career paths and seek a shore-side engineering position or to return to school for graduate study. Cal Maritime alumni are typically strong supporters of our program and are involved with the Academy through the alumni association and its board of directors. In addition to the maritime transportation industry there is a significant representation of our alumni in the areas of power generation, HVAC, and facility commissioning and engineering.

The Cal Maritime Advisory Council (CMAC) seeks to include this constituency in our assessment and improvement process for the university. Within CMAC, members are associated with a subcommittee for one of three schools. The CMAC subcommittee for the School of Engineering includes representation from industry and the ASME professional society. The full list of CMAC members can be found in Table 2.1, with the members of subcommittee for the School of Engineering in bold. The CMAC was formed in 2018 with a structure designed to support the realignment of programs to the three school model discussed in the Background Information under Program History. Prior, the engineering advisory committee was named as External Advisory Board (EAB) and the Maritime Industry Advisory Board (MIAB). However, throughout the review period, this organization has provided external feedback to the Mechanical Engineering Program. The CMAC generally meets twice a year: once in the fall and once in the spring semester. The spring meeting is scheduled on the same day as the senior design presentations to allow CMAC member participation in assessment of student performance.

The PEOs meet the needs of our constituencies by defining qualities of successful engineers. Our constituency is divided into groups (such as students and faculty) that want our students to become successful engineers, as well as groups (such as the CMAC and the engineering profession and employers) that require successful engineers to further their own aims. By defining qualities of successful engineers as our PEOs, our program meets the needs of groups who wish to become successful engineers or who require well-educated engineers.

Table 2.1. List of Cal Maritime Advisory Council (CMAC) members. Members on the subcommittee supporting the School of Engineering are in bold.

Name	Company	Job Title	School
John Amos	Amos Logistics	President	MTLM
Bruce Applegate	Scripps Institution of Oceanography	Associate Director of Ship Operations	L&S
Larry Asera	**Asera, LLC**	**Chairman, CEO and Founder**	**Engineering**
Mark Bailey	**Northrop Grumman Corp.**	**Engineering Manager**	**Engineering**
John Beard	Advanced Maritime Education	Capt., Third Mate, Unlimited Tonnage-All Oceans	MTLM
Dr. Mary K. Berkaw Edwards	University of Connecticut-Avery Point	Associate Professor of English	L&S
Del Boyle	**Verus Associates Inc.**		**Engineering**
Steve Brady	**Chevron Shipping Co LLC**	**Manager of Performance & Reliability**	**Engineering**
Kurt Carpenter	DHS/TSA Intelligence & Analysis Sacramento Region	Field Intelligence Officer	L&S
Lynden Davis	**ASME**		**Engineering**
Kim Estes	The Estes Group LLC	Expert Witness	L&S
Mike Jacob	Pacific Merchant Shipping Association	Vice President & General Counsel	L&S
Dale Keller	TSA		MTLM
Don King	Kaiser (Retired)	Healthcare Facilities Executive	MTLM
Lynn Korwatch	Marine Exchange of the SF Bay Region	Executive Director	MTLM
Manuch Nikanjam	**ASME SF Industry Relations Chevron Products Co.**		**Engineering**
Bob Piazza	**Price Pump Company**	**President & CEO**	**Engineering**
Ian Ralby	IR Consilium	President & CEO	L&S
Andy Schlegel	**Southland Industries**	**Contract Executive**	**Engineering**
Lisa Swanson	Matson Navigation Company	Director, Environmental Affairs	L&S
Liz Taylor	DOER Marine	President	L&S
Karen Vellutini	Devine Intermodal	Executive Vice President	MTLM
Brian Wilson	US Coast Guard		L&S

E. Process for Review of the Program Educational Objectives

Describe the process that periodically reviews the program educational objectives including how the program's various constituencies are involved in this process. Describe how this process is systematically utilized to ensure that the program's educational objectives remain consistent with the institutional mission, the program constituents' needs and these Criteria.

The current PEOs were presented to the EAB (predecessor to the CMAC) and the administration and approved in 2009. The PEOs are published in the official school catalog and school web site. They are communicated to the students in course syllabi and are covered in ENG 110, Introduction to Engineering and Technology. They are also communicated to the alumni, employers, and CMAC in various forms such as surveys or in cases where feedback is needed.

Every year during the President's Retreat, the campus President and his staff (Provost, Vice-Presidents, and Deans), faculty representation from the department chairs, the faculty Senate chair, and the Academic Senate Executive Committee members gather to discuss and exchange views as to the direction that the Academy is going and the challenges ahead. This brings up an opportunity for faculty and staff to review the mission of the Academy, and therefore, provides an opportunity for the ME department to review its Program Educational Objectives and their relations to this mission.

Input from the various constituencies is reviewed by the department annually as part of the assessment report. Objectives are reviewed in light of these constituent inputs and modifications are proposed if necessary. As a final step, the recommendations of the faculty for any changes to the PEOs must be presented to the CMAC for approval at the next meeting of the CMAC. Although approval has been the norm, any disapproval would lead to further faculty discussion. Recently, the Cal Maritime Advisory Council (CMAC) subcommittee for the School of Engineering was briefed and asked for feedback at their last meeting in January 2019. No major changes were recommended. The CMAC Subcommittee for the School of Engineering (and its predecessors) meeting minutes from this meeting, along with meetings from the prior advisory groups during the review period, will be available in a binder for review during the visit.

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

List the student outcomes and state where they may be found by the general public as required by APPM Section I.A.6.a. If the student outcomes used by the program are stated differently than those listed in Criterion 3, provide a mapping of the program's student outcomes to the student outcomes (1) through (7) listed in Criterion 3.

All graduates receiving a Bachelor of Science in Mechanical Engineering degree from the Cal Maritime are expected to have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The program Student Outcomes (SO) were revised in 2018 to follow the ABET revision to Criterion 3. The student outcomes may be found on the university's web page at https://www.csum.edu/web/academics/programs3

B. Relationship of Student Outcomes to Program Educational Objectives

Describe how the student outcomes prepare graduates to attain the program educational objectives.

The SOs are skills that students demonstrate through their coursework in the program. Through the application of these skills after graduation, it is expected that alumni will be able to meet our PEOs. Table 3.1 maps the student outcomes back to the appropriate PEOs.

Table 3.1. Mapping of student outcomes to program educational objectives.

Program Educational Objective	**Student Outcome**						
Mechanical engineering graduates of the California State University Maritime Academy working in the engineering profession will:	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A. Be well educated professionals who utilize their intellectual learning, applied technology experience, leadership skills and global awareness in successful careers, and continue to improve their skills through lifelong learning and advanced studies;	X	X		X	X		X
B. Effectively practice as professional engineers, managers, and leaders in the maritime and energy industries and a wide variety other fields, and as licensed engineers in the merchant marine;	X	X	X	X	X	X	X
C. Successfully combine fundamental engineering knowledge, core leadership skills and the practical experience gained at the Academy to turn ideas into reality for the benefit of society;	X	X			X	X	
D. Be influential members of multidisciplinary teams, creatively and effectively contributing to the design, development, and objective evaluation of engineering components, systems, and products, and clearly communicating the work in an appropriate manner to their customers and colleagues; and		X	X		X		
E. Personally assume and actively encourage peers to uphold the professional, ethical, social and environmental responsibilities of their profession.				X			

The PEOs are broader statements than the SOs and are defined by a combination of qualities graduates should have after completing the program rather than skills that are measured in students before completion. As such they bridge between the University Mission and the Student Outcomes. The broadest PEOs are related to most or all of the Student Outcomes, and also tend to mention fundamental engineering skills which are easily mapped to the SOs. The more narrowly mapped PEOs focus on the methods of work the graduates should have, in order to be a successful engineer. The SOs are specific and designed to be easily measured so that the program ensures that graduates are prepared to achieve the PEOs.

Each course has a number of Course Outcomes that are linked to the SOs, and performance criteria that describes how the evaluations are measured. Course outcomes are shown and included in the ABET Syllabi as part of the Course Portfolios. As the course outcomes are met, the SOs are met. As the SOs are met, the PEOs should be achieved.

CRITERION 4. CONTINUOUS IMPROVEMENT

This section of your Self-Study Report should document your processes for regularly assessing and evaluating the extent to which the student outcomes are being attained. This section should also document the extent to which the student outcomes are being attained. It should also describe how the results of these processes are utilized to affect continuous improvement of the program.

Assessment is defined as one or more processes that identify, collect, and prepare the data necessary for evaluation. Evaluation is defined as one or more processes for interpreting the data acquired though the assessment processes in order to determine how well the student outcomes are being attained.

Although the program can report its processes as it chooses, the following is presented as a guide to help you organize your Self-Study Report.

A. Student Outcomes

It is recommended that this section include (a table may be used to present this information):

1. *A listing and description of the assessment processes used to gather the data upon which the evaluation of each student outcome is based. Examples of data collection processes may include, but are not limited to, specific exam questions, student portfolios, internally developed assessment exams, senior project presentations, nationally-normed exams, oral exams, focus groups, industrial advisory committee meetings, or other processes that are relevant and appropriate to the program.*
2. *The frequency with which these assessment processes are carried out*
3. *The expected level of attainment for each of the student outcomes*
4. *Summaries of the results of the evaluation process and an analysis illustrating the extent to which each of the student outcomes is being attained*
5. *How the results are documented and maintained*

The Mechanical Engineering program at Cal Maritime has a strong data-driven process to assess the Student Outcomes (SO). The primary reference for the process is the Assessment System Manual, available to reviewers at the visit. The main points are summarized here, as well as the results of the assessment since the last ABET report. The ME department uses many sources of data for the continuous improvement process, both direct methods (rubric-based assessment of artifacts of student learning) and indirect methods (generally a survey or self-assessment). The processes are listed in Table 4.1 and discussed in detail in the next section. The overall flow of assessment information can be seen in Figure 4.1, illustrating the bodies from which the assessment data is drawn. The evaluation of the assessment data is carried out primarily by the faculty. Based on the data, they may recommend changes to the curriculum or changes to the assessment process. The results of the assessments during this period have generally met the benchmarks leading to no major changes within the program. However, the program has used the data to identify areas of improvement, both in the classroom and in the assessment process itself, which will be discussed later in this criterion.

Table 4.1. Assessment data collected by the Mechanical Engineering program

	Assessment	Constituency Assessed	Constituency Assessing	Goals	Frequency
Direct Assessment	Instructor Class Assessment of Student Work (ICA)	Students in ME courses	Mechanical Engineering Faculty	Assessment of Course Outcomes, Mapped to Student Outcomes (SO)	Annual, SO rotate on 2-year cycle
	Institution Wide Assessment of Student Artifacts	Cal Maritime Students	Faculty (Institution Wide Assessment Council)	Assessment of Institution Learning Outcomes (ILO)	Annual, ILO rotate on a 4-year cycle
	Employer Evaluation of Co-op (Internship) Students	ME Option Students	Employers	SO attainment	Annual
	Capstone Presentation Assessment	Capstone Project Students	Faculty and CMAC members viewing presentations	Assessment of Capstone Presentation, Mapped to SO	Annual
Indirect Assessment	Alumni Survey	Cal Maritime Mechanical Engineering Alumni	Mechanical Engineering Faculty	Assessment of Program Educational Objectives (PEO) and Student Outcomes in Retrospect	6 year cycle
	Employer Survey	Employers Attending Cal Maritime Career Fair	Employers of Cal Maritime ME graduates	PEO attainment	6 year cycle
	Senior Exit Survey	Senior ME Students	Mechanical Engineering Faculty	SO attainment	2 year cycle

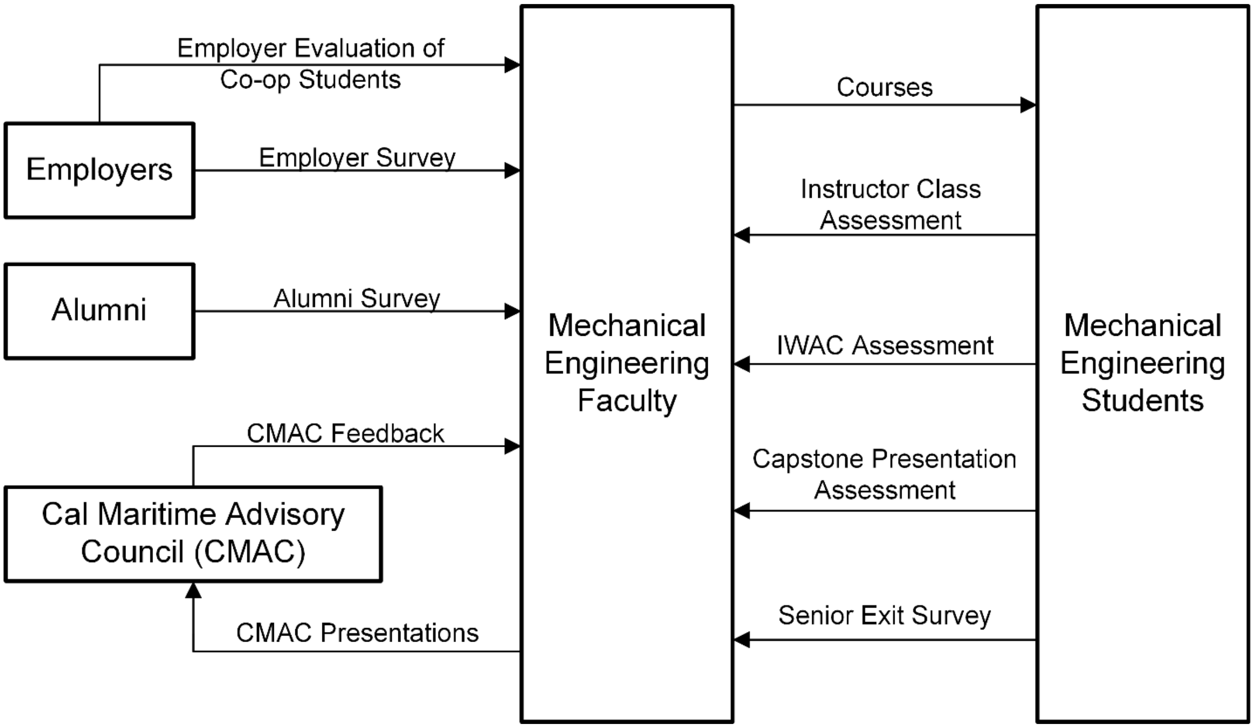

Figure 4.1 Flow chart of the feedback mechanisms utilized by the Mechanical Engineering program as a part of its continuous improvement process.

A.1. Instructor Class Assessment of Student Work

The primary mechanism for the assessment of student outcomes is from the instructor class assessment (ICA) of student work. This is the evaluation of student work carried out by the faculty for use in the assessment of the program's achievements of its student outcomes. The ICA was revamped in Summer 2018 as a part of the changes made to implement the revised EAC Criterion 3 and 5. The following sections present: i) the processes of assessment and evaluation (also documented in the Mechanical Engineering program's Assessment System Manual) ii) the results from the Academic Year 2018-19 assessment, and iii) a discussion of the ICA process and results prior to the changes in Summer 2018.

A.1.1. Assessment

Criterion 5 contains the mapping of course outcomes to student outcomes in Table 5.3. Based on that table, the program selected courses in which instructor class assessment would occur. The selections were made such that every student outcome would be assessed in at least three courses. To address some previous concerns with the assessment process (refer to Section B.2), the seven student outcomes are assessed on a rotating two-year cycle. Beginning in Academic Year 2018-19 (the first year of implementation of the new EAC Student Outcomes), student outcomes 1, 2, 3, and 6 were assessed. These will again be assessed in Academic Year 2020-21. In Academic Years 2019-20, student outcomes 4, 5, and 7 will be assessed. In documentation, these are designated Cycle 1 and Cycle 2 respectively.

For the course level assessment, the instructor selects appropriate samples of student work that demonstrates attainment of course outcomes. These samples may include exam questions, quiz problems, homework problems, reports, or other assignments. The student work is assessed by the instructor on a 5-point scale, where 5 is considered mastery and 1 is considered developing. The instructor records the data into an Excel spreadsheet, which then maps the data onto the program student outcomes. The spreadsheets are then collected by the department assessment coordinators and the data aggregated for the department.

A.1.2. Evaluation

The aggregation of the course level data to generate program level findings marks the end of the assessment process as defined by the prompt. The evaluation process follows, where the program level data is compared to the benchmark and disseminated to the faculty for discussion. Currently, the benchmark is met when one of the two criteria are met: i) an average score of 3 or better, or ii) 70% of students scoring 3 or better. This benchmark originates from the assessment process before the changes to EAC Criterion 3 and 5. It will be reviewed upon the completion of the first cycle of student outcome assessment during the Fall 2020 semester. The aggregated data is then disseminated to the faculty for discussion in the following Fall semester.

The data and feedback are compiled and then presented in an annual Student Outcome Assessment Report as well as the Annual Program Report for the university. These reports generally include notable findings and recommendations based on the data. In general, the findings can be categorized on the course level or the program level. If only one or two data points fall outside the benchmark, recommendations are generally made to the instructor on the course level to review the assessment data. In the review, the instructor can determine the causes for the results and consider changes in the course that may address those causes. If there are several courses that fall outside of the benchmark or an entire student outcome falls outside the benchmark, a program level response must be developed and presented to the program’s leadership for implementation. In terms of archives, all of the documentation associated with the instructor class assessment, such as spreadsheets, reports, and presentations are maintained within a Dropbox folder that is shared between all members of the faculty involved with assessment.

For Academic Year 2019-20, the assessment plan was implemented for Cycle 1, which assessed program student outcomes 1, 2, 3, and 6. A sample of the course level information provided can be seen in Figure 4.2. The figure illustrates the cover page that represents the aggregated results of the scoring data. These spreadsheets are submitted to the program’s assessment faculty and aggregated on the program level as seen in Table 4.2. The data show that the courses did all meet the current benchmark using either the average score or met by percentage. The only item of note was that Student Outcome 1 met the average requirement but did not meet the percentage requirement in ME 349 Fluid Thermal Lab. At the time of this report, the data are being disseminated to the faculty for discussion during the start of the Fall 2019 semester. At the ABET Accreditation Visit, the report, assessment spreadsheets, and associated samples of student work will be available for review.

Course #	Course Title	Instructor Name	Year	Semester		
ME360	Instrumentation	Holden	2018	Fall		

Course Outcomes		Assessment Instrument	Assessment Results				
	(List below as stated in syllabus)	(i.e. Exam Question, Quiz, HW Problem; Use same name as portfoilio entry)	ME Student Outcomes Assessed	Mean	Std. Dev	% Scoring 3 or higher	# Students
1	Students will have knowledge of data acquisition systems and components.	Final problem 1	1	4.47	1.96	97%	37
2	Students will be able to specify signal conditioning specifications.	Final problem 6	1,2	4.63	1.99	95%	37
3	Students will be able to compute descriptive statistics for experimental data.	Exam 2 Problem 2	1,2,6	4.42	1.90	97%	37
4	Students will be able to understand probability concepts and read statistical distribution tables.	Final problem 3	1	4.88	2.08	100%	37
5	Students will be able to quantify the uncertainty of experimental data.	Final problem 4	6	4.62	1.98	100%	37
6	Students will be able to carry out linear regression and understand measurements of correlation for paired data sets.	Exam 2 problem 5	1	3.59	1.67	73%	37

ME Student Outcomes		Mean	% 3 or higher
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	4.40	92%
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	4.52	96%
3	an ability to communicate effectively with a range of audiences	0.00	0%
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	0.00	0%
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	0.00	0%
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	4.52	99%
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	0.00	0%

Figure 4.2. Sample data set for course level assessment for ME 360. Results from the course outcomes (*top*) are mapped onto the program student outcomes (*bottom*).

Table 4.2. Academic Year 2018-19 Instructor Class Assessment Data for Cycle 1 program student outcomes.

Cal Maritime Department of Mechanical Engineering
Instructor Class Assessment

AY 2018-19

Cycle 1

Outcomes Assessed	1	2	3	6
Classes	9	5	5	5
Met by Mean	9	5	5	5
Met by %	8	5	5	5

Averages

Course	Semester	Instructor	SO 1 Mean	SO 2 Mean	SO 3 Mean	SO 6 Mean
ME339	Spring	Nordenholz	3.89		4.00	3.99
ME349	Fall	Tsai	3.07		3.40	3.14
ME350L	Fall	Snell	4.31			
ME360	Fall	Holden	4.40	4.52		4.52
ME392	Spring	Oppenheim	3.98			
ME394	Fall	Bagheri	3.74	4.07		
ME436	Spring	Holden	4.51	4.22		
ME444	Spring	Bagheri	3.63	3.80	4.04	
ME460L	Spring	Snell	4.97		4.64	4.97
ME494	Spring	Oppenheim		4.25	4.20	4.10

Percentages

Course	Semester	Instructor	SO 1 % >3	SO 2 % >3	SO 3 % >3	SO 6 % >3
ME339	Spring	Nordenholz	90%		97%	92%
ME349	Fall	Tsai	57%		98%	81%
ME350L	Fall	Snell	94%			
ME360	Fall	Holden	92%	96%		99%
ME392	Spring	Oppenheim	88%			
ME394	Fall	Bagheri	81%	95%		
ME436	Spring	Holden	98%	90%		
ME444	Spring	Bagheri	83%	84%	92%	
ME460L	Spring	Snell	100%		100%	100%
ME494	Spring	Oppenheim		85%	100%	100%

A.1.3. Instructor Class Assessment of Student Work Prior to AY 2018-19

For the completeness of this document, data and reports from the instructor class assessment of student work from 2013 to 2018 (prior to the changes to EAC Criterion 3 and 5) will be discussed. During this period, the instructor class assessment was to be conducted biennially. The process for the course level instructor class assessments was similar to the process described for the current assessment; however, it was done for all classes in the Mechanical Engineering program every other year. Due to some challenges in the process (discussed in Section B. Continuous Improvement) these assessments were carried out in Academic Years 2015-16 and 2016-17.

The data from the Academic Year 2015-16 and 2016-17 assessments are shown in Figure 4.3 and Figure 4.4 respectively. The benchmark for a student outcome was met if the results showed: i) an average score of 3 or better, or ii) 70% of students scoring 3 or better. In both data sets, all courses met the benchmark and most courses met both the condition on score and percentage. However, in both years, there were a couple of classes that met the benchmark by average score but fell just below the percentage of students.

The program faculty reviewed the results and discussed any recommendations that should be made. The findings were then compiled into a Student Outcome Assessment Report, which will be made available for review during the visit. A sample from the Student Outcome Assessment Report for Academic Year 2016-17 can be found in Figure 4.5. This excerpt highlights some of the common findings. First, there was a note regarding ME 349, which met the benchmark by one of the two criteria (met with an average of 3.41 but 67% scored 3 or better). As a result, a recommendation was given to the instructor to review course outcome mapping and examine any possible improvements. Second, for Student Outcome 4, the program level recommendation did not relate to a particular class. However, it refers to a concern about the limited sample size of 2 classes. The appearance of this concern in the reports and from faculty were a part of the motivation for the new revised instructor class assessment methods and will be discussed in the Continuous Improvement Process as well.

Red flags: Average belc 3
Passing belo 70%

Instructor Class Assessment (ICA) Quantitative Measures 2015-2016

					SO1		SO2		SO3		SO4		SO5		SO6		SO7		SO8		SO9		SO10		SO11		SO12		SO13		SO14		SO15		SO16	
Course	Year	Semester	Instructor	Stem	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Perce	Ave	Percent ≥ 3
ME 240	2	Spring	Tsai	Energy	3.8	79%							3.78	78%																						
ME 340	3	Fall		Energy																																
ME344	3	Spring	Tsai	Energy	4.03	87%							4.03	87%													4.05	86%								
ME 440	3	Spring	Bagheri	Energy	3.5	81%			4.06	100%			3.5	81%															3.5	81%						
ME 349	4	Fall	Tsai	Energy	4.29	76%	4.23	76%	4.18	75%	4	77					4.15	79%							4.23	76%	4%	76%	4.18	75%			4	77%	4.15	79%
ME 394	4	Fall	Bagheri	Energy	4	85%			4.19	92%			4	85%			4.49	98%			4.49	98%			4.28	94%	4	85%	4	85%						
ENG 440	4	Fall		Energy																																
ENG 440	4	Fall		Energy																																
ME 442	4	Fall	Pronchick	Energy	4.6	100%			4.7	100%			4.5	100%	4.6	100%	4.8	100%			4.9	100%			4.6	100%	4.6	100%	4.6	100%					4.8	
ME 444	4	Spring	Bagheri	Energy	4.07	88%			4.3	92%			3.5	100%			3.5	100%			3.5	100%							4.27	88%						
ME 230	2	Fall	Pronchick	Mech.	3.8	82%			3.3	69%			3.3	67%											3.6	69%	3.6	74%	3.8	85%			3	62%		
ME 230	2	Fall	Oppenheim	Mech.	3.6	70%							3.4	66%			3.7	73%																		
ME 232	2	Fall	Nordenholz	Mech.	4.1	84.8							4.1	84.8																						
ME232	2	Fall	Snell	Mech.	4.31	98%							4.31	98																						
ME 330	2	Spring	Snell	Mech.	3.96	82%							3.96	82%													3.91	82%								
ME 332	2	Spring	Oppenheim	Mech.	2.36	45%							2.36	45%																						
ME 339	3	Spring	Nordenholz	Mech.	4.35	96%	4.47	98%					4.12	93%			4.26	95%							4.33	95%	4.12	93%	4.33	96%					4.4	97%
ME 392	3	Spring	Oppenheim	Mech.	3.56	72%							3.56	72%																						
ME 436	3	Spring	Holden	Mech.					3.8	83%															4.18	91%	4.07	92%			4.19	92%				
ME 430	4	Fall	Nordenholz	Mech.	3.7	77.2	4.48	97.1					3.7	77.2			4.48	97.1							3.75	81.4	3	52.2	3.75	81.4						
ME 432	4	Spring		Mech.																																
ENG 250	2	Spring	Holden	Inst/Ctr	3.86	81%							3.81	80%											3.62	82%	3.81	80%								
ENG 250	2	Spring	Holden	Inst/Ctr																																
ME 350	3	Fall	Snell	Inst/Ctr	3.91	88							3.91	88																						
ME 350L	3	Fall	Snell	Inst/Ctr			3.89	91%			3.86	90%													3.96	92%									3.88	85%
ME 360	3	Fall	Holden	Inst/Ctr	4.16	90%	3.95	87%	4.11	88			3.9	85%											4.33	92%	3.52	69%								
ME 360L	3	Fall	Holden	Inst/Ctr	4.36	93%																														
ME 460	3	Spring	Snell	Inst/Ctr	3.88	78%							3.88	78%											3.88	78%										
ME 460L	3	Spring	Snell	Inst/Ctr																																
ENG 110	1	Fall	Pronchick	Design											4.5	96%			4.8	98%	4.4	96%	4.6	97%												
ENG 210	1	Fall	Tsai	Design	4.09	88%							3.62	77%							4.14	88%			4.08	87%										
ME 220	2	Fall	Gutierrez	Design																					4.65	100%										
ENG 300	3	Fall	Gutierrez	Design	3.33	79%							4.02	97%											4.34	100%										
ME 490	3	Spring		Design																																
ME 492	4	Fall		Design																																
ME 429	4	Spring		Design																																
ME 494	4	Spring		Design																																
	Number meeting:				22	22	5	5	8	7	2	2	20	18	2	2	7	7	1	1	5	5	1	1	14	13	10	10	8	8	1	1	2	1	4	3
	Percent meeting:				96%	96%	100%	100%	100%	88%	100%	100%	95%	86%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	93%	91%	91%	100%	100%	100%	100%	100%	50%	100%	100%
	Total having				23	23	5	5	8	8	2	2	21	21	2	2	7	7	1	1	5	5	1	1	14	14	11	11	8	8	1	1	2	2	4	3

	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	SO10	SO11	SO12	SO13	SO14	SO15	SO16
Notes:	Fine	Fine	Fine	OK	Fine	OK	Fine	OK	Fine	OK	Fine	Fine	Fine	OK	OK	Fine
	Over-assessed			Under-asses	Over-assesse	Under-assessed		Under-assessed		Under-asses	over-assessed?			Under-asses	Under-assessed	

Figure 4.3. Instructor Class Assessment Data for Academic Year 2015-16.

Instructor Class Assessment (ICA) Quantitative Measures 2016-2017

Red flags:	0	Note: 4 cases where average was acceptable but % slightly below 70%. Considered ok since 1 crieterion met and other was not dramatically below.
Average below	3	
Passing below	70%	

					PO1		PO2		PO3		PO4		PO5		PO6		PO7		PO8		PO9		PO10		PO11		PO12		PO13		PO14		PO15		PO16	
Course	Year	Semester	Instructor	Stem	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3	Ave	Percent ≥ 3
ME 240	2	Spring	Tsai	Energy	3.507	73%							3.602	76%																						
ME 340	3	Fall	Bagheri	Energy	3.92	86%							3.92	86%																						
ME 344	3	Spring	Tsai	Energy	3.724	77%							3.724	77%													3.83	83%								
ME 440	3	Spring	Bagheri	Energy	4.32	95%			4.83	100%			4.32	95%															4.42	96%						
ME 349	4	Fall	Tsai	Energy	3.82	76%	3.54	72%	3.41	67%	3.38	78%	3.6	73%			3.38	100%							3.54	72%	3.82	84%	3.41	67%					3.38	78%
ME 394	4	Fall	Bagheri	Energy	4.11	87%			4.19	91%			4.11	87%			4.31	97%			4.31	97%			4.22	93%	4.11	87%	4.11	87%						
ME 442	4	Fall	Pronchick	Energy	3.6	81%			3.6	81%			3.6	81%	3.4	75%	3.6	67%			3.2	67%			3.4	76%	3.6	81%	3.6	81%					3.4	71%
ME 444	4	Spring	Bagheri	Energy	4.54	88%			4.39	94%			4.54	88%			4.53	100%			4.53	100%							4.54	88%						
ME 230	2	Fall	Pronchick	Mech.	3.9	84%			4.1	97%			3.9	88%											4.1	98%	4	91%	4.3	100%			3.80	93%		
ME 232	2	Fall	Snell	Mech.	3.91	82%							3.91	82%													3.78	80%								
ME 330	2	Spring	Hadian	Mech.																																
ME 332	2	Spring	Hadian	Mech.																																
ME 339	3	Spring	Nordenhol	Mech.	4.55	100%	4.58	100%					4.5	100%			4.54	96%							4.54	100%	4.5	100%	4.55	99%					4.56	99%
ME 392	3	Spring	Jorge	Mech.																																
ME 436	3	Spring	Holden	Mech.																																
ME 430	4	Fall	Nordenhol	Mech.	4.7	100%	4.72	100%					4.69	100%			4.67	100%							4.69	100%	4.72	100%	4.69	100%						
ME 432	4	Spring	Jorge	Mech.																																
ENG 250	2	Spring	Snell	Inst/Ctr	4.187	87%							4.187	87%													4.357	90%								
ENG 250 L	2	Spring	Holden	Inst/Ctr																																
ME 350	3	Fall	Snell	Inst/Ctr	4.131	81%							4.131	81%																						
ME 350L	3	Fall	Snell	Inst/Ctr			4.015	89%			3.997	88%													4.015	89%									3.866	92%
ME 360	3	Fall	Holden	Inst/Ctr																																
ME 360L	3	Fall	Holden	Inst/Ctr																																
ME 460	3	Spring	Snell	Inst/Ctr	3.952	78%							3.952	78%													3.952	78%								
ME 460L	3	Spring	Snell	Inst/Ctr			4.564	98%																	4.564	98%	4.564	98%								
ENG 110	1	Fall	Pronchick	Design											4.3	99%			4.4	100%	4.3	99%	4.4	100%											4.1	100%
ENG 210	1	Fall	Tsai	Design	3.91	84%							3.91	84%							4.64	100%			3.89	84%	4.67	100%								
ME 220	2	Fall	Oppenhein	Design																						96%										
ENG 300	3	Fall	Hadian	Design																																
ME 490	3	Spring	Pronchick	Design					4.00	96%			4.00	93%	4	97%			3.9	93%															4.2	100%
ME 492	4	Fall	Oppenhein	Design																																
ME 429	4	Spring	Oppenhein	Design																																
ME 494	4	Spring	Oppenhein	Design																											4.05	84%				
	Number meeting:				16	16	5	5	7	6	2	2	17	17	3	3	6	5	2	2	5	4	1	1	9	10	12	12	8	7	1.00	1	1.00	1	6	6
	Percent meeting:				100%	100%	100%	100%	100%	86%	100%	100%	100%	100%	100%	100%	100%	83%	100%	100%	100%	80%	100%	100%	100%	100%	100%	100%	100%	88%	1.00	100%	1.00	100%	100%	100%

Figure 4.4. Instructor Class Assessment Data for Academic Year 2016-17.

Student Outcome 3: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Previous Recommendations: No further action required.

Status of Previous Recommendations: N/A.

This Year's Data: According to the instructor course assessments (Table 5), course outcomes associated with SO 3 were assessed in 7 courses, with 7 meeting a satisfactory level (mean of 3.0 or greater). 6 courses met our threshold of 70% achieving a score of 3 or better.

Faculty Recommendation: One course just fell below one of the thresholds (ME 349 with 67% with a score of 3 or better). It meets the standard of the mean greater than 3.0, and is only a few percentage points below the other standard. Regarding the program quality, the aggregated numbers are satisfactory, and we do not advise changes. The instructor for ME 349 will examine the course outcomes that map to this student outcome to see if there are changes that could improve this particular course.

Student Outcome 4: an ability to function on multi-disciplinary teams

Previous Recommendations: This outcome needs more data. Capstone self-evaluation has been used in the past.

Status of Previous Recommendations: N/A

This Year's Data: According to the instructor course assessments (Table 5), course outcomes associated with SO 4 were assessed in 2 courses, both meeting a satisfactory level (mean of 3.0 or greater). The courses met our threshold of 70% achieving a score of 3 or better.

Faculty Recommendation: Identify courses to assess this better.

Figure 4.5. Sample of the Annual Student Outcome Assessment Recommendation 2016-17.

A.2. Institution Wide Assessment of Student Artifacts

Not only is student work assessed at the program level, it is also assessed at the institutional wide level as well. The Institution-Wide Assessment Council (IWAC) is tasked with assessing the Institution-Wide Learning Outcomes (ILO) for the university in part for Western Association of Schools and Colleges accreditation. IWAC is made up of faculty members from all three schools. The campus has nine ILOs:

A. Oral and written communication
B. Creative and critical thinking
C. Quantitative reasoning
D. Lifelong learning
E. Discipline specific skills
F. Information fluency
G. Leadership and teamwork
H. Ethical awareness
I. Global learning

Of those nine ILOs, IWAC carries out assessment of all but discipline-specific skills (carried out by the individual programs) and leadership and teamwork (carried out by the Edwards Leadership program). The ILOs can be related to the Mechanical Engineering program outcomes as well, as shown in Table 4.3.

Table 4.3. Mapping of ILO to ME student outcomes.

Institution-wide Learning Outcomes (ILO)	Year Last Assessed	ME Program Student Outcome						
		1	2	3	4	5	6	7
A. Oral and Written Communication	2018-19			X				
B. Critical and Creative Thinking	2015-16		X					
C. Quantitative Reasoning	2017-18	X					X	
D. Lifelong Learning	2016-17							X
F. Information Fluency	2016-17							X
H. Ethical Awareness	2016-17		X		X			
I. Global Learning	2015-16		X		X			

Each year, one to two of the ILO are assessed campus wide. Similar to the Mechanical Engineering program's instructor class assessment, the IWAC assessment relies on instructor assessment of student artifacts related to the ILO. IWAC identifies the courses where these outcomes are introduced and mastered. The council then provides instructors in those courses with a rubric to assess student artifacts of work. Instructors carry out the assessment and provide the data to the council.

During the summer, IWAC meets to complete the assessment process and evaluate the findings. The committee meets for a full week to complete much of this process. The week begins by aggregating and organizing the data into different groups, such by major, gender, and ethnicity. With a complete data set, IWAC then evaluates the data by comparing the numbers to the benchmarks. This benchmark is generally 70% of students scoring satisfactory or better. The particular value depends on the scale used (i.e. ≥3 on a 4-point scale or ≥4 on a 6-point scale). Lastly, based on the results, recommendations are made. These recommendations may be made to particular departments, programs, or to the council itself if there are concerns about the assessment process. The process, rubrics, data, and findings are compiled into an annual report which is not only distributed to all the departments, but also made available to the public on the university's website (Link to IWAC webpage). The data and findings provided by IWAC are valuable because they provide a second form of instructor assessment that is reviewed by a body outside of the program. It provides another and somewhat independent perspective of the Mechanical Engineering program. In fact, IWAC data was a major contributor in the development of a curriculum improvement in information fluency, as discussed later in this self-study (Link).

Results from the 2018 and 2019 IWAC assessments are presented. In Academic Year 2017-18, IWAC assessed Quantitative Reasoning (ILO-C). The report was completed during Summer 2018. The findings were broken down by program (Figure 4.6) and compared against the benchmark of 70% scoring 4 or better out of 6. The Mechanical Engineering programs passed the benchmark with 73% scoring 4 or better. While recommendations were made by IWAC, none directly impacted the Mechanical Engineering program. In Academic Year 2018-19, IWAC assessed Written and Oral Communication. The report was completed recently at the start of Summer 2019. Of particular interest to the program is the breakdown of performance on the mastery level. In this report, the data are broken down by dimensions (e.g. specific criteria) as different dimensions were used for different programs. In written communication (Figure 4.7) The Mechanical Engineering program was found to meet the benchmark in mechanics but not in content. In oral communication (Figure 4.8), the Mechanical Engineering program was found to meet the benchmarks in all dimensions. Based on the findings, IWAC has recommended that the programs examine the potential causes for dimensions not meeting the benchmark. As a result, the Mechanical Engineering faculty will be briefed on the findings and discuss responses during the Fall 2019 semester.

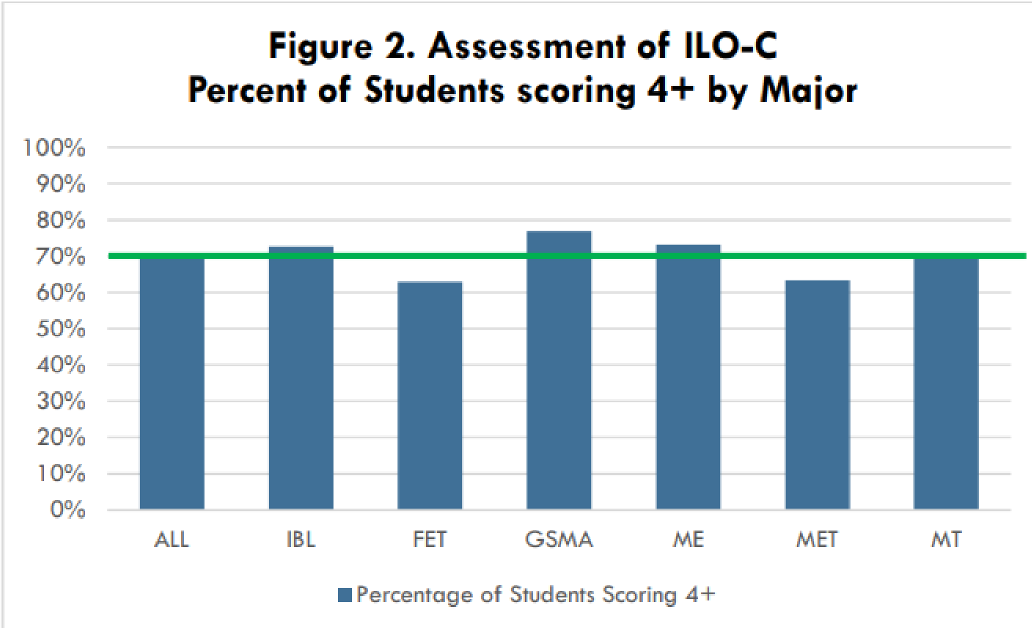

Figure 4.6. IWAC assessment data for ILO-C Quantitative Reasoning. The benchmark is the line shown in green.

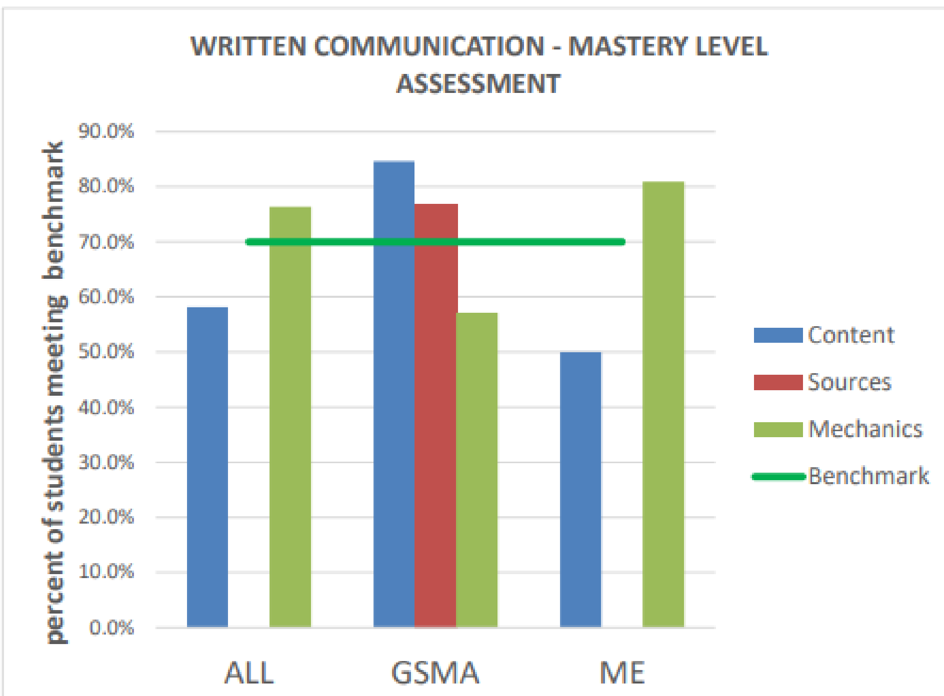

Figure 4.7. IWAC assessment data for written communication portion of ILO-A Written and Oral Communication. The benchmark is the line shown in green.

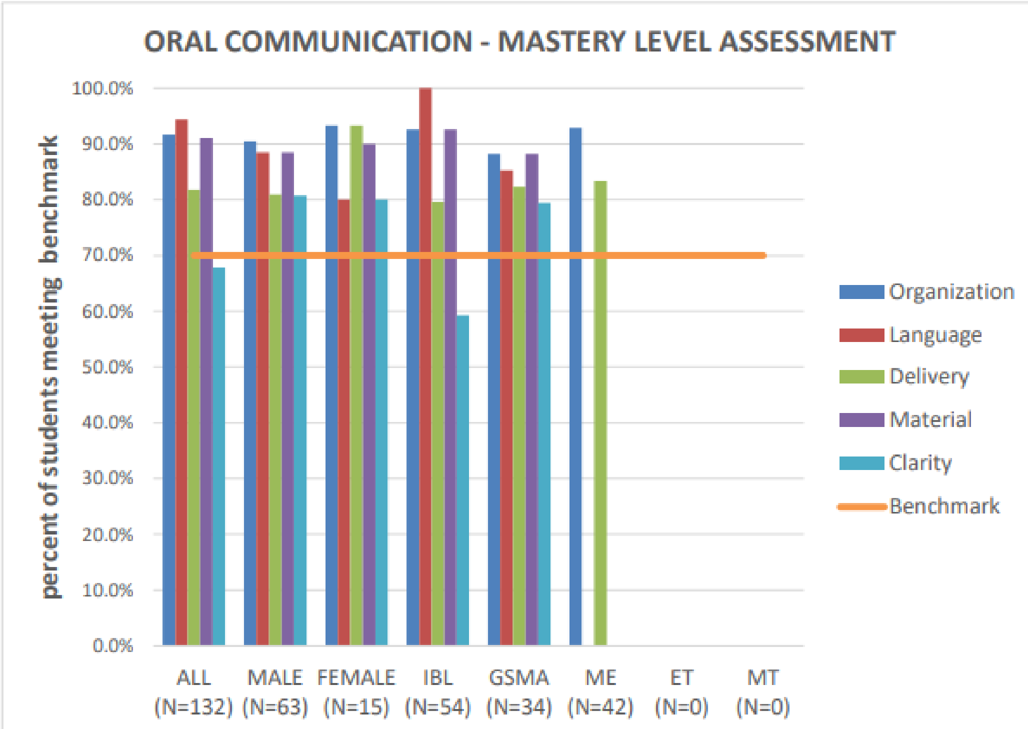

Figure 4.8. IWAC assessment data for written communication portion of ILO-A Written and Oral Communication. The benchmark is the line shown in orange.

A.3. Employer Evaluation of Co-op Students

Students in the ME Option are required to complete two summer internships and enroll in a supplementary online course (CEP 250 for the first internship and CEP 350 for the second internship). A requirement for completion of the course is the submission of an employer evaluation. The evaluation asks a supervisor or professional to assess the student's performance in multiple dimensions, which can be mapped back to the department student outcomes. The evaluation form uses a series of questions covering different aspects of the student's performance during the internship. The evaluator then uses a 1-5 Likert scale, where 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree, and 5 is strongly agree. The employer evaluations are used by the instructor in the determination of grades. Each of these items has been related to the program student outcomes as well. The general benchmark that has been applied has been the expectation that students on the whole should perform at a score of 4 or better, to where the employers agree that the students have demonstrated those qualities. Areas where performance does not meet the benchmark are presented to the program's faculty for further discussion.

The average results from the employer evaluations from 2015-2018 are shown in Figure 4.9. Overall, meeting the benchmark has consistently occurred and generally well above 4.5. To help with the program feedback process, the results are monitored for a consistent multi-year trend that may require program intervention. The program is primarily interested in multi-year trends due to the relatively small sample size. For example, in 2018, there were three scores below 4.5. These were in items 5 (The student communicated well in writing), 11 (The student was able to assume leadership roles), and 12 (The student was able to perform engineering problem solving). If the results from Summer 2019 show results that are similar, then the issue will be brought up to the faculty during the Fall 2019 semester. Copies of all evaluations are archived by the course instructor. The documents are stored within a Dropbox folder available to faculty involved with assessment.

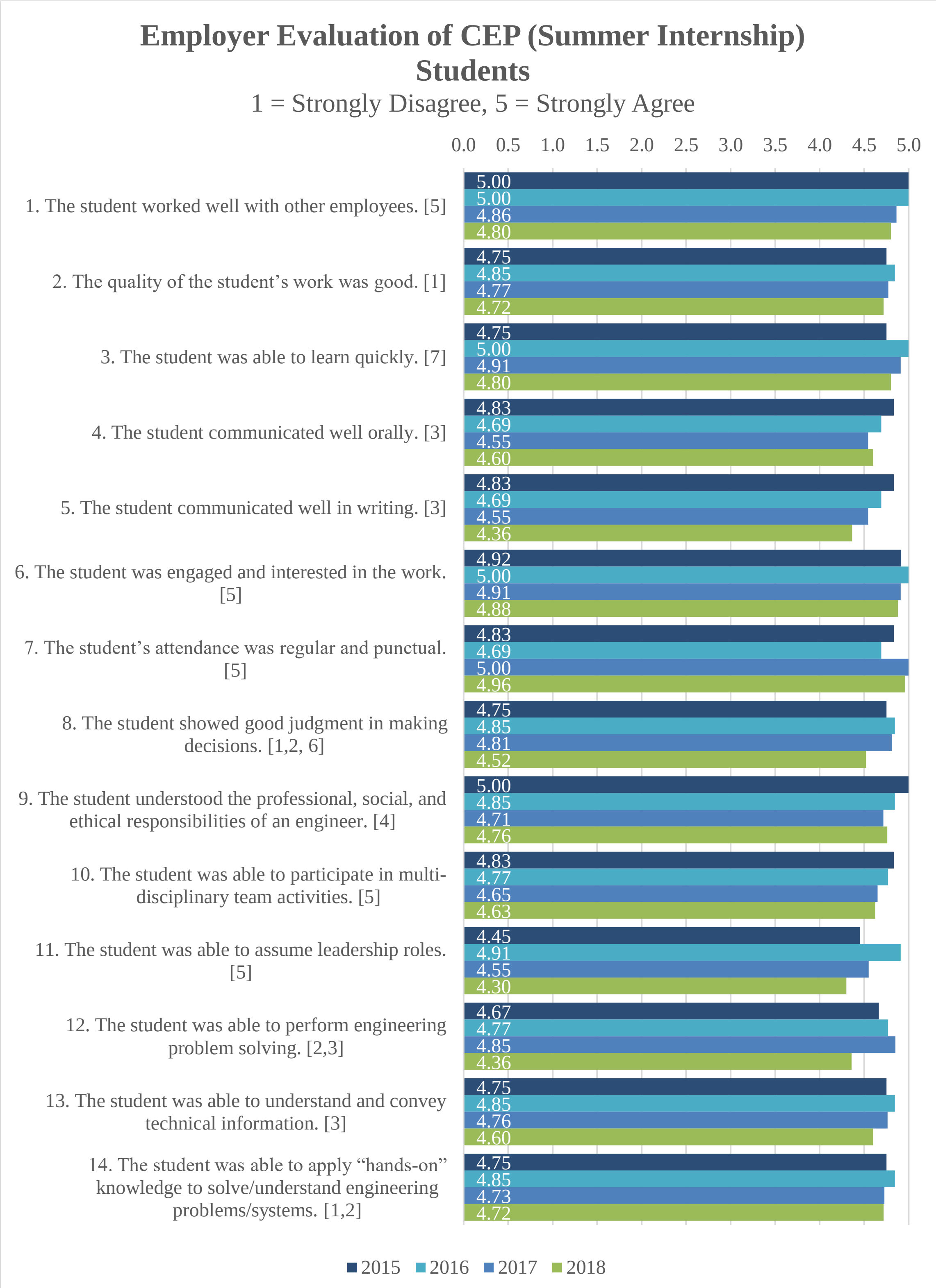

Figure 4.9. Employer evaluation of co-op students for Summer 2017 and 2018 using current survey format. Related program student outcomes in brackets.

A.4. Capstone Presentation Assessment

In addition to the assessment of the students' capstone projects in the course, the program also carries out assessment of the capstone presentations. This assessment is done during the project presentations. The process was also changed in 2018 with the change in ABET Criterion 3. This section will first discuss the current process followed by the former process. In both processes, assessment was done by the ME faculty and any members of industry in attendance at the presentation.

In the current process, the faculty and industry members present are given a rubric to complete that assessing multiple dimensions of the presentation. The dimensions are the organization, content, language and delivery use, quality of delivery aids, and response to audience questions. These dimensions are mapped mostly to Student Outcome 3 (an ability to communicate effectively with a range of audiences), with exception of content, which is considered an assessment of Student Outcome 2 (an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors). The assessment is mapped to a similar 1 to 5 scale for consistency with other assessments. However, as defined on the rubric, a score of 3.5 represents meeting the standard. Therefore, the benchmark for this particular assessment tool is a score of 3.5 or higher. The data from these assessments are aggregated by the Department Chair and provided to the senior capstone course instructor as a part of the course assessment and to the faculty of the department for review. The data and documents are stored within a Dropbox folder available to faculty involved with assessment.

This process was first implemented in Spring 2019. The results from this assessment were processed during Summer 2019. The results can be found in Figure 4.10. Evaluation of the results will occur during the meeting with faculty prior to the start of the Fall 2019 semester. However, preliminary evaluation of the data showed that students met the benchmark for most of the dimensions as well as overall, with an average of 3.60 for Student Outcome 2 and 3.79 for Student Outcome 3. Overall, this suggests that the program met the benchmark for this student outcome overall according to this assessment tool. However, in one dimension, language use and delivery, the average fell below the benchmark value of 3.5. This will be a point of discussion as this data set comes from the senior capstone series, where the students apply and demonstrate all they have learned in the program.

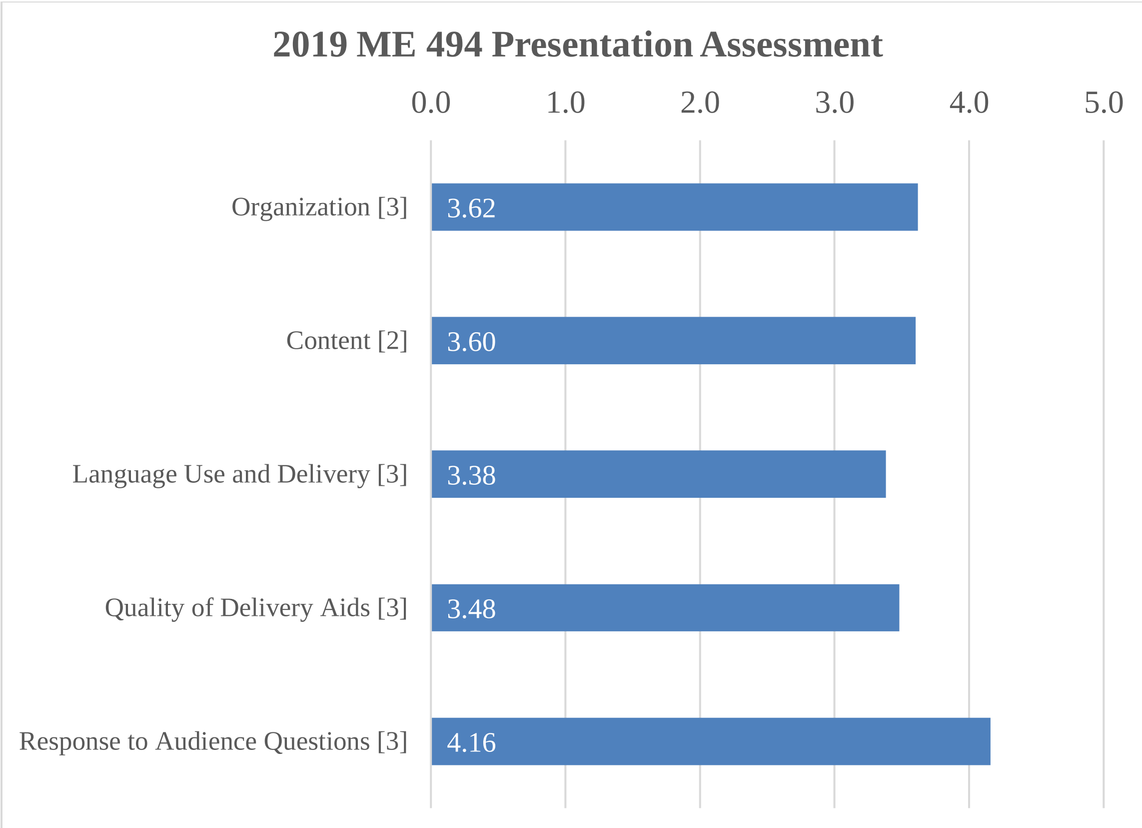

Figure 4.10. Spring 2019 senior capstone presentation assessment results (n=49).

In prior years, faculty and industry participants were given surveys to assess the senior project groups during the presentation. However, rather than the aforementioned dimensions, the students were assessed for their performance in meeting outcomes. From Spring 2014-16, students were measured in whether or not they met the program student outcomes. This survey used a 1-5 scale where a satisfactory performance is defined as a 3. The benchmark for this data was set at an average of 3 or higher. The results from this time period are shown in Figure 4.11 and demonstrate that during the period, students consistently met the benchmark. However, this process was revised following Academic Year 2015-16; the faculty found it challenging to assess broad program student outcomes during these presentations. They recommended refining the rubric such that it focused on outcomes that could be measured within the presentation itself. In Academic Year 2016-17 and 2017-18, a revised survey was used, where the faculty and industry participants were given a survey to assess course outcomes. These eight course outcomes and related student outcomes as shown along with the data in Figure 4.12. This survey again used a standard 5-point scale, where the benchmark was set to an average of 3 or higher. Again, the data showed that students were meeting the benchmarks in all aspects. However, after a couple of years of implementation, a concern was again raised as to whether the presentation was sufficient to allow for the assessment of all of the course outcomes. This concern combined with the changes to EAC Criterion 3 and instructor-class assessment resulted in the current methodology.

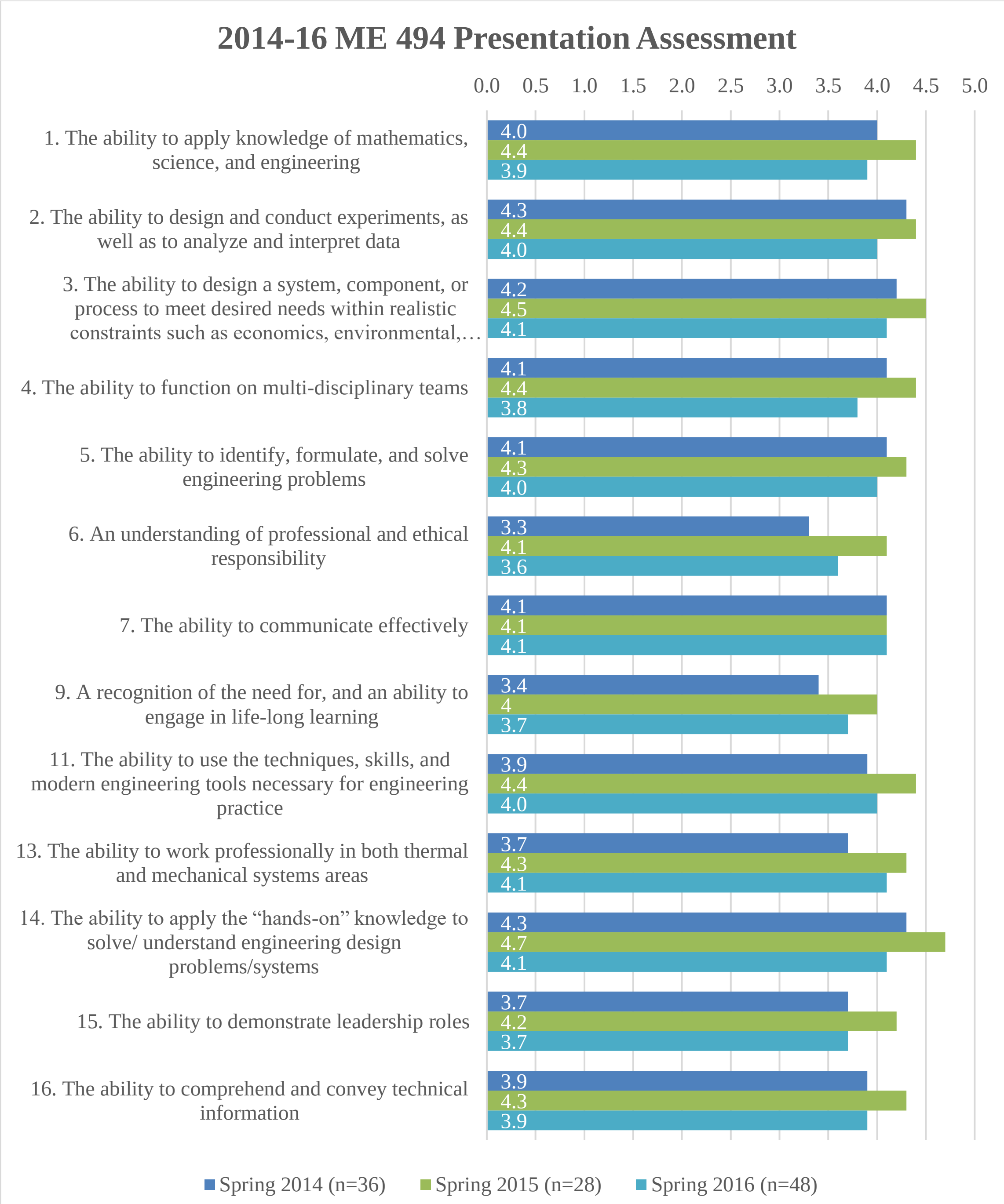

Figure 4.11. Spring 2014-16 senior capstone presentation assessment results.

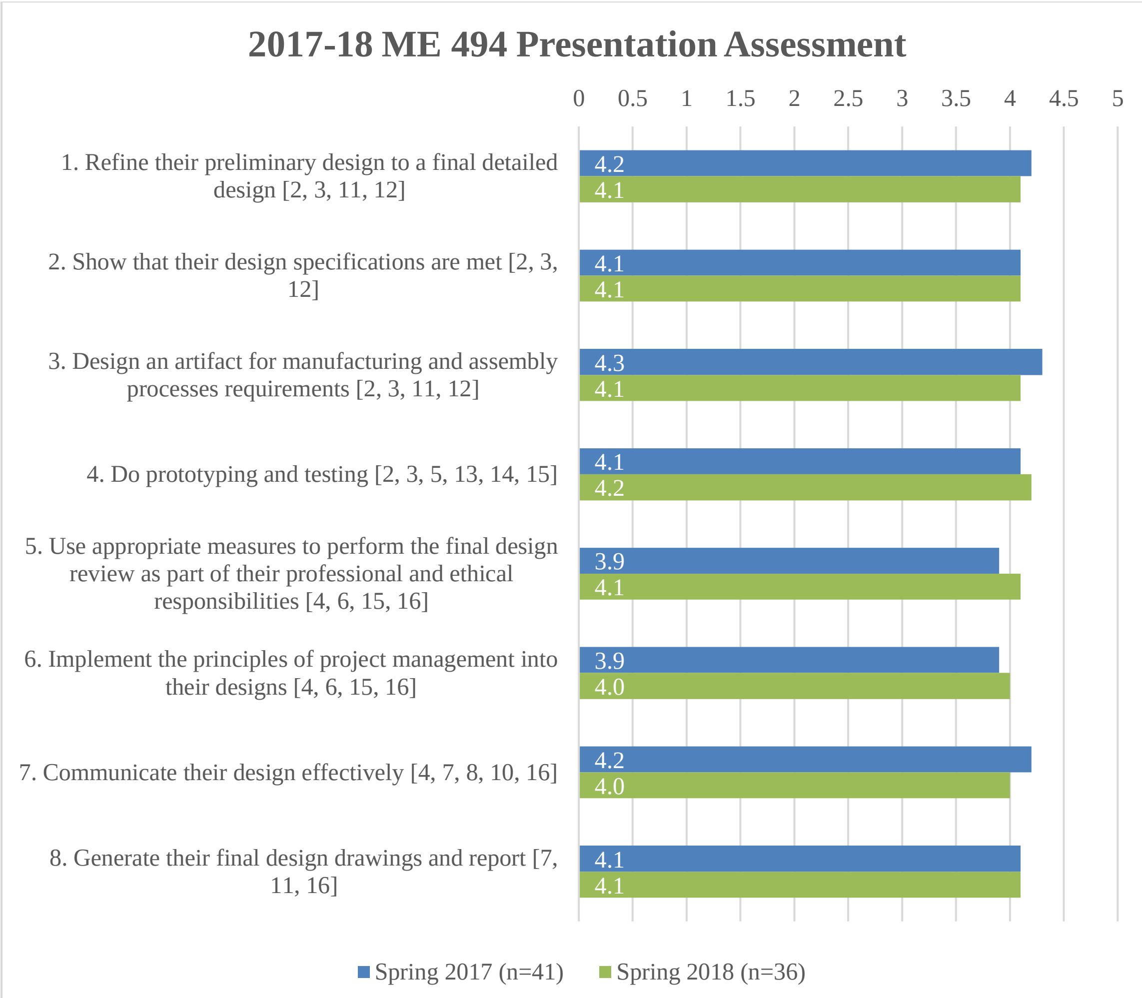

Figure 4.12. Spring 2017-18 senior capstone presentation assessment results.

A.5. Alumni Survey

In 2018, the alumni from the Mechanical Engineering Department were surveyed as a part of the regular assessment process. This survey is conducted every six years to periodically assess the program after the alumni have had some time in the engineering workplace. For the purpose of assessment of student outcomes, the survey helps the department indirectly assess whether it has met student outcomes and program educational objectives.

The survey was conducted online via Survey Monkey. Alumni were initially asked about their background including year of graduation, degree option, industry, workplace role, and continuing education. Alumni were then asked how well Cal Maritime prepared them to meet each program educational objective and each program student outcome. The alumni were given a Likert scale, where 1 = Not prepared, 3 = Prepared, and 5 = Extremely prepared. For this scale, the benchmark was considered an average score of 3 out 5. This was followed up by asking alumni about preparation in particular skills commonly related to the engineering workplace and could be related back to the program student outcomes as well.

The survey closed in December 2018 with a total of 50 respondents. The results were processed by the assessment faculty. The full results of the survey were provided as a presentation to the department faculty in April. The faculty were then asked to follow up comments or evaluations. The questions related to program educational objectives and student outcomes are shown in Figure 4.13 through Figure 4.15. Overall, the department found the data to be encouraging as it reinforces the belief that the students are meeting the program objectives after graduation and that they still feel confident regarding their completion of the student outcomes. In addition to the quantitative results, the open feedback from the survey communicated a concern that needs to be raised when considering future curricular changes. This concern, focused on the unit load, will be discussed later in this Criterion (Link).

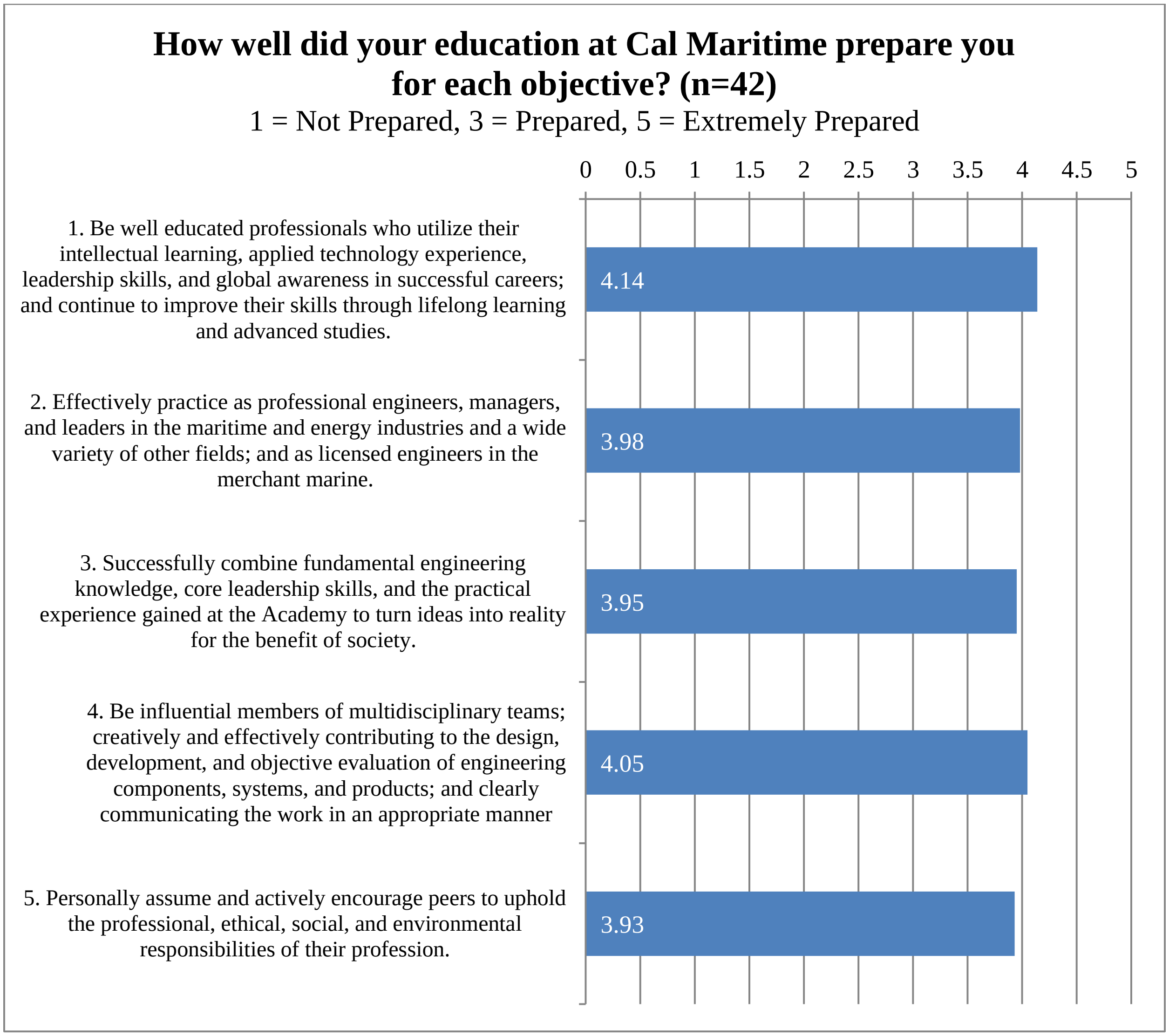

Figure 4.13. Alumni response to the question "How well did your education at Cal Maritime prepare you for each [program] objective?"

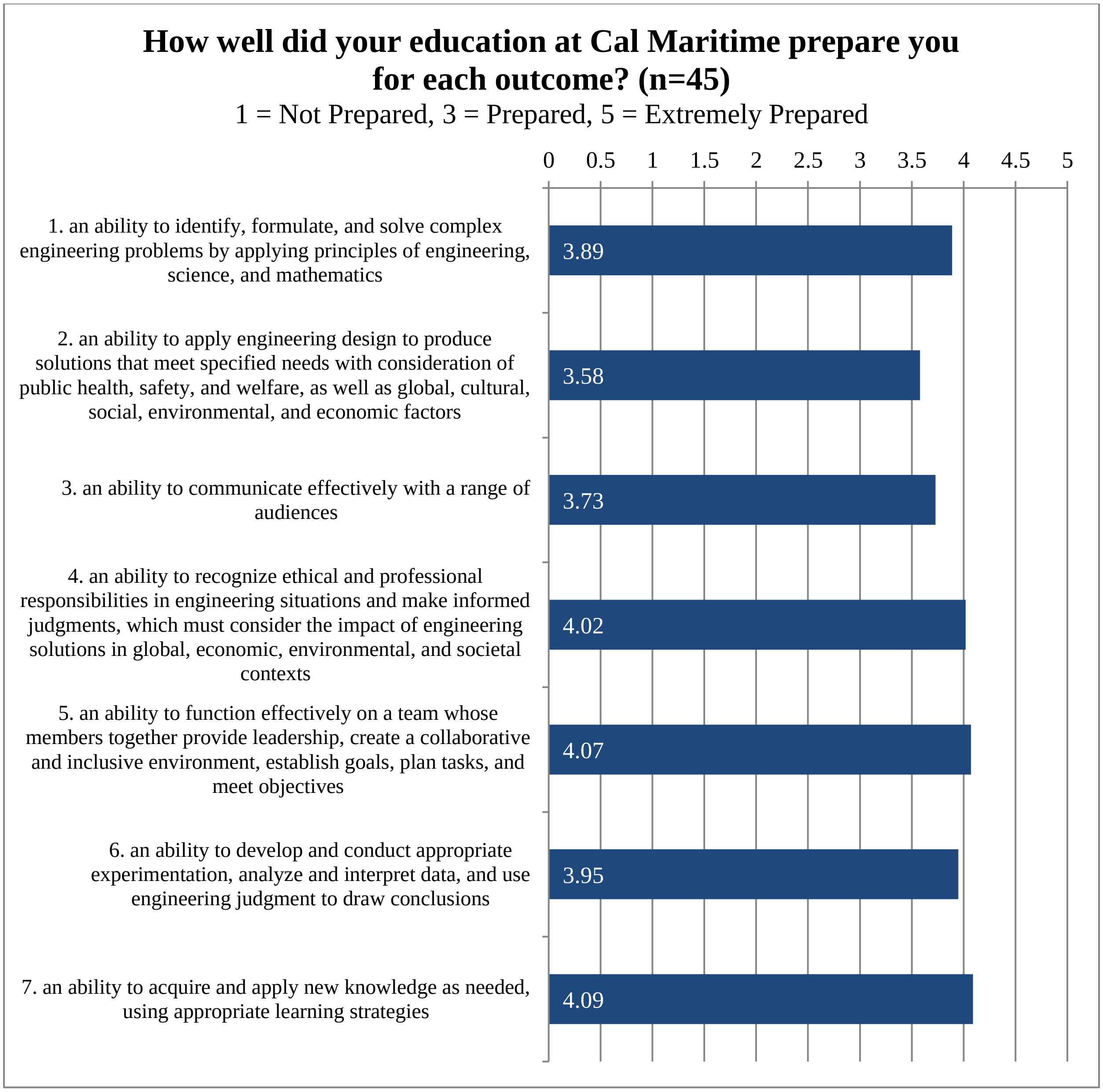

Figure 4.14. Alumni response to the question "How well did your education at Cal Maritime prepare you for each [student] outcome?"

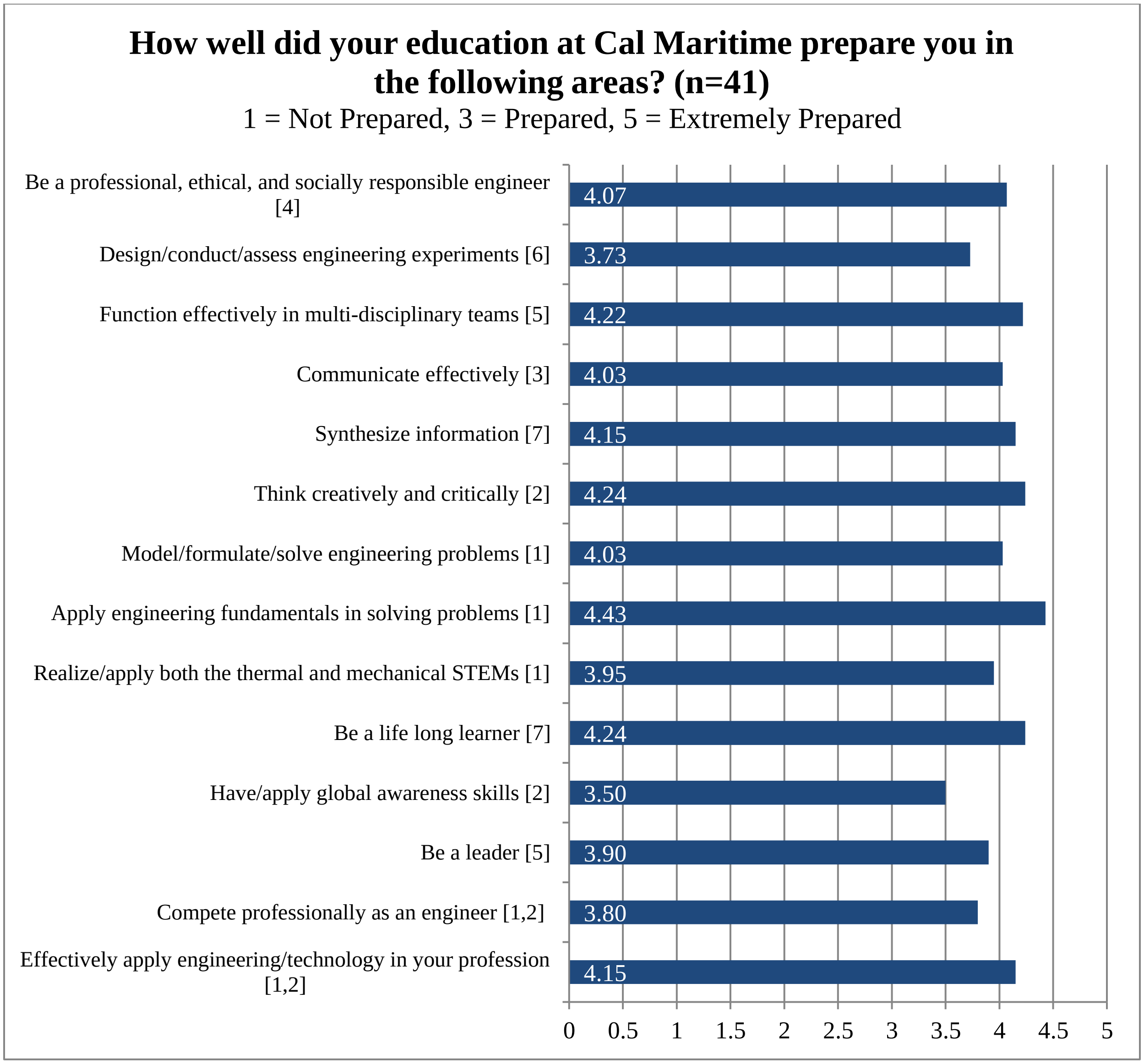

Figure 4.15. Alumni response to the question "How well did your education at Cal Maritime prepare you for the following areas?"

A.6. Employer Survey

Every 6 years, the School of Engineering conducts a survey of engineering companies that attend the Cal Maritime Career Fair. The companies are asked to assess their experience with Cal Maritime engineering alumni that have been hired by these companies. The survey provides the school with feedback regarding its preparation of students for the engineering workplace. Although this is indirect feedback, the fact that the reviewing body is outside Cal Maritime and represents the engineering industry makes this feedback valuable.

The employers are asked to assess the Cal Maritime engineering alumni in multiple dimensions that are related back to the student outcomes using a Likert scale, where 1 = unsatisfactory, 2 = marginal, 3 = average, 4 = very good, and 5 = outstanding. For this scale, the benchmark is defined as an average score of 3 or better. The results are then evaluated on the School of Engineering level by the Dean and the assessment faculty. Findings and any recommendations are then disseminated to the faculty within the School of Engineering. The results from 2019 employer survey are shown in Figure 4.16. The scores are all 4.0 or higher, suggesting that our employers' assessment of alumni has been very good or better in the listed dimensions. Evaluating these findings, there are no recommendations with regard to program changes based on this data.

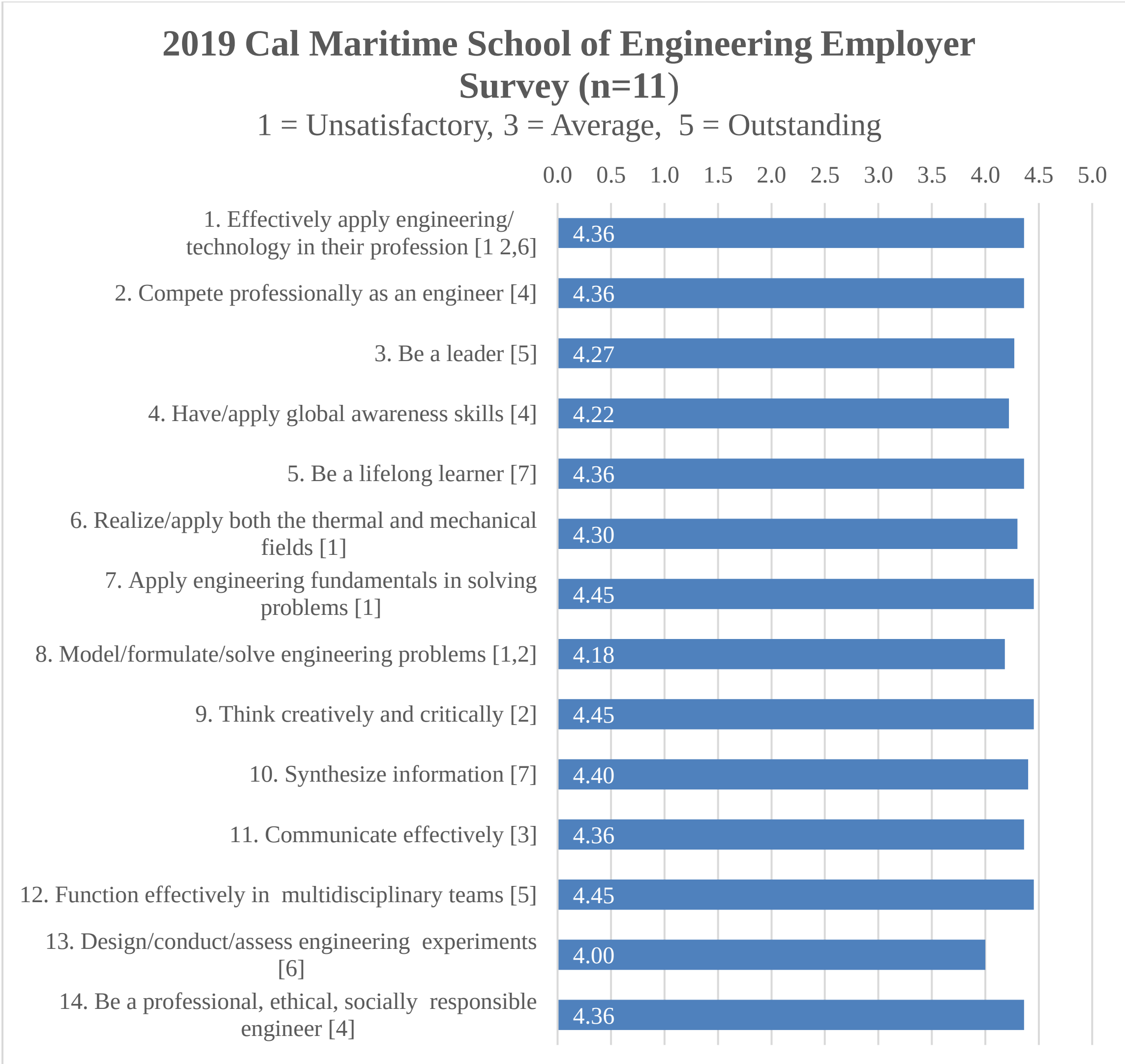

Figure 4.16. Average scores from the 2019 Cal Maritime School of Engineering Employer Survey.

A.7. Senior Exit Survey

Every 2 years, the Mechanical Engineering program administers a survey of the graduating seniors in April. The survey asks the students to assess their experience at Cal Maritime in multiple aspects. This includes information about their future plans as well as retrospective on the department's performance from the perspective of the students. With regard to the assessment of student outcomes, the survey asks about their satisfaction with the student outcomes with respect to the education they received. The survey uses a Likert scale of 1 to 5 where 1 = not satisfied, 2 = somewhat satisfied, 3 = satisfied, 4 = very satisfied, and 5 = extremely satisfied. The survey data is processed by the department chair with a benchmark of 3 or higher on average (i.e. satisfied or better).

The results from the most recent survey in 2019 is shown in Figure 4.17. The results from the 2015 and 2017 surveys are shown Figure 4.18, but use the old student outcomes. Over the span of the surveys, scores in all student outcomes have been consistently over 3. Therefore, no recommendations have been brought to the faculty based on the evaluation of the data. The department continues to monitor the data though. However, since this is an indirect measurement, the survey acts as a qualitative bellwether for areas of improvement. The short answer responses were reviewed as well to provide some qualitative data that may not be represented in the numbers. These can be more challenging to parse. However, one comment that has arisen multiple times was the number of units and courses that needed to be completed in a 4-year span. Sample comments can be seen in Figure 4.19. These comments will be made available to faculty as well for evaluation. However, the implications of this comment relate to curriculum changes discussed in the next section as well.

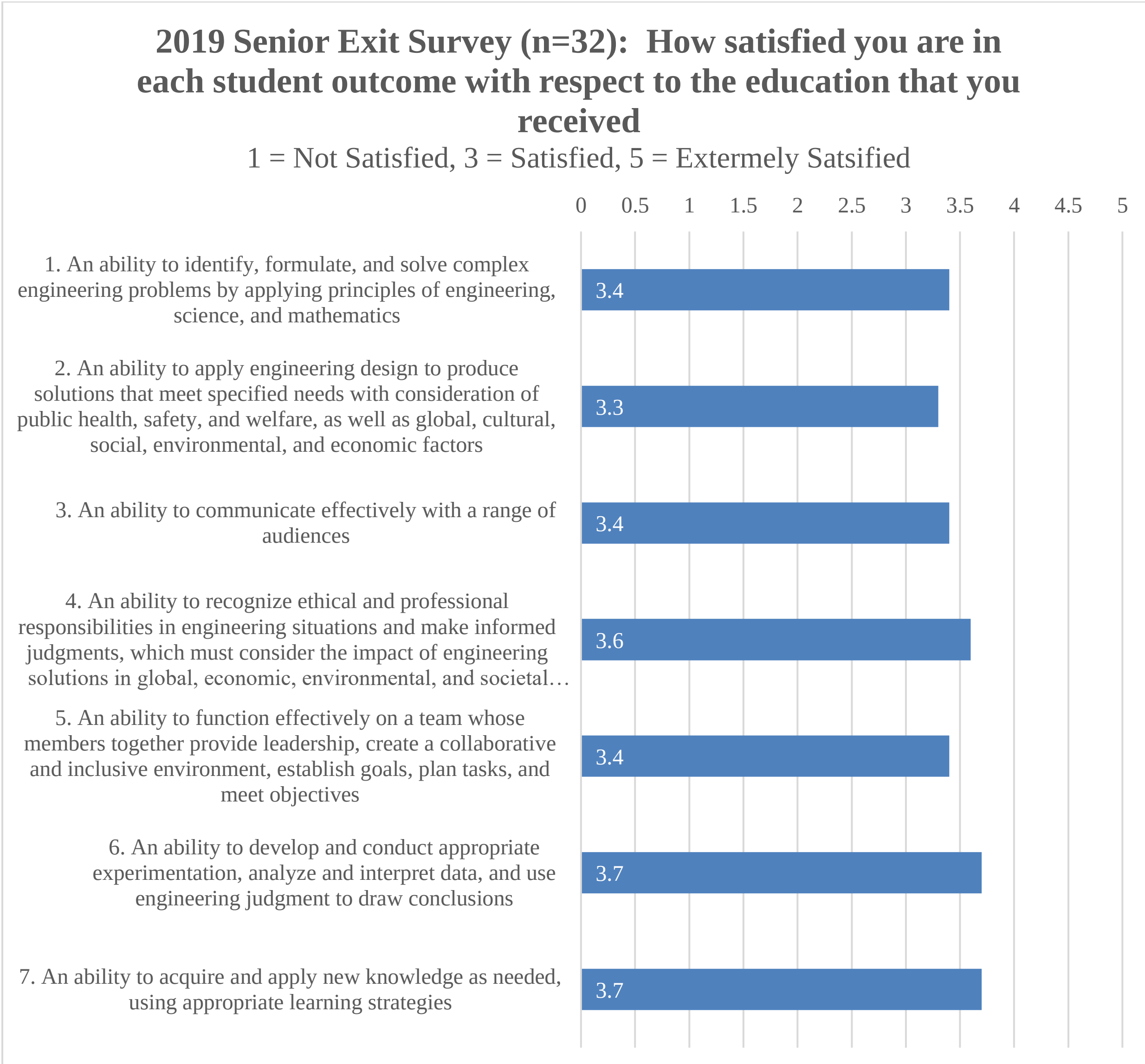

Figure 4.17. Senior survey for the class graduating Spring 2019 regarding student self-assessment of student outcome attainment.

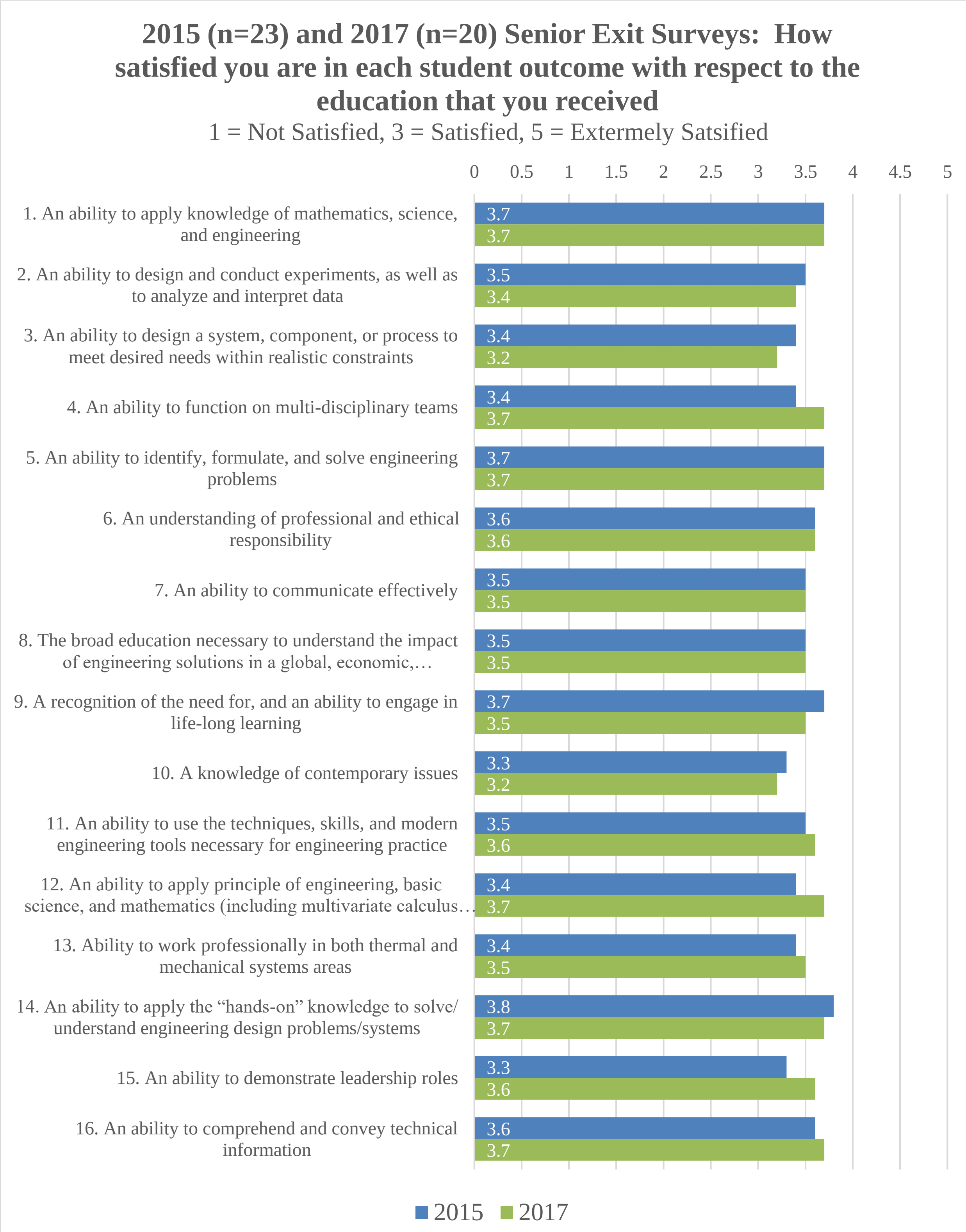

Figure 4.18. Senior survey for the class graduating Spring 2015 and 2017 regarding student self-assessment of attainment of the former student outcomes.

4	The huge course load for ME licensed students. Trying to jam too much into a 4 year program, that really should be 5 years in order to get a quality education.	12/22/2018 2:24 PM
5	Need to be more exposed to AutoCAD instead of Pro Creo.	12/20/2018 4:02 PM
6	When I was there they didn't offer a math minor with most other programs offer.	12/20/2018 7:32 AM
7	The program is too condensed for a four year degree, and relies a lot on material being covered in a previous class, or in a future class. This means that often classes do not stay on schedule, and both personal and academic learning are hindered by an advanced schedule.	12/19/2018 8:17 PM
8	The load students have to take compromise their engineering education overall.	12/19/2018 7:56 PM
9	the speed at which you go through semesters. courses are condensed with overloaded units and semesters are shorter. its a weakness, but also a strength if you can get through it.	12/19/2018 8:58 AM

Figure 4.19. Sample responses from the alumni survey to the question "What do you think are the weaknesses of the ME program at Cal Maritime?"

B. Continuous Improvement

Describe how the results of evaluation processes for the student outcomes and any other available information have been systematically used as input in the continuous improvement of the program. Describe the results of any changes (whether or not effective) in those cases where re-assessment of the results has been completed. Indicate any significant future program improvement plans based upon recent evaluations. Provide a brief rationale for each of these planned changes.

All of the assessment data discussed in the previous section are evaluated by the Mechanical Engineering faculty. The program may make recommendations based on the data. The scale of the response will depend on the magnitude and repeatability of the findings. Overall, the program met nearly all of its benchmarks during the review period, which suggests that the program does not need to make any large-scale changes to the program. However, this section will discuss the changes that have occurred within the program based on the continuous improvement process.

Examples of minor corrections to the program were illustrated in the previous section. As discussed in the Instructor Class Assessment of Student Work, there were courses that met the benchmark, but fell below one of the two criteria used for the benchmark. In these instances, a recommendation may be made to the instructor to explore the problem, determine possible causes, and apply course changes as needed. Those recommendations can be found in the Annual Student Outcome Assessment Recommendations.

Program level improvement plans occur when findings suggest a larger scale concern. This occurs when findings of failure to meet the benchmark expand beyond the span of a single course. There are multiple avenues that can lead to these recommendations.

- In the instructor class assessment, the program does not meet the benchmark for a student outcome overall.
- In the instructor class assessment, multiple courses in the program do not meet the benchmark for a particular student outcome
- In the instructor class assessment of the senior capstone courses (ME 490, ME 492, and ME 494), the benchmarks for any of the student outcomes are not met. This is a specific case because it captures the overall attainment of the student outcomes of the program

- In the IWAC assessment, the program does not meet overall benchmarks
- In the indirect assessment methods, the program does not meet the overall benchmarks
- Concerns regarding the assessment process itself

The following sections will discuss the major program level initiatives that were carried out during the review period based on the assessment mechanism discussed in the previous section. This is followed by a discussion of the changes to the curriculum that have occurred during the review period. This section closes with a discussion of future considerations based on the most recent results, which are presented in this document.

B.1. Information Fluency

Since the last ABET visit, the most significant improvement plan directly impacting student learning in the Mechanical Engineering program has been the redesign of how information fluency (e.g. information literacy) has been addressed. Information fluency is defined by IWAC as the ability to carry out research for new information and ethically use the information. In some institutions, this is also considered lifelong learning. It is also directly connected with the ME Program Student Outcome 7 as well.

In Academic Year 2016-17 IWAC assessment of information fluency (Link to IWAC 2017 Information Fluency Report), the Mechanical Engineering students were found to perform below the benchmark in all dimensions on the mastery level (Figure 4.20). The Mechanical Engineering Department was advised by IWAC to examine these issues. In the conversations with the faculty that followed, there was a qualitative concern regarding these aspects.

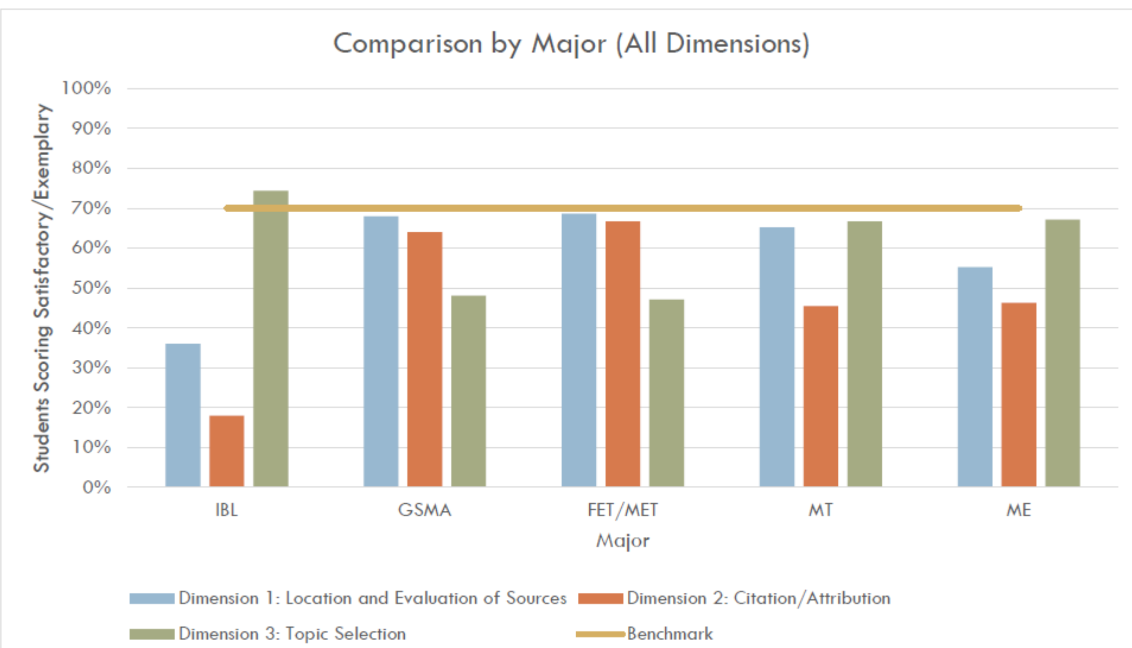

Figure 4.20. IWAC information fluency assessment data presented in its 2017 report.

From these findings, it was decided that the appropriate course of action was that further information fluency should be added to the Mechanical Engineering program curriculum. Faculty from the Mechanical Engineering Department worked with the faculty from the Library assigned to work with the engineering majors to develop a multi-year plan to interject additional information fluency education into the curriculum. The target courses were identified based on the degree of information fluency required (Figure 4.21). From the ME program, these tended to be courses that involved a research component, such as the courses requiring comprehensive lab reports (ME 339 and ME 349) and the senior capstone series (ME 490, ME 492, and ME 494).

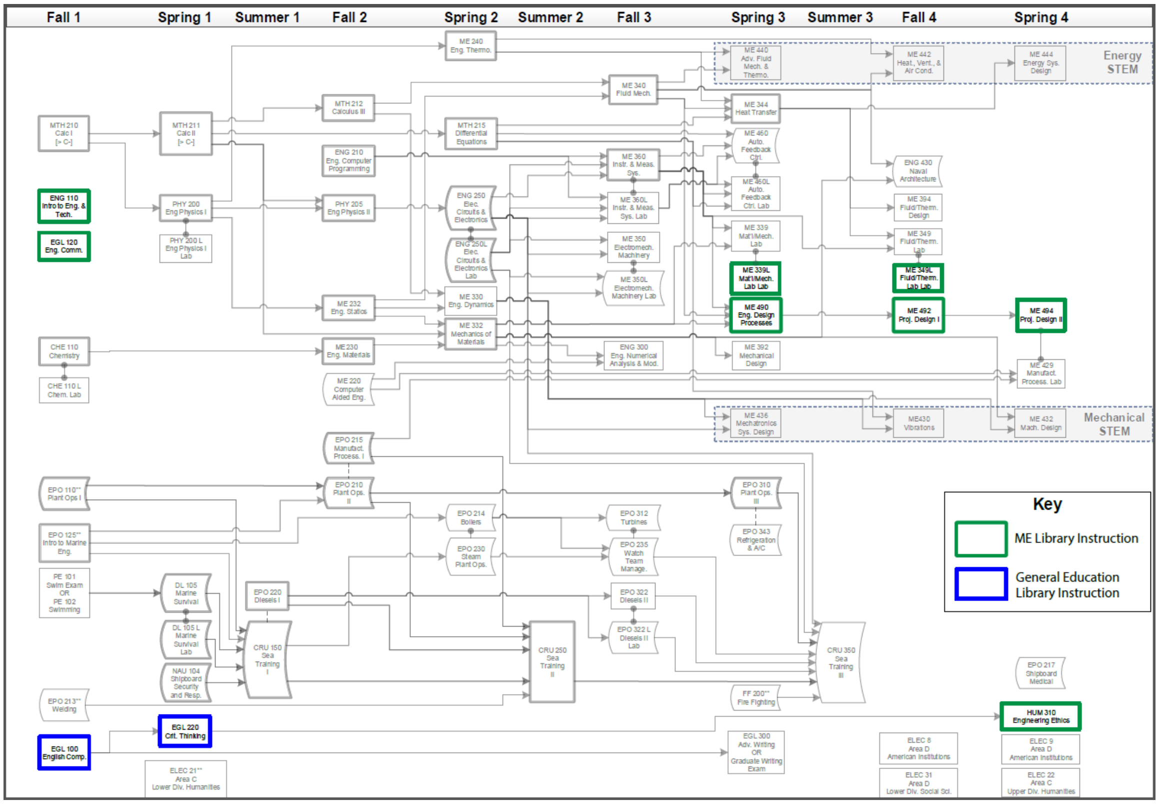

Figure 4.21. Courses where additional library instruction has been implemented

The rollout began in Academic Year 2017-18 with supplemental instruction in information fluency being applied to ME 349 in the Fall. The course faculty and library liaison developed changes to the course curriculum and lesson plans that would better teach information fluency in the course. This included focused lectures on the topic and greater emphasis on information fluency. After the success of the initial implementation in Fall 2017, further changes to the curriculum were introduced where students received information fluency education in Academic Year 2018-19. In EGL 120 Technical Communications, the students received introductions to the library, research techniques, and citation usage. In ME 490 Engineering Design Process and ME 492 Project Design I, Mechanical Engineering senior students had information fluency modules integrated into their senior capstone project development process. The supplemental instruction for each course involved extensive collaboration between the instructor and the library faculty. Students were given additional instruction in the research process as it applied to their capstone project in addition to proper use of that information in their own work.

Furthermore, new assignments were developed that not only reinforced the information fluency instruction, but also helped the student achieve broader course outcomes in the process.

Thus far, the response from the students and the faculty have generally been positive. The development and implementation the information fluency instruction was documented in a 2018 ASEE Conference Paper (Link to 2018 ASEE Paper) and another that will presented at the 2019 ASEE Conference & Exposition (Presented, pending post in ASEE PEER). The papers discuss not only the process, but the assessment of student work as well. The findings showed measurable improvement in particular dimensions. The overall effect of this effort will be measured both in the assessment of Student Outcome 7 in Academic Year 2019-2020 and in the IWAC assessment of information fluency in Academic Year 2020-21. The findings will serve as a measure of success for the information fluency program. It will also help guide any future changes and modifications to the program.

B.2. Assessment Process

In reviewing the Student Outcome Assessment reports during this span, a common theme was to address a phenomenon that could be termed "assessment fatigue." The initial response was to continue to assess all courses in the program on a biennial cycle, where assessment was still done for all courses but every 2 years. However, the challenge with that process is the irregularity of the timing. This is evidenced by the fact that following the 2012-2013 ICA, the next ICA was conducted in 2015-16 followed by 2016-17. While the assessments were realigned, it became apparent that forgoing the assessment process program-wide created implementation challenges.

Another concern that arose was the small sample sizes for some of the outcomes. At the time of the last visit, the program was assessing 16 outcomes. Even with the number of courses in the Mechanical Engineering program, certain student outcomes (i.e. 4, 8, 14) were only being assessed by one or two classes. This reduced the confidence in the results for those outcomes. Worse, if data were not available for one of those particular courses, it would be possible that no assessment data would be available for that outcome. On the other hand, student outcomes related to the general engineering skillset were being assessed by 16 to 17 courses. This was considered oversampling of those student outcomes and actually added to the "assessment fatigue." This issue also appeared in the Student Outcome Assessment Reports.

Following Academic Year 2016-2017, the ME faculty discussed developing a more sustainable approach toward the instructor class assessment but were mindful of the impending change in student outcomes in the EAC criterion. When the EAC Criterion changes were made official in October 2017, a team of ME faculty (Mike Holden and William Tsai) were tasked with developing a new instructor class assessment plan that would incorporate both the revisions to the student outcomes and to improve the assessment implementation. The team met throughout summer to roll out this implementation. This process began with a presentation regarding the change to the new outcomes electronically on May 31, 2018. This also included a request for the ME faculty to review their course outcomes, make any updates that would better reflect the current course, and map those course outcomes onto the new student outcomes. With the syllabi in hand, the team was able to create a course outcome to student outcome mapping. The team then assessed where there was over-sampling and under-sampling of outcomes. It became apparent that it was not necessary to sample every course; instead, it would be more effective to strategically target courses to ensure that each student outcome had at least 4 courses worth of data. To address the concern regarding "assessment fatigue," the team decided to follow the IWAC process of creating a rotating cycle for the assessment of outcomes. The seven outcomes were divided into two groups. Each year, only one group of outcomes would be assessed, with the groups alternating each year. This reduced the number of courses each faculty would have to assess to no more than 2 per year. The new plan was presented to the department at the first department meeting for Academic Year 2018-19 on August 15, 2018.

The effectiveness of this implementation will be measured over the next two years by examining the quality of results, sample sizes, and change in workload. The data from the first year was presented earlier, showing the results for Outcomes 1, 2, 3, and 6. Following the collection of data for Academic Year 2019-2020, a major review will be carried out by the faculty. This review will include reviewing the benchmarks, reviewing the quality of the sample sizes, assessing the improvement of the process for faculty, and a discussion of any changes to the process over the next two-year cycle.

B.3. Curriculum Changes

During the review period, there have been minor changes to the curriculum. Although the originations of these changes were at the request of stakeholders outside the university, the feedback from constituents and assessment processes were considered in the decision process.

Academic Year 2014-15
ME 432 Machinery Design was reduced from 4 units to 3 units
ME 444 Energy Systems was reduced from 4 units to 3 units
ENG 300 Engineering Numerical Modeling and Analysis was reduced from 4 units to 3 units

In 2013-15, the Office of the Chancellor for the CSU system requested that programs over 120 semester units review their curriculum, justify their unit loads, and take appropriate steps to bring unit loads closer to 120 semester units. At Cal Maritime, programs, including Mechanical Engineering, were asked to review the curriculum and identify any potential unit reductions. However, this change also reflects feedback from students and from alumni (as would again be shown in the 2018 Alumni Survey) that the high unit load was a concern to be examined. In that year, the Mechanical Engineering program determined that one avenue to address this concern was to align lecture based Mechanical Engineering courses to 3 units. This was preferential to removing any courses as feedback from students and external constituencies such as the predecessor to CMAC had not identified any courses that were extraneous or unnecessary. The only remaining 4-unit courses in the program were ME 432, ME 444, and ENG 300. The change in units were submitted and approved by the Curriculum Committee and the changes were implemented in 2015.

Academic Year 2017-18
EPO 343 Refrigeration & A/C was added as a 1-unit course
EGL 120 Technical Communications was increased from 2 units to 3 units
ME 429 Manufacturing Processes Lab was reduced from 2 units to 1 unit
ME 460 Automatic Feedback Control was reduced from 3 units to 2 units

The changes during this academic year reflect the implementation of two requirements on the Mechanical Engineering program from outside constituencies. Changes in the STCW requirements required that License Option Mechanical Engineering students receive a course dedicated to refrigeration and air conditioning operations. This required the addition of a 1-unit course designated EPO (Engineering Plant Operations) 343.

In addition, a review by the Culture and Communication Department of EGL (English) 120 found that additional instruction was needed in the Technical Communication course to fulfill the oral communication component of the CSU General Education requirement. The program agreed to commit additional resources to the development of communications skills as it is both a program outcome, an institution outcome, and an area that the program’s industry constituents continue to stress. The response was to add 1 unit to EGL 120 to allow for the additional oral communication instruction.

The Mechanical Engineering program was (and continues to be) limited in the maximum number of units required to complete the program. The program has a waiver that allows it to exceed the 120 semester unit limit established by the Chancellor's Office. However, the waiver does not allow for the addition of any units. Therefore, the unit increases proposed for Refrigeration and Technical Communication would need to be met by unit reductions within the program's courses.

As in the previous case, the process focused on identifying courses that exceeded the general 3 units that applied to most of the program's courses. The goal was to preserve the quality of the education. Again, there was no assessment data that suggested any of the courses should be eliminated. As a result, the program selected changes that were expected to have the least impact on the quality of education and attainment of student outcomes. The first course identified, ME 429, was selected because, although its primary role was to further education in manufacturing processes (i.e. CNC), it served a support course for the senior capstone project series, which was already 9 units over 3 semesters. The second course identified, ME 460, was selected because it had an additional support unit in ME 460L. Although the unit reduction would result in less material being covered in the course, it was determined that since the topic of Automatic Feedback Control would still have 3 units overall, it could be covered to sufficient depth with limited impact on the students' understanding of the material.

B.4. Future Considerations

As a part of the continuous improvement process, the Mechanical Engineering program will continue to use the data gathered to shape curriculum changes going forward. For example, this report has presented data made available at the end of Academic Year 2019-20. For the most part, the program was meeting its benchmarks with respect to student outcomes.

However, there were also data that can help shape changes within the program going forward. There will be discussion about the IWAC findings for written communication. Not only does that topic fall in the category of Student Outcome 3, but it was also mentioned as an area that both industry and alumni feedback recommend that we emphasize as well. There will continue to be discussions about the course load associated with the curriculum as well. The requirements for freshman cruise and the US Coast Guard Third Engineer's License result in students having to take many more units than at other Mechanical Engineering programs within the CSU. As previously mentioned, this concern appears in several comments in the alumni survey (Figure 4.19). The process required to change the unit load in the curriculum will be a long process, which means that while continuous improvement based on the data may take time, the feedback is being considered.

C. Additional Information

Copies of any of the assessment instruments or materials referenced in 4.A and 4.B must be available for review at the time of the visit. Other information such as minutes from meetings where the assessment results were evaluated and where recommendations for action were made could also be included.

CRITERION 5. CURRICULUM

A. Program Curriculum

A.1. Plan of Study

Complete Table 5-1 that describes the plan of study for students in this program including information on course offerings in the form of a recommended schedule by year and term along with maximum section enrollments for all courses in the program for the last two terms the course was taught. If there is more than one curricular path or option for a program, a separate Table 5-1 should be provided for each path or option. State whether the institution operates on quarters or semesters.

Cal Maritime operates on a semester system, with Fall (F), Spring (S), and Summer (SU) semesters. Table 5.1 presents the courses required for all students of the Cal Maritime Mechanical Engineering Program for the Coast Guard License Option (License Option) and the ME Non-license Option (ME Option). The primary difference between the options is that the License Option includes additional courses required for the attainment of a USCG Third Assistant Engineer's License. A complete discussion of the differences between the options can be found in the discussion of Options in Background Information.

The semesters for the courses are indicated by year and semester as well as the specific semester for an incoming student starting in Fall 2015 and graduating at the end of the Spring 2019.

Table 5.1 Curriculum list for the Mechanical Engineering Program License Option and ME Option. The options are discussed in detail in Background Information, Section C.

Mechanical Engineering Program, License Option

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*			Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	Other		
1st Year, Fall Semester (Fall 2015)						
CHE 110 General Chemistry	R	3			F2017/F2018	40/40
CHE 110L General Chemistry Lab	R	1			F2017/F2018	24/24
EGL 100 English Composition	R			3	F2018/S2019	25/25
ENG 110 Intro to Engineering and Technology	R		1		F2017/F2018	50/50
EGL 120 Technical Communication	R			3	F2017/F2018	25/25
MTH 210 Calculus I	R	4			F2018/S2019	25/25
FF 200 Basic/Advanced Marine Firefighting	R			0	F2018/S2019	80/80
PE 101 Swim Competency Exam	R			0	F2018/S2019	400/400
1st Year, Spring Semester (Spring 2016)						
Humanities Elective (Lower Division)	SE			3	F2018/S2019	40/40
EGL 220 Critical Thinking	R			3	F2018/S2019	25/25
MTH 211 Calculus II	R	4			F2018/S2019	25/25
PHY 200 Engineering Physics I	R	3			F2018/S2019	40/40
PHY 200L Engineering Physics Lab	R	1			F2018/S2019	16/16
DL 105 Marine Survival	R			1	F2018/S2019	28/28
DL 105L Marine Survival Lab	R			1	F2018/S2019	10/10
EPO 110 Plant Operations I	R			3	F2018/S2019	10/10
EPO 125 Introduction to Marine Engineering	R			1	F2018/S2019	25/25
EPO 213 Welding Lab	R			0	F2018/S2019	14/14

NAU 104 Shipboard Security and Responsibility	R			1	F2018/S2019	40/40
1st Year, Summer Semester (Summer 2016)						
CRU 150 Sea Training I (Engine)	R			8	SU2018/SU2019	88/88
EPO 220 Diesel Engineering	R			2	SU2018/SU2019	88/88
2nd Year, Fall Semester (Fall 2016)						
ENG 210 Engineering Computer Programming	R		2		F2017/F2018	20/20
ME 220 Computer Aided Engineering	R		2 (✓)		F2017/F2018	20/20
ME 230 Engineering Materials	R		3		F2017/F2018	30/30
ME 232 Engineering Statics	R		3		F2017/F2018	30/30
MTH 212 Calculus III	R	4			F2017/F2018	25/25
PHY 205 Engineering Physics II	R	4			F2017/F2018	40/40
EPO 210 Plant Operations II	R			1	F2018/S2019	12/12
2nd Year, Spring Semester (Spring 2017)						
ENG 250 Elec Circuits and Electronics	R		3		S2018/S2019	30/30
ENG 250L Elec Circuits and Electronics Lab	R		1		S2018/S2019	12/12
ME 240 Engineering Thermodynamics	R		3		S2018/S2019	30/30
ME 330 Engineering Dynamics	R		3		S2018/S2019	30/30
ME 332 Mechanics of Materials	R		3		S2018/S2019	30/30
MTH 215 Differential Equations	R	4			S2018/S2019	25/25
EPO 214 Boilers	R			3	F2018/S2019	27/27
EPO 230 Steam Plant System Operations	R			3	F2018/S2019	6/6
2nd Year, Summer Semester (Summer 2017)						
CRU 250 Sea Training II	R			8	SU2018/SU2019	30/30
3rd Year, Fall Semester (Fall 2017)						
ENG 300 Engineering Numerical Modeling & Analysis	R	3			F2017/F2018	25/25
ME 340 Engineering Fluid Mechanics	R		3		F2017/F2018	40/40
ME 350 Electromechanical Machinery	R		3		F2017/F2018	25/25

ME 350L Electromechanical Machinery Lab	R		1		F2017/F2018	12/12
ME 360 Instrumentation and Measurement Systems	R		2		F2017/F2018	25/25
ME 360L Instrumentation and Measurement Systems Lab	R		1		F2017/F2018	12/12
EPO 235 Steam Plant Watch Team Management	R			1	F2018/S2019	6/6
EPO 312 Turbines	R			3	F2018/S2019	39/39
EPO 322 Diesel Engineering II/Simulator	R			1	F2018/S2019	39/39
EPO 322L Diesel Engineering II/Simulator Lab	R			1	F2018/S2019	8/8
3rd Year, Spring Semester (Spring 2018)						
EGL 300 Advanced Writing	R			3	S2018/S2019	25/25
ME 339 Material/Mechanical Lab	R		2		S2018/S2019	12/12
ME 344 Heat Transfer	R		3		S2018/S2019	40/40
ME 392 Mechanical Design	R		3 (✓)		S2018/S2019	40/40
ME 460 Auto Feedback Control	R		2 (✓)		S2018/S2019	25/25
ME 460L Auto Feedback Control Lab	R		1		S2018/S2019	12/12
ME 490 Engineering Design Process	R		3 (✓)		S2018/S2019	40/40
ME 440 Adv. Fluids and Thermodynamics OR ME 436 Mechatronic System Design	SE		3 (✓)		S2018/S2019	25/25
EPO 310 Plant Operations III	R			1	S2018/S2019	12/12
EPO 342 Refrigeration & A/C	R			1	S2018/S2019	12/12
3rd Year, Summer Semester (Summer 2018)						
CRU 350 Sea Training III	R			8	SU2018/SU2019	120/120
4th Year, Fall Semester (Fall 2018)						
American Institutions I Elective (Lower Division) HIS 100 U.S. History to 1877 or HIS 101 U.S. History from 1877	SE			3	F2018/S2019	40/40
Social Science Elective (Lower Division)	SE			3	F2018/S2019	40/40
ME 349 Fluid/Thermal Lab	R		2		F2017/F2018	12/12
ME 394 Fluid/Thermal Design	R		3 (✓)		F2017/F2018	40/40
ME 492 Project Design I	R		3 (✓)		F2017/F2018	25/25

ME 442 Heating Ventilation and A/C Design OR ME 430 Mechanical Vibrations	SE		3 (✓)		F2017/F2018	25/25
ENG 430 Naval Architecture	R			3	F2017/F2018	28/28
4th Year, Spring Semester (Spring 2019)						
American Institutions II Elective (Upper Division) GOV 200: American Government	SE			3	S2018/S2019	40/40
Humanities Elective (Upper Division)	SE			3	F2018/S2019	40/40
HUM 310 Engineering Ethics	R			3	S2018/S2019	40/40
ME 429 Manufacturing Processes Lab	R		1		S2018/S2019	14/14
ME 494 Project Design II	R		3 (✓)		S2018/S2019	25/25
ME 444 Energy Systems Design OR ME 432 Machinery Design	SE		3 (✓)		S2018/S2019	25/25
EPO 217 Shipboard Medical	R			1	F2018/S2019	20/20
TOTALS (in terms of semester credit hours)		31	69	82		
Total must satisfy minimum credit hours	Minimum Semester Credit Hours	30 Hours	45 Hours			

Mechanical Engineering Program, ME Option

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)* Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	Other	Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
1st Year, Fall Semester (Fall 2015)						
CHE 110 General Chemistry	R	3			F2017/F2018	40/40
CHE 110L General Chemistry Lab	R	1			F2017/F2018	24/24
EGL 100 English Composition	R			3	F2018/S2019	25/25
ENG 110 Intro to Engineering and Technology	R		1		F2017/F2018	50/50
EGL 120 Technical Communication	R			3	F2017/F2018	25/25
MTH 210 Calculus I	R	4			F2018/S2019	25/25
FF 200 Basic/Advanced Marine Firefighting	R			0	F2018/S2019	80/80
PE 101 Swim Competency Exam	R			0	F2018/S2019	400/400
1st Year, Spring Semester (Spring 2016)						
Humanities Elective (Lower Division)	SE			3	F2018/S2019	40/40
EGL 220 Critical Thinking	R			3	F2018/S2019	25/25
MTH 211 Calculus II	R	4			F2018/S2019	25/25
PHY 200 Engineering Physics I	R	3			F2018/S2019	40/40
PHY 200L Engineering Physics Lab	R	1			F2018/S2019	16/16
DL 105 Marine Survival	R			1	F2018/S2019	28/28
DL 105L Marine Survival Lab	R			1	F2018/S2019	10/10
EPO 110 Plant Operations I	R			3	F2018/S2019	10/10
EPO 125 Introduction to Marine Engineering	R			1	F2018/S2019	25/25
EPO 213 Welding Lab	R			0	F2018/S2019	14/14
NAU 104 Shipboard Security and Responsibility	R			1	F2018/S2019	40/40

1st Year, Summer Semester (Summer 2016)						
CRU 150 Sea Training I (Engine)	R			8	SU2018/SU2019	88/88
EPO 220 Diesel Engineering	R			2	SU2018/SU2019	88/88
2nd Year, Fall Semester (Fall 2016)						
ENG 210 Engineering Computer Programming	R		2		F2017/F2018	20/20
ME 220 Computer Aided Engineering	R		2 (✓)		F2017/F2018	20/20
ME 230 Engineering Materials	R		3		F2017/F2018	30/30
ME 232 Engineering Statics	R		3		F2017/F2018	30/30
MTH 212 Calculus III	R	4			F2017/F2018	25/25
PHY 205 Engineering Physics II	R	4			F2017/F2018	40/40
2nd Year, Spring Semester (Spring 2017)						
ENG 250 Elec Circuits and Electronics	R		3		S2018/S2019	30/30
ENG 250L Elec Circuits and Electronics Lab	R		1		S2018/S2019	12/12
ME 240 Engineering Thermodynamics	R		3		S2018/S2019	30/30
ME 330 Engineering Dynamics	R		3		S2018/S2019	30/30
ME 332 Mechanics of Materials	R		3		S2018/S2019	30/30
MTH 215 Differential Equations	R	4			S2018/S2019	25/25
2nd Year, Summer Semester (Summer 2017)						
CEP 250 ME Co-op I	R			3	SU2018/SU2019	30/30
3rd Year, Fall Semester (Fall 2017)						
ENG 300 Engineering Numerical Modeling & Analysis	R	3			F2017/F2018	25/25
ME 340 Engineering Fluid Mechanics	R		3		F2017/F2018	40/40
ME 350 Electromechanical Machinery	R		3		F2017/F2018	25/25
ME 350L Electromechanical Machinery Lab	R		1		F2017/F2018	12/12
ME 360 Instrumentation and Measurement Systems	R		2		F2017/F2018	25/25
ME 360L Instrumentation and Measurement Systems Lab	R		1		F2017/F2018	12/12
3rd Year, Spring Semester (Spring 2018)						

EGL 300 Advanced Writing	R			3	S2018/S2019	25/25
ME 339 Material/Mechanical Lab	R		2		S2018/S2019	12/12
ME 344 Heat Transfer	R		3		S2018/S2019	40/40
ME 392 Mechanical Design	R		3 (✓)		S2018/S2019	40/40
ME 460 Auto Feedback Control	R		2 (✓)		S2018/S2019	25/25
ME 460L Auto Feedback Control Lab	R		1		S2018/S2019	12/12
ME 490 Engineering Design Process	R		3 (✓)		S2018/S2019	40/40
ME 440 Adv. Fluids and Thermodynamics OR ME 436 Mechatronic System Design	SE		3 (✓)		S2018/S2019	25/25
3rd Year, Summer Semester (Summer 2018)						
CEP 350 ME Co-op II	R			3	SU2018/SU2019	30/30
4th Year, Fall Semester (Fall 2018)						
American Institutions I Elective (Lower Division) HIS 100 U.S. History to 1877 or HIS 101 U.S. History from 1877	SE			3	F2018/S2019	40/40
Social Science Elective (Lower Division)	SE			3	F2018/S2019	40/40
ME 349 Fluid/Thermal Lab	R		2		F2017/F2018	12/12
ME 394 Fluid/Thermal Design	R		3 (✓)		F2017/F2018	40/40
ME 492 Project Design I	R		3 (✓)		F2017/F2018	25/25
ME 442 Heating Ventilation and A/C Design OR ME 430 Mechanical Vibrations	SE		3 (✓)		F2017/F2018	25/25
4th Year, Spring Semester (Spring 2019)						
American Institutions II Elective (Upper Division) GOV 200: American Government	SE			3	S2018/S2019	40/40
Humanities Elective (Upper Division)	SE			3	F2018/S2019	40/40
HUM 310 Engineering Ethics	R			3	S2018/S2019	40/40
ME 429 Manufacturing Processes Lab	R		1		S2018/S2019	14/14
ME 494 Project Design II	R		3 (✓)		S2018/S2019	25/25
ME 444 Energy Systems Design OR ME 432 Machinery Design	SE		3 (✓)		S2018/S2019	25/25

TOTALS (in terms of semester credit hours)			31	69	53		
Total must satisfy minimum credit hours	Minimum Semester Credit Hours		30 Hours	45 Hours			

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.

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

A.2. Alignment with Program Educational Objectives

Describe how the curriculum aligns with the program educational objectives.

The program educational objectives are what the program aspires its students to achieve within 5 years of graduation. While this cannot be directly measured by the institution, the program does map the program educational objectives to the student outcomes as discussed in Criterion 3 (Table 3.1). The rationale is that if all course and student outcomes are achieved, graduates of the program are prepared for the program educational objectives. Table 5.2 provides a sample of courses that support the program educational objectives to help demonstrate this relationship. Although many more courses cover the student outcomes, the courses on the list have connections with the program educational objective to which they are categorized.

Table 5.2. Relationship between program educational objectives, student outcomes, and sample courses in the program that meet both.

Program Educational Objective	Student Outcome	Sample of Related Courses
A. Be well educated professionals who utilize their intellectual learning, applied technology experience, leadership skills and global awareness in successful careers, and continue to improve their skills through lifelong learning and advanced studies	1 2 4 5 7	ME 339 Material/Mechanical Lab ME 349 Fluid/Thermal Lab ME 444 Energy Systems Design ME 490 Engineering Design Processes
B. Effectively practice as professional engineers, managers, and leaders in the maritime and energy industries and a wide variety other fields, and as licensed engineers in the merchant marine	1 2 3 4 5 6 7	ME 240 Thermodynamics ME 340 Fluid Mechanics ME 350 Electro-Mechanical Machines ME 394 Fluid/Thermal Design
C. Successfully combine fundamental engineering knowledge, core leadership skills and the practical experience gained at the Academy to turn ideas into reality for the benefit of society	1 2 5 6	ME 490 Engineering Design Processes ME 492 Project Design I ME 494 Project Design II
D. Be influential members of multidisciplinary teams, creatively and effectively contributing to the design, development, and objective evaluation of engineering components, systems, and products, and clearly communicating the work in an appropriate manner to their customers and colleagues	2 3 5	ENG 250L Electrical Circuits and Electronics Lab ME 339 Material/Mechanical Lab ME 349 Fluid/Thermal Lab ME 360L Instrumentation and Measurement Systems Lab ME 460L Automatic Feedback Control Lab
E. Personally assume and actively encourage peers to uphold the professional, ethical, social and environmental responsibilities of their profession	4	ME 240 Thermodynamics ME 442 Heating, Ventilating and Air Conditioning ME 492 Project Design I HUM 310 Engineering Ethics

A.3. Alignment with Student Outcomes

Describe how the curriculum and its associated prerequisite structure support the attainment of the student outcomes.

The student outcomes are considered the skillset necessary for graduates of the Cal Maritime Mechanical Engineering program to enter the engineering workforce. The courses that make up the student learning experience are geared toward ensuring that the graduates have developed that skillset as defined by the constituents. As shown in Table 5.3, all courses in the Mechanical Engineering program have course outcomes that are aligned with one of the seven program student outcomes. Each student outcome can be related to course outcomes in at least 3 courses in the program. This ensures multiple opportunities to provide instruction that supports the student outcomes and assesses student performance in those areas. In the senior capstone project series of classes (ME 490 Engineering Design Processes, ME 492 Project Design I, and ME 494 Project Design II), the course outcomes over the series span all seven student outcomes. This provides an opportunity to comprehensively assess the student outcomes for the entire graduating class.

Every student outcome can be related to course outcomes in at least three courses within the program but are also addressed in other courses outside the program. For example, Student Outcome 3 (an ability to communicate effectively with a range of audiences) is not only addressed in the courses within the Mechanical Engineering program. Students receive additional exposure and training in communication in EGL 120 Technical Communication and through their Humanities and Social Science Electives. Similarly, Student Outcome 4 (an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts) is also addressed in HUM 310 Engineering Ethics as well as the students' Humanities and Social Science Electives. Although these are outside the program, they do further support the program's student outcomes. As discussed in Criterion 4, these areas are also assessed on the campus-wide level by IWAC, whose data are then used by the program for assessment.

Table 5.3. Mapping between courses taught by the Mechanical Engineering program and student outcomes

Dept.	#	Course Name	Student Outcome						
			1	2	3	4	5	6	7
ENG	110	Introduction to Engineering and Technology				x			x
ENG	210	Engineering Computer Programming	x					x	
ENG	250	Electrical Circuits and Electronics	x	x					
ENG	250L	Electrical Circuits and Electronics Lab	x		x				
ENG	300	Engineering Numerical Methods	x					x	
ME	220	Computer Aided Engineering		x					x
ME	230	Engineering Materials	x						
ME	232	Engineering Statics	x						
ME	240	Engineering Thermodynamics	x			x			
ME	330	Engineering Dynamics	x						
ME	332	Mechanics of Materials	x						
ME	339	Material/Mechanical Lab	x		x			x	
ME	340	Fluid Mechanics	x						
ME	344	Heat Transfer	x						
ME	349	Fluid/Thermal Lab	x		x		x	x	x
ME	350	Electro-Mechanical Machines	x						
ME	350L	Electro-Mechanical Machines Lab	x		x			x	
ME	360	Instrumentation and Measurement Systems	x	x				x	
ME	360L	Instrumentation and Measurement Systems Lab			x			x	
ME	392	Mechanical Design	x						
ME	394	Fluid/Thermal Design	x	x					
ME	429	Manufacturing Processes Lab		x				x	x
ME	430	Mechanical Vibrations	x		x			x	
ME	432	Machinery Design	x	x					
ME	436	Mechatronic System Design	x	x					
ME	440	Adv. Fluid Mechanics & Thermodynamics	x	x					
ME	442	Heating, Ventilating, and Air Conditioning	x	x		x			
ME	444	Energy Systems Design	x	x	x				
ME	460	Automatic Feedback Control	x						
ME	460L	Automatic Feedback Control Lab	x		x			x	
ME	490	Engineering Design Processes	x		x				x
ME	492	Project Design I	x	x		x	x		x
ME	494	Project Design II		x	x		x	x	

The prerequisite structures for the Mechanical Engineering program License and ME Options are illustrated in Figure 5.1 and Figure 5.2 respectively. Prerequisites within the Mechanical Engineering Program are designed to demonstrate that the students have the background competencies necessary to fulfill the course outcomes (and therefore student outcomes) for this course. The prerequisites are often directed at the engineering knowledge required for students to be able to achieve a course outcome in the current course. Since course outcomes are related to the student outcomes, these are deemed necessary skills to demonstrate competency in prior to graduation.

In Table 5.4, an example is shown demonstrating the connection between the course outcome for convection in ME 344 Heat Transfer and related course outcomes in the prerequisite courses ME 240 Thermodynamics, ME 340 Fluid Mechanics, and Math 215 Differential Equations. ME 344 becomes a prerequisite for ME 349 Fluid/Thermal Lab, where students will run a convection heat transfer experiment, and ME 394 Fluid/Thermal Design, where students will apply heat transfer in heat exchanger design. All these courses support Student Outcome 1 by teaching students engineering concepts at different levels that are necessary to solve complex engineering problems. This is representative of the basis for the prerequisites in the program, where a required skill from a prerequisite course has been identified as necessary to meet the course outcomes.

Table 5.4. Example of prerequisite structure supporting Student Outcome 1.

<table>
<tr><th colspan="6">Supports Student Outcome 1 (an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics)</th></tr>
<tr><th colspan="2">ME 240
Thermodynamics</th><th colspan="2">ME 340
Fluid Mechanics</th><th colspan="2">Math 215
Differential Equations</th></tr>
<tr><td colspan="2">Apply conservation laws (mass balance and energy balance) to solve problems with closed and open system processes.</td><td colspan="2">Apply conservation laws (mass balance, momentum, and energy balances) in integral/differential/experimental/simplified forms to fluid systems.</td><td colspan="2">Model real-life applications using differential equations.</td></tr>
<tr><th colspan="6">ME 344
Heat Transfer</th></tr>
<tr><td colspan="3">Compute resistance, heat rates, and temperature in steady-state, one-dimensional configurations involving conduction</td><td colspan="3">Compute convection coefficients and solve for heat rate and temperature for different flow types (i.e. forced external, forced internal, and free)</td></tr>
<tr><th colspan="3">ME 349
Fluid/Thermal Lab</th><th colspan="3">ME 394
Fluid/Thermal Design</th></tr>
<tr><td colspan="3">Be able to understand the function of and use of common instrumentation for fluid and thermal measurements</td><td colspan="3">Apply conservation laws to fluid/thermal systems.

Model, analyze, solve, and design fluid/thermal systems</td></tr>
</table>

Another example is the attainment of Student Outcome 6 (an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions) throughout the Mechanical Engineering program. In Table 5.5, the progression of the students training in uncertainty analysis is shown. Students are expected to be able to demonstrate the ability at the senior level to use appropriate instrumentation and carry out an uncertainty analysis in experimentation in ME 339 Material/Mechanical Lab and ME 349 Fluid/Thermal Lab. These topics are introduced in ME 360 Instrumentation and Measurement Systems. This serves as the rational for the prerequisite of ME 360 for both ME 339 and ME 349. It also demonstrates how all three courses are related to Student Outcome 6 through their course outcomes. Similar mappings can be identified in the course outcomes, which may be found in the syllabi in Appendix A.

Table 5.5. Example of prerequisite structure supporting Student Outcome 6.

<table>
<tr><th colspan="2">Supports Student Outcome 6 (an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions)</th></tr>
<tr><th colspan="2">ME360
Instrumentation and Measurement Systems</th></tr>
<tr><td colspan="2">Students will have knowledge of data acquisition systems and components
Students will be able to quantify the uncertainty of experimental data</td></tr>
<tr><th>ME339
Material/Mechanical Lab</th><th>ME349
Fluid Thermal Lab</th></tr>
<tr><td>Install and calibrate strain gages and accelerometers, estimate the uncertainty of their measurements, acquire strain and acceleration data electronically, and analyze and interpret the data.</td><td>Be able to understand the function of and use of common instrumentation for fluid and thermal measurements
Be able to reduce and quantitatively estimate measurement uncertainties through calibration and statistical analyses of data.</td></tr>
</table>

The prerequisites for ME 490 Engineering Design Processes, the first course in the capstone project series, are defined by the technical knowledge needed to meet the course outcomes. One expectation is that the students demonstrate enough knowledge to understand the quantitative tools that will be introduced in the course. For example, during the course, students complete a module in "Learning to Use Mathematical/Physical Models to Quantitatively Analyze Physical Systems." This is an opportunity for students to formulate the analytical, experimental, and/or numerical tools necessary for the capstone project. To use these tools, students must have gained sufficient knowledge in the areas on which those tools were built. These are identified as ME 332 Mechanics of Materials and ME 340 Engineering Fluid Mechanics. ME 360 Instrumentation and Measurement Systems is a necessary course because students must be able to plan validation and testing into the early stages of their design; this is consistent with the course outcome: Students will be able to learn the necessary tools to design and build their senior design projects. Overall, the program finds that these prerequisites sufficiently support the senior capstone project process, which serves as the demonstration of the students' fulfillment of all of the program student outcomes. Further discussion of the senior capstone project series is provided in the next section.

Prerequisites outside of the program are driven either by requirements from the university, the California State University (CSU) system, or the United States Coast Guard's (USCG) Standards of Training, Certification and Watchkeeping (STCW). Prerequisites for the math and science classes are driven by the required skills for Math and Science courses. These were defined at the creation of the program and reviewed though the program's continuous improvement practices. Prerequisites for general education courses are defined by the CSU, the General Education Committee and the departments teaching those courses. These are generally not under the purview of the program. Prerequisites for courses that support the USGC Third Assistant Engineer's License (generally EPO courses) are defined by the Engineering Technology Department. Although the prerequisites are defined by different departments, any changes to the prerequisites that would impact Mechanical Engineering student require input from the Mechanical Engineering Department during the review process.

A.4. Prerequisite Flowchart

Attach a flowchart or worksheet that illustrates the prerequisite structure of the program's required courses.

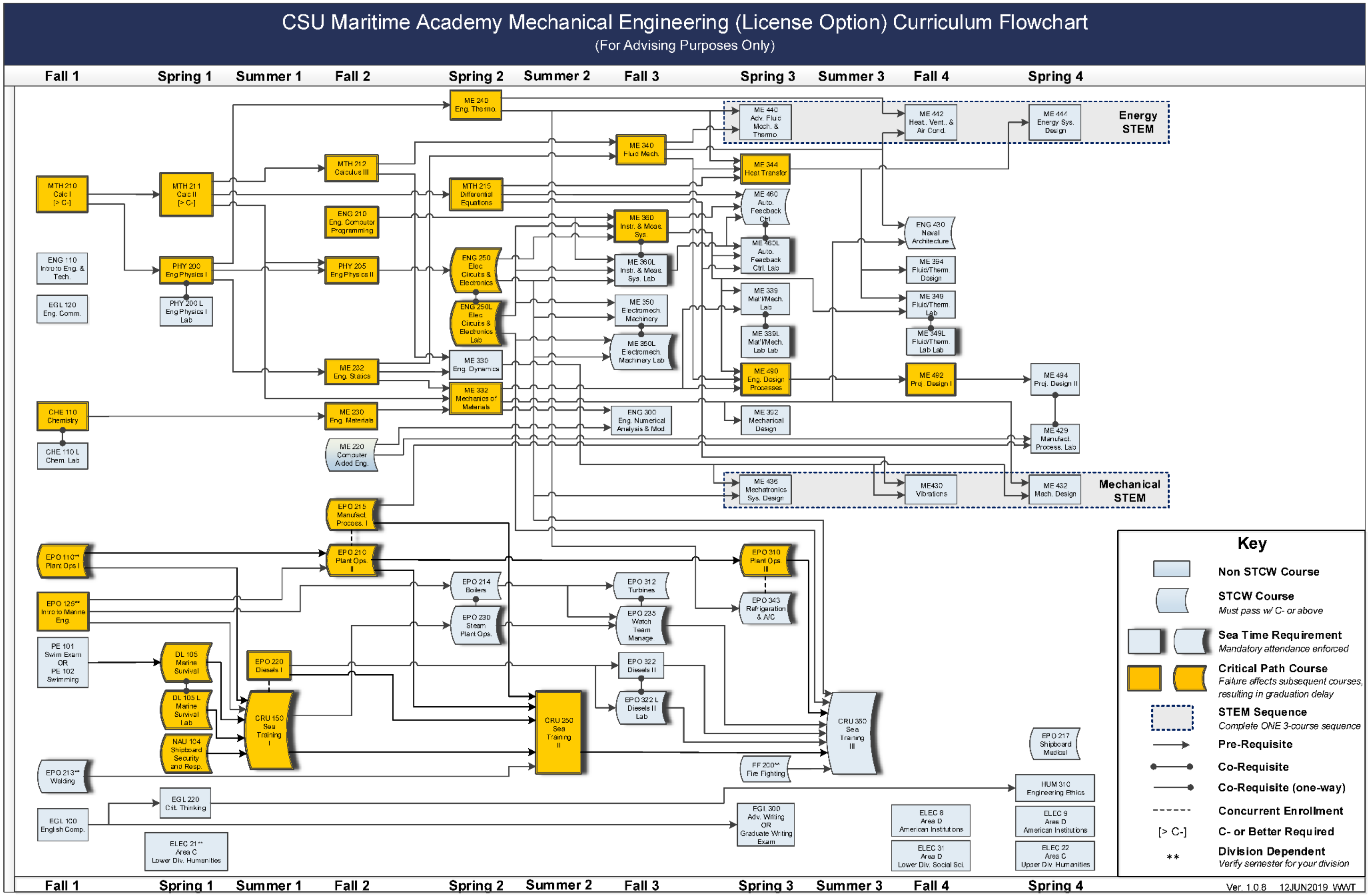

Figure 5.1. Mechanical Engineering Program – License Option prerequisite flowchart.

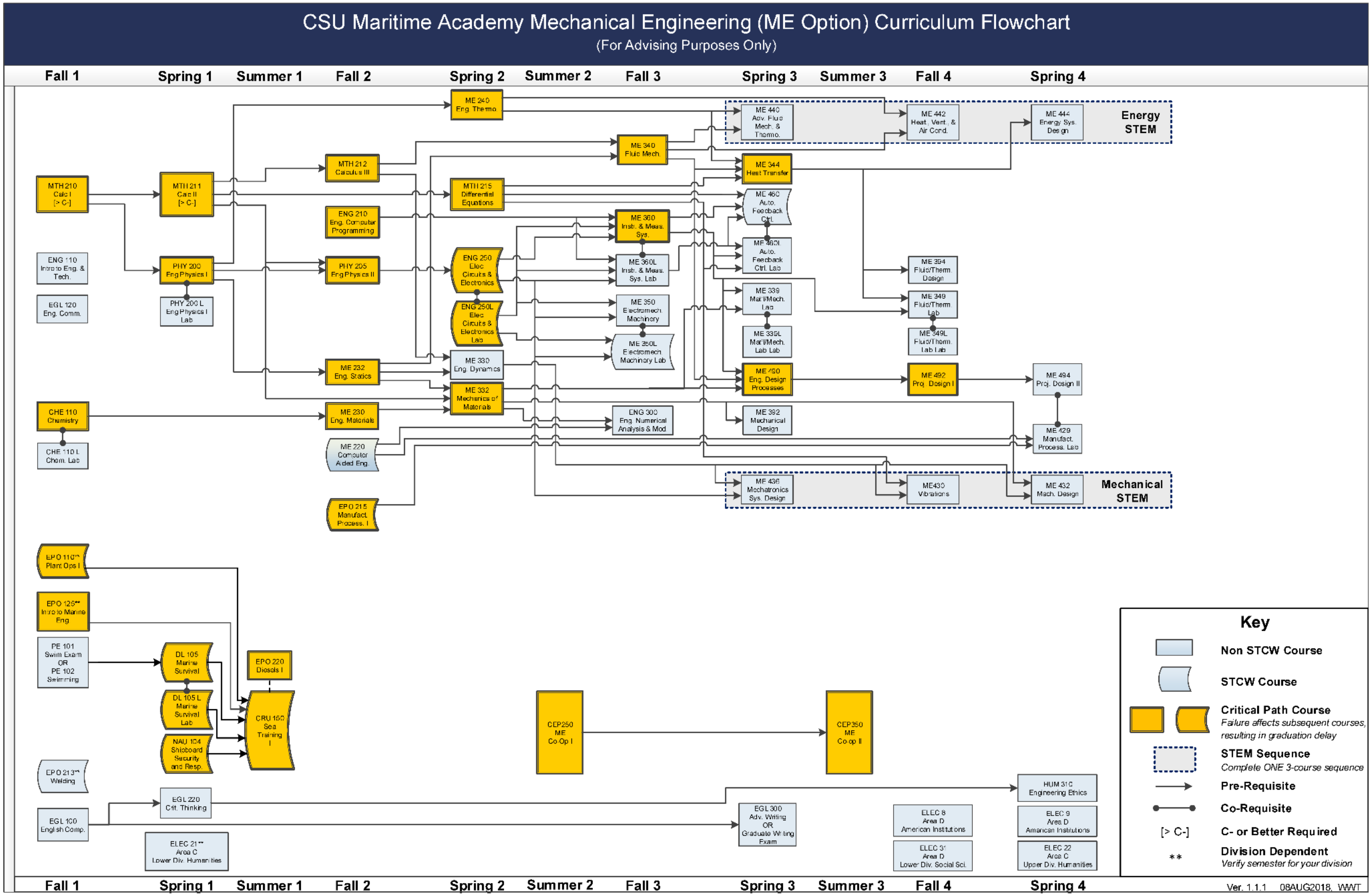

Figure 5.2. Mechanical Engineering Program – ME Option prerequisite flowchart.

A.5. Compliance with General and Program Criteria

Describe how the program meets the requirements in terms of hours and depth of study for each subject area (Math and Basic Sciences, Engineering Topics) specifically addressed by either the general criteria or the program criteria.

The Mechanical Engineering program meets or exceeds all requirements for Math & Basic Sciences and Engineering Topics in terms of hours as laid out in the EAC General Criteria. EAC Criterion 5 requires 30 hours of Math and Basic Science; the ME program curriculum has 31 hours of Math and Basic Science (Table 5.1). With the exception of ENG 300, Engineering Numerical Modeling & Analysis, the units are lower division courses taught by the Science & Math Department. EAC Criterion 5 requires 45 hours of Engineering Topics; the ME program curriculum has 69 hours of Engineering Topics for both options. In terms of depth of study, 18 of the 69 hours are considered lower division, while 51 hours are considered upper division. In addition, 9 hours are a choice between the energy or mechanical stem (e.g. specialization). Choosing a stem means choosing a 3-course series with an emphasis in either the energy design or mechanical design.

The Mechanical Engineering program meets or exceeds all criteria for curriculum for Mechanical Engineering Programs. The program criterion specifically state:

> *The curriculum must require students to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes; and prepare students to work professionally in either thermal or mechanical systems while requiring topics in each area.*

Courses that apply the principles of engineering make up the heart of the engineering program. More specifically, those courses that are connected to Student Outcomes 1, 2, and 6. These outcomes are met by many of the program's courses, as listed in Table 5.3. The basic science and math courses are met as discussed in the previous paragraph.

The ability to model, analyze, design, and realize physical systems, components or processes is encompassed in courses with outcomes that align with program Student Outcome 2. For all students, this list includes ME 220 Computer Aided Engineering (2 units), ME 360 Instrumentation and Measurement Systems (2 units), ME 394 Fluid/Thermal Design (3 units), ME 429 Manufacturing Processes (1 unit), ME 492 Project Design I (3 units), and ME 494 Project Design II (3 units). In Energy Stem, this list also includes ME 440 Advanced Fluid Mechanics & Thermodynamics (3 units), ME 442 Heating, Ventilating, and Air Conditioning (3 units), and ME 444 Energy Systems Design (3 units). In Mechanical Stem, this list also includes ME 432 Machinery Design and ME 436 Mechatronic System Design (3 units).

Students are prepared to work professionally in either thermal or mechanical systems by having to complete courses that provide the foundational knowledge in those fields. The courses that prepare all of the program's students in thermal systems include: ME 240 Engineering Thermodynamics (3 units), ME 340 Engineering Fluid Mechanics (3 units), ME 344 Heat

Transfer (3 units), ME 349 Fluid/Thermal Laboratory (2 units), and ME 394 Fluid/Thermal Design (3 units). The courses that prepare all of the program's students in the mechanical systems include: ME 230 Engineering Materials (3 units), ME 232 Engineering Statics (3 units), ME 330 Engineering Dynamics (3 units), ME 332 Mechanics of Materials (3 units), and ME 339 Material/Mechanical Lab (2 units). In addition, the program's students receive additional preparation based on the stem that they choose. Those in the Energy Stem receive additional preparation in thermal systems while those in the Mechanical Stem receive additional preparation in mechanical systems.

A.6. Broad Educational Component

Describe the broad education component and how it complements the technical content of the curriculum and how it is consistent with the program educational objectives.

In addition to the engineering, math, and science courses, students in the Mechanical Engineering program also have broader general education courses. This broad education serves multiple purposes. The general education component of the Mechanical Engineering program is defined by the California State University system. Graduates from the program are required to complete courses in communication, math & science, fine arts & humanities, social sciences, and lifelong learning. In the areas of fine arts & humanities, students are required to complete courses designated in Area C. Similarly, in the area of social sciences, students are required to complete courses designated in Area D. In addition, students are required to complete the American Institutions requirement, in which students must complete two semesters of courses in either American History or American Government. The courses can be seen in Figure 5.1 and Figure 5.2 in the lower portion of the prerequisite flowchart. In the area of writing, students are required to complete EGL 100 English Composition, EGL 120 Technical Communication, and EGL 300 Advanced Writing (students may test out of this requirement through the Graduate Writing Exam). In addition, Mechanical Engineering students are required to take HUM 310 Engineering Ethics.

These courses help support engineering education in multiple ways. First, they help in developing skills, such as critical thinking, written communication, and oral communication. These "soft skills" have been identified as a critical skill for graduates by engineering employers (broadly and in our own Cal Maritime Advisory Council). Fine arts & humanities courses offer an opportunity to for students to develop their creativity skills, which aids in developing aspects of design that are not necessarily emphasized in engineering. Teaching engineering ethics helps instill the students the code of ethics on which the profession is based. The general engineering courses prepare Mechanical Engineering graduates to be contributing members to society on the whole, which is a key mission to the California State University system.

A.7. Major Design Experience (Capstone Project)

Describe the major design experience that prepares students for engineering practice. Describe how this experience is based upon the knowledge and skills acquired in earlier coursework and incorporates appropriate engineering standards and multiple design constraints.

The three sequence capstone design courses are ME 490 Engineering Design Process (3 units), ME 492 Project Design I (3 units), and ME 494 Project Design II (3 units). These courses are designed to provide students with the knowledge necessary to successfully execute the engineering design process beginning with the conceptual design, preparing the preliminary design, and ending with the final design. Students generate a preliminary design report, carry out engineering analysis to prepare the final design, manufacture their designs, and lastly test and validate their design. At the end of the course sequence, all constituents, including students, faculty, staff, and industrial partners, are invited to attend an exhibition of the projects and final project presentations.

In ME 490 Engineering Design Process, students are introduced to all tasks of the engineering design process. These include: (1) project management, (2) developing detailed design constraints, (3) preliminary computer aided drafted (CAD) designs, (4) cost and safety analysis, (5) quantitative design analysis (i.e. structural, thermal, fluid, etc), (6) fabrication and test of final design, and (7) iterations of design. Additionally, students are required to learn or improve skills needed for designing or fabricating their final design. Such skills may include: (1) machining, (2) welding, (3) finite element analysis, (4) computational fluid modeling, (5) 3D printing, (6) printed circuit board design and fabrication. This broad range of topics and information build upon the fundamental engineering knowledge imparted by previous courses. The ME 490 prerequisites of ME 340 Fluid Mechanics, ME 332 Mechanics of Materials, and ME 360 Instrumentation and Measurement Systems were identified as meeting the breadth of technical needs for the course, particularly in the area of quantitative design analysis. The final goal of this course is to develop a project idea on which their senior project will be based.

In ME 492 Project Design I, the design teams implement what they learned in ME 490 into their own designs. One of the first tasks in this course is to identify the project objective and constraints on their designs. By the first half of the course, these are clearly defined and presented to the class and department faculty. This process entails an extensive literature review, that begins in ME 490 and carries into the beginning of this course. As a part of their literature search, students are expected to consult professional standards (e.g. ASME, Codes of Federal Regulation, Consumer Product Safety Commission, National Institute for Standards and Technology). Students are expected to explore the various aspects beyond engineering such as economics and safety. Toward the latter half of the semester, the students are expected to finalize their preliminary design and carry out a detailed engineering analysis, using tools such as theoretical analysis, numerical analysis, or prototyping and testing. Throughout this process, the student teams are supported by the course instructor and a designated faculty advisor. At the end of this design phase (end of the fall senior year), design groups are expected to have a project design ready for fabrication and are required to make an oral presentation of their project as well as prepare their written preliminary design report. The presentations are evaluated by the ME faculty.

In ME 494 Project Design II, the main emphasis is on fabrication and testing. At this point, the students have many of the manufacturing skills necessary. However, they are given additional support in the co-requisite for this class, ME 429 Manufacturing Process Lab. By the end of the semester, each group is required to demonstrate that their completed project fulfills the objectives and meets the constraints laid out in ME 492. Finally, they are required to communicate their designs through an exhibition, where the projects are on display for the campus community, and an oral presentation, which is attended by students, faculty, administrators, and industrial partners.

A.8. Cooperative Education

If the program allows cooperative education to satisfy curricular requirements specifically addressed by either the general or program criteria, describe the academic component of this experience and how it is evaluated by the faculty.

Cooperative (co-op) education (defined as a full-time work experience combined with academic instruction) in the Mechanical Engineering Program can only be used to satisfy the summer co-op course requirements. Co-op education cannot be used to satisfy curricular requirements during the fall or spring semesters.

License option students are required to complete CRU 250 Commercial Cruise in the summer of their 2nd year. Students are assigned billets to sail as engineers aboard commercial vessels. The sea-time earned from these commercial cruises is part of the Coast Guard requirements for students to earn their USCG Third Engineer Assistant's License. The course includes the submission of a cruise portfolio, which is assessed and used to determine the student's grade. This course is administered by the Engineering Technology Department.

ME Option students are expected to complete two summer internships during their sophomore and junior summer semesters in CEP 250 ME Co-op I and CEP 350 ME Co-op II respectively. The course is designed to work in parallel with 8 weeks of the student's summer engineering internship experience. The course includes regular assignments, such as weekly reports, biweekly assignments (e.g. SMART goal development, employer interview, and resume building), and final report. The final report is an opportunity for the student to summarize their work through the summer and reflect on the learning experience provided by the internship. The faculty supervisor for the course assesses the student work, generally following a point distribution or rubric laid out with the assignment. In addition to the faculty assessment, a percentage of the student's final grade is based on an employer evaluation. The evaluation looks at the student's performance in multiple areas and helps assess their performance relative to the student outcomes for the department.

A.9. Materials Available for Review

Describe the materials (course syllabi, textbooks, sample student work, etc.), that will be available for review during the visit to demonstrate achievement related to this criterion. (See the 2019-2020 APPM Section I.E.5.b.(2) regarding display materials.)

The following material will be available for review during the visit:

- Course Portfolios, with syllabi and samples of student work
- 2019 Senior Capstone Project Final Reports
- Textbooks for each course

B. Course Syllabi

In Appendix A of the Self-Study Report, include a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 or by any applicable program criteria.

Course syllabi for engineering courses taught by the Mechanical Engineering program, as well as math and science courses taught by the Department of Sciences and Mathematics can be found in Appendix A.

CRITERION 6. FACULTY

A. Faculty Qualifications

Describe the qualifications of the faculty and how they are adequate to cover all the curricular areas of the program and also meet any applicable program criteria. This description should include the composition, size, credentials, and experience of the faculty. Complete Table 6-1. Include faculty resumes in Appendix B.

Teaching courses in the mechanical engineering department are currently six full-time faculty members, one half-time faculty member, and five faculty members who are either part-time lecturers or members of other Cal Maritime academic departments. Five of the full-time faculty members and the half-time time faculty member are tenured, while the other faculty member is on the tenure-track. They all hold Ph.D. degrees in mechanical engineering or a closely related field, with two of them holding a Professional Engineer's license. Full information regarding the qualifications can be found in Table 6.1.

Our faculty come from a variety of backgrounds in engineering, have substantial teaching, research, and industry experience, are enthusiastically involved in program and professional development, have published and presented scholarly work, and are active in professional societies. Faculty resumes are included in Appendix B. As can be seen in the resumes, Dr. Bagheri and Dr. Tsai have expertise in the fluid/thermal area, Dr. Nordenholz, Dr. Oppenheim, and Dr. Gutierrez in the mechanical/structural area, and Dr. Snell and Dr. Holden in the areas of automation, controls and mechatronics. This range of expertise provides the department with the ability to adequately cover the range of subject matter in our curriculum. Some of the scholarly activity for the ME faculty members is summarized in Section D.

Table 6.1. Faculty Qualifications

Mechanical Engineering

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
Nader Bagheri	Ph.D. Mechanical Engineering, 1989	P	T	FT	0	29	29	Y	L	M	L
Jim Gutierrez	Ph.D., Engineering, 1998	P	T	PT	28	18	18	Y	M	M	H
Antony Hasson-Snell	Ph.D., Aerospace Engineering, 1991	P	T	FT	4	26	18	N	M	M	L
Michael Holden	Ph.D., Aeronautics and Astronautics, 1999	P	T	FT	5	15	11	N	L	M	M
Thomas Nordenholz	Ph.D., Mechanical Engineering, 1998	P	T	FT	0	21	21	N	L	H	L
Tomas Oppenheim	Ph.D., Mechanical Engineering, 2011	AST	TT	FT	0	4	4	Y	L	M	M
William Tsai	Ph.D., Mechanical Engineering, 2009	AST	TT	FT	3	6	6	N	H	M	L
Frank Yip	Ph.D., Theoretical Chemistry	ASC	T	PT	0	9	7	N	M	M	L

Jeff Hadian	Ph.D., Engineering Science and Mechanics, 1992	A	NTT	PT	28	10	5	N	L	L	H
Sepand Momeni	Ph.D., Mechanical Engineering, 2008	A	NTT	PT	10	2	0	N	L	H	H
Ali Moradmand	Ph.D., Physics, 2013	A	NTT	PT	1.5	4	4	N	L	L	L
Sarah Szewczyk	B.S., Electrical Engineering, 2012	A	NTT	PT	7	2	0	Y	M	M	H
Steffan Long	B.A., Language Arts, 1989	I	NTT	PT	20	2	2	N	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: T = Tenured TT = Tenure Track NTT = Non-Tenure Track
3. FT = Full-Time Faculty or PT = Part-Time Faculty, at the institution.
4. The level of activity (high, medium or low) should reflect an average over the three years prior to the visit.

B. Faculty Workload

Complete Table 6-2, Faculty Workload Summary and describe this information in terms of workload expectations or requirements.

The Faculty Workload Summary (Table 6.2) shows the ME faculty workload for the 2018-19 academic year. The Collective Bargaining Agreement (CBA) for the faculty defined by the California Faculty Association (CFA) requires that each semester a full-time instructional faculty needs to fulfill 15 weighted teaching units (WTUs) of workload covering the areas of teaching, scholarship and service. The areas of service and scholarship, including departmental responsibilities, typically account for 3 WTUs of indirect workload, leaving 12 WTUs for direct teaching per semester. Faculty in new tenure track positions are provided for the first two years with an additional 3 WTUs per semester of non-teaching time to facilitate scholarship, resulting in a direct teaching workload of 9 WTUs per semester for the first two years. A faculty is also able to buy-out their teaching responsibilities by using funding through external contracts and grants. Reduction from the minimum teaching load of 12 WTUs may be allowed for several reasons including but not limited to: release time awarded due to CFA or accreditation responsibilities, departmental chair responsibilities, program coordination responsibilities, special assignments, and internally funded grants or projects. Full-time faculty members are expected to participate in commencement ceremonies each spring. All faculty participate in student evaluation of instruction.

The workload schedule information identifies time allocated to teaching, buy-out through external contracts/grants, and service duties. Information on the workload schedules are reviewed by the department chair to facilitate equitable distribution of teaching and non-teaching duties to all the faculty members. Department chairs are expected to discuss faculty workload with the Dean prior to making faculty assignments each Fall and Spring semesters. The Dean verifies and approves reassigned time for faculty reassignments prior to the schedule being confirmed.

Most of the core ME courses and labs are taught by the ME faculty and the average load per semester per faculty falls in the 9 to 13 units range. The department limits the number of class preparations to no more than three. The general expectation is that faculty will teach an average of 9 to 12 units per semester, and that 20 percent of their time will be devoted to service activities. During the past academic year, Dr. Nordenholz received a reduced load for his mentoring and management of the university's Collegiate Wind Turbine Competition team and associated grant support. Dr. Bagheri served as department chair, while Dr. Nordenholz served as Academic Senate Chair, resulting in reduced teaching loads.

Over the last decade or so, the student population has grown, and in order to keep small class and lab sizes, most classes have more than one section, and the number of lab sections has also gone up proportionally. The result is that the faculty are teaching fewer courses (preparations) with more sections to fill their teaching load assignments. To cover the remaining courses, part time lecturers and also faculty from outside of the Mechanical Engineering (such as the Sciences and Mathematics department) have been used where appropriate.

Table 6.2. Faculty Workload Summary

Mechanical Engineering

Faculty Member	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]	
Nader Bagheri	FT	ME 340/3 Fall 2018 ME 394/3 Fall 2018 ME 440/3 Spring 2019 ME 444/3 Spring 2019	40	0	60	100
Jim Gutierrez	PT	ENG 300/3 Fall 2018 ENG 300/3 Fall 2018 ME 230/3 Fall 2018 ME 230/3 Fall 2018 Pre-Retirement Reduction in Time-Base, Spring 2019	80	0	20	100
Antony Hasson-Snell	FT	ME 232/3 Fall 2018 ME 350/3 Fall 2018 ME 350L/1 Fall 2018 ME 350L/1 Fall 2018 ME 350L/1 Fall 2018 ME 350L/1 Fall 2018 ME 460/3 Spring 2019 ME 460/3 Spring 2019 ME 460L/1 Spring 2019 ME 460L/1 Spring 2019	80	0	20	100

		ME 460L/1 Spring 2019 ME 460L/1 Spring 2019				
Michael Holden	FT	ENG 110/1 Fall 2018 ME 360/2 Fall 2018 ME 360L/1 Fall 2018 ME 360L/1 Fall 2018 ME 360L/1 Fall 2018 ME 360L/1 Fall 2018 ABET Coordinator/1.5 Fall 2018 ENG 250/3 Spring 2019 ENG 250/3 Spring 2019 ME 436/3 Spring 2019 ME 436/3 Spring 2019 ABET Coordinator/3 Spring 2019	62	0	38	100
Thomas Nordenholz	FT	ME 232/3 Fall 2018 ME 430/3 Fall 2018 Senate Chair/6 Fall 2018 ME 339/1 Spring 2019 ME 339L/1 Spring 2019 ME 339L/1 Spring 2019 ME 339L/1 Spring 2019 Senate Chair/6 Spring 2019	40	0	60	100
Tomas Oppenheim	FT	ME 220/2 Fall 2018 ME 220/2 Fall 2018 ME 220/2 Fall 2018 ME 492/3 Fall 2018	80	0	20	100

		ME 492/3 Fall 2018 ME 392/3 Spring 2019 ME 490/3 Spring 2019 ME 494/3 Spring 2019 ME 494/3 Spring 2019				
William Tsai	FT	ME 442/3 Fall 2018 ME 349/1 Fall 2018 ME 349L/1 Fall 2018 ME 349L/1 Fall 2018 ME 349L/1 Fall 2018 ME 349L/1 Fall 2018 ABET Coordinator/1.5 Fall 2018 ME 240/3 Spring 2019 ME 240/3 Spring 2019 ME 344/3 Spring 2019 ABET Coordinator/3 Spring 2019	65	0	35	100
Frank Yip	PT	ENG 210/2 Fall 2018 ENG 210/2 Fall 2018 ENG 210/2 Fall 2018	100	0	0	100
Jeff Hadian	PT	ME 332/3 Spring 2019 ME 332/3 Spring 2019	100	0	0	100
Steffan Long	PT	ME 429/1 Spring 2019 ME 429/1 Spring 2019 ME 429/1 Spring 2019 ME 429/1 Spring 2019	100	0	0	100
Sepand Momeni	PT	ME 432/3 Spring 2019	100	0	0	100

Ali Moradmand	PT	ME 330/3 Spring 2019 ME 330/3 Spring 2019	100	0	0	100
Sarah Szewczyk	PT	ENG 250L/1 Spring 2019 ENG 250L/1 Spring 2019 ENG 250L/1 Spring 2019 ENG 250L/1 Spring 2019	100	0	0	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."

Out of the total time employed at the institution.

C. Faculty Size

Discuss the adequacy of the size of the faculty and describe the extent and quality of faculty involvement in interactions with students, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners including employers of students.

The department's intention is to keep a relatively low student/faculty ratio that allows sufficient interaction between students and faculty in the areas of academic advising and technical advising. Table 6.3 shows the number of full time as well as graduating students in the past 5 years as well as the numbers from the 5 years below that. As can be seen, there has been significant growth within the major in the past decade. Since the last accreditation visit in 2013, the department has gained one faculty member, but lost one to retirement and has another half-time in a pre-retirement program. The department has requested additional tenure-track faculty each year for several years, but to date other departments have received priority for new hires.

Table 6.3. Full time student and graduating senior count for the Mechanical Engineering program since 2008. Note that the 2018-2019 value does not include Summer 2019 graduates.

Academic Year	Full Time Students	Graduates
2008-09	133	27
2009-10	144	24
2010-11	137	19
2011-12	165	28
2012-13	181	25
2013-14	202	29
2014-15	185	32
2015-16	206	48
2016-17	189	34
2017-18	190	36
2018-19	190	36*

Class sizes at Cal Maritime, especially upper division ME classes, are usually small. Computer classes are capped at 24 students and the labs are capped at 12 students per section. ME faculty, who teach the majority of both lectures and lab, and who generally grade all student work, know their students by name and are familiar with their strengths and challenges. ME faculty hold several office hours every week and are present on campus a good part of the week. These activities allow a high level of interaction between students and faculty. The department takes pride in creating a student-centered environment where students are encouraged to grow, learn, lead, and flourish.

As mentioned above, all ME students are assigned an advisor and are required to meet with the advisor at least once a semester. Many students meet more often to discuss course selection and career goals.

As a small campus, Cal Maritime relies on faculty to provide service to the institution, and the Mechanical Engineering faculty has provided strong service to the institution. Four of our faculty have served as officers on the Cal Maritime Academic Senate. Two have served as chair of the senate, and one has been the campus representative at the CSU academic senate. The faculty has served on key committees and has participated in planning the future of the campus.

Interaction between faculty and industry is provided through semi-annual meetings with the Cal Maritime Advisory Council, comprised of representatives from employers, professional organizations and other academic institutions. The department provides updates to activities within the department, seeks the board's input on any proposed modifications to the program, and solicits recommendations from the board on any areas they feel needs attention.

Additional input from industry is collected from employer surveys, in which organizations employing Cal Maritime mechanical engineers are asked to evaluate how well the program has prepared the students that they have hired, and what recommendations they have for program improvement.

Finally, our faculty interact with industry through their active involvement in local branches of professional organizations, particularly ASME and ASEE.

D. Professional Development

Provide detailed descriptions of professional development activities for each faculty member.

Nader Bagheri
Dr. Bagheri has attended the Women in Maritime Leadership Conference, CSU Maritime, month of March: Spring 2017, 2018, 2019; the Cal Maritime Annual Leadership Offsite Retreat, Sonoma State University, March 2018; the New and Experienced Department Chair Workshop, CSU Long Beach, October 2016; the Academic Impression Collaborative Leadership in Higher Education Conference, St. Louis, MO, July 2016. He was an International Association of Maritime Universities reviewer, 2016, and collaborated on Air flow studies of wind barriers in dry cooling systems in power plants, UC Davis, for his Spring 2014 sabbatical leave activity.

Jim Gutierrez
Introduction to ANSYS Mechanical (ver. 18) 12/17. Introduction to LS DYNA, Impact Dynamics (FEA) Training Course, 6/16. ANSYS 17.0 Update Workshop, 5/16. HAAS (CNC) Milling Center Training, 9/15. HAAS (CNC) Programming and Modeling with Fusion, 7/15. Introduction to ANSYS Fluent, 9/14. HAAS (CNC) Vertical Milling Machine Training, 6/14. HAAS (CNC) Lathe Programming, 3/14.

Michael Holden
Dr. Holden was conference chair for the 2018 E-navigation Underway North America conference held at Cal Maritime. He attended the Women in Maritime Leadership conference in 2019, the ABET Symposium in April 2018, the CSU COAST annual conference in April 2018, Sabbatical Fall 2017, Cal Maritime Future Conference V in January 2016, CERF Conference 2015.

Tom Nordenholz
Dr. Nordenholz was active in the Cal Maritime leadership and planning as Senate Chair during academic years 2016-2017, 2017-2018, and 2018-2019.

Tomas Oppenheim
Dr. Oppenheim has nearly completed a Machine Tool Tech certificate from Laney College to keep his skills up-to-date in support of the capstone project class. He is also taking auto tech classes in order to support the SAE projects in the capstone class. He has completed a Solidworks FEA class, works with UCSF faculty in the neuroprosthetics area, and supports the Cal Maritime oceanography faculty with fabrication support.

Antony Snell
Dr. Snell is a member of ASME and SAE as well as a senior member of AIAA. In order to gain more experience with interfacing and programming micro-controllers, he audited the ET 370L, Electronics Lab class taught by his colleague, Dr. Evan Chang-Siu, and advised some of the students in that class. He participated in a Pacific Gas and Electric Company workshop on Heat Pumps for water heating, June 2017. Since 2015, he has served as an engineering course reviewer for the statewide C-ID project which approves the equivalence of courses taught at California Community Colleges to standard course descriptors. This allows approved courses to be readily transferred from the Community Colleges to California State University or University of California programs.

William Tsai
MITx Course 2019: Additive Manufacturing for Innovative Design and Production: Online course teaching the fundamentals of additive manufacturing as well as the applications and business potential.   Goal is to understand the fundamental principles and vocabulary of additive manufacturing and understanding its relationship to thermal properties and heat transfer.

CSU Course: Introduction to Online Teaching 2018: An introductory course designed to help instructors build courses online. This is a requirement for courses using a completely online modality for instruction. The course goes over the pedagogy, course design, considerations, and implementation associated with creating an online course.

ASEE Conferences (2017, 2018, 2019): The American Society for Engineering Education holds annual conferences that showcase the latest research in the area of engineering education. This conference provides a valuable opportunity to gather new ideas in engineering education for the classroom. This helps facilitate improvement of teaching in the classroom.

ABET Conference 2018: The ABET conference is designed to help institutions develop their assessment processes and prepare for accreditation visits. This have been instrumental in developing the assessment process used by the program.

E. Authority and Responsibility of Faculty

Describe the role played by the faculty with respect to course creation, modification, and evaluation, their role in the definition and revision of program educational objectives and student outcomes, and their role in the attainment of the student outcomes. Describe the roles of others on campus, e.g., dean or provost, with respect to these areas.

The Mechanical Engineering faculty are responsible for the program quality, assessment, evaluation, and improvement of the program. As part of this responsibility the ME faculty take primary responsibility of the courses they teach. This includes defining course outcomes to assess and evaluate how well student outcomes are being met.

Program objectives and student outcomes are reviewed by all department faculty members as part of the course assessment process that is documented in periodic assessment reports. In the reports, course outcomes are measured, and are aggregated and mapped to student outcomes to assess how well they are being met. The faculty will then discuss what areas need improvement, and what action is recommended. The faculty will also review the outcomes to see whether modifications are recommended.

The process described above leads to faculty-initiated recommendations. In addition, the department periodically reviews recommendations made by employers, students and alumni through surveys and meetings of the Cal Maritime Advisory Council (CMAC). These recommendations may also result in recommended actions.

The department will inform the Dean of proposed action items and will present them to the next meeting of the CMAC. Any proposed actions involving significant modification to the curriculum or program will then go through a formal approval process by the curriculum committee.

The process to modify an existing course or create a new course or program is through the Curriculum Committee (CC) of the Cal Maritime Academic Senate. CC minutes will be made available for the ABET site visit. The Curriculum Committee, with representatives from each department, serves three primary functions:

1) It functions as the official archives for the curriculum of the institution. The master-documents of the committee constitute the state-of-the curriculum for the institution.
2) It functions as the institutionally designated vehicle-of-change for all modifications to the curriculum.
3) It functions as an academic policy-making organ of the institution.

With respect to the second function, the following policies apply:

- All requests for changes in the curriculum, including new programs or courses, or significant modification of existing programs or courses, are evaluated by the Curriculum Committee (CC).
- Proposals for program or course changes can be initiated by a faculty member, an academic administrator, or a student.
- An official Curriculum Change Request is required to start the process. The form, which includes assessment and evaluation methods, along with all the appropriate documents, is submitted to the appropriate department chair(s). The chairs of all affected departments conduct an internal review of the request. A vote of the proposed change is conducted within each affected department. The form and the results of the tally of the department along with a Department Chair Questionnaire are forwarded to their Dean.
- The Dean reviews the proposal and all related documents. The Dean may choose to provide additional written commentary and forwards all the documents to the Chair of the Curriculum Committee.
- The CC Chair will call for an open meeting to consider the proposal and vote on it. The CC recommendation will then be forwarded to the appropriate academic administrator for final approval and implementation of the curriculum change
- A curriculum change is implemented after the approval by the department, the CC, and the appropriate administrators.

CRITERION 7. FACILITIES[1]

A. Offices, Classrooms and Laboratories

Summarize each of the program's facilities in terms of their ability to support the attainment of the student outcomes and to provide an atmosphere conducive to learning.

1. *Offices (such as administrative, faculty, clerical, and teaching assistants) and any associated equipment that is typically available there.*

2. *Classrooms and associated equipment that are typically available where the program courses are taught.*

3. *Laboratory facilities including those containing computers (describe available hardware and software) and the associated tools and equipment that support instruction. Include those facilities used by students in the program even if they are not dedicated to the program and state the times they are available to students. Complete Appendix C containing a listing of the major pieces of equipment used by the program in support of instruction.*

A.1. Offices

All ME tenured and tenure-track faculty have individual offices located in the Faculty Office Building. The Engineering Technology tenured and tenure-track faculty have individual offices located in the Technology Building. Adjunct faculty and lecturers have shared office spaces in the Faculty Office and Technology Buildings. The Dean of Engineering has an office in the Technology Building. An administrative coordinator for the School of Engineering has an office adjacent to the Dean's office.

Faculty use the office space as a workplace when not in the classroom and for holding office hours. All of the offices include furnishings (chairs, desks, and bookshelves), whiteboards, storage space (e.g. file cabinet or bookshelf), and a wired network connection. Faculty in these offices have access to all of the campus multifunction and network printers, including the two multifunction printers in the Faculty Office Building and one multifunction and one network printer in the Technology Building.

A.2. Classrooms

Cal Maritime has 19 instructional classrooms located in five buildings on campus as well five classrooms aboard the Training Ship Golden Bear. Classroom capacities vary from 8-96 students in a teaching setting. Although most of the classrooms are laid out in a standard lecture style (rows of seats facing a forward lectern and whiteboard), others such as ABS102 have a flexible layout, discussed later. All classrooms include at least one projector and desktop PC.

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[1]Include information concerning facilities at all sites where program courses are delivered.

The Classroom Building has six conventional lecture classrooms. The three lecture halls on the first floor have capacities of 40-52 students in a standard lecture layout. Those classrooms all have sliding whiteboards, dual projectors, and SMART Boards, which allow for on-screen writing. The three classrooms on the second floor have capacities of 28-52 students. These rooms contain a projector, desktop PC, and whiteboard spanning 3 of the 4 walls. The building also contains a computer lab, which is used for instruction and student computing, that will be discussed in further detail in Section B.

The Technology Building has five classrooms. The largest of the classrooms is Peachman Lecture Hall (Tech 146) which has a capacity for 96 in a standard lecture format. The room has whiteboards and projection capability at the front. The building also contains four smaller classrooms with capacity for 28-40 in a standard lecture layout. These rooms have whiteboards on 2 of the walls in the room and projector in the front of the classroom.

The Laboratory Building primarily houses the laboratories which will be discussed in the next section. However, it does contain one classroom, Lab 201, which is a standard lecture hall with capacity for 30 students. It contains whiteboards and a projector at the front of the room.

The ABS Building consists of two classrooms. ABS 101 is a standard lecture hall layout with a capacity of 56. This room offers a small whiteboard, a projector, and two SMART boards in the front of the room. ABS 102 is considered a flexible layout classroom. This room is setup in a meeting style, where the tables can be arranged in a conference format, allowing students to see one another during discussions.

In the simulator building, one classroom is scheduled for engineering courses. SIM 135 is a standard lecture layout classroom with capacity for 30 students. It contains whiteboards along three walls, a desktop computer, and 2 projectors at the front of the room.

The TSGB has five classrooms with capacities varying from 15-45 students. The classrooms are named Bowditch (45), Ericson (40), Maury (25), Miller (15), and Osborne (23). The layout is similar to the shore-side classrooms with a standard lecture layout and includes access to a computer and projector. These classrooms are primarily used for instruction during the summer training cruises, when the ship is out at sea. During the semester the classrooms are available for scheduled classes if there is insufficient capacity on the main campus.

A.3. Laboratories

The laboratories used by the Mechanical Engineering program are found in the Laboratory and Technology Building.

A.3.1. Laboratory Building

The Lab Building was opened with all new equipment in January 2000. Since then several updates to systems and hardware have taken place. The following labs listed in Section A.3.1 are located in the Laboratory Building.

Chemistry Lab
The chemistry lab contains equipment and computers for CHE 110L Chemistry Lab and can support up to 24 students. The Chemistry Laboratory is equipped with standard general chemistry laboratory equipment to support experiential student learning. In addition to standard chemistry glassware and equipment, students use Vernier LabQuest 2® standalone interfaces in combination with a variety of sensors including spectrophotometers, colorimeters, pH meters, and temperature probes.

Physics Lab
The physics lab contains a variety of equipment for conducting the 13 lab activities that typically comprise the PHY 200L course. In addition to a variety of small tools such as springs, meter sticks, and stopwatches, the general, and activity specific equipment housed in the physics lab includes:

General:
- 10 computers with a variety of software including LabVIEW, MS Office, and Arduino
- 15 Arduino microcontrollers
- 12 PocketLab wireless sensors
- 10 sets of graduated masses
- 8 triple beam balances
- 8 air tracks with 16 associated floating carts

Activity Specific:
- 8 force tables
- 8 sets of projectile rails
- 8 aluminum friction tracks with clamped pulleys
- 8 sets of standard density materials
- 8 ballistic pendula with spring loaded projectile launchers
- 8 motorized chucks coupled through a tunable radius friction clutch

Material/Mechanical Lab
This is the laboratory that supports the ME 339 Material/Mechanical Lab, which is the capstone laboratory experience in the mechanical side of the ME curriculum. In addition, it is used to support the ME 430 Mechanical Vibrations course. It has the following equipment:

- Universal Tensile Test Machine (with electrohydraulic control and data acquisition with a dedicated computer)
- Manual Tensile Test apparatus with Brinell Hardness Tester
- Rockwell Hardness Test Machine
- Charpy Impact Test Machine
- Creep Test Machine
- Rotating Beam Fatigue Test Machine
- Two 1000 ºC ovens
- Fixture for Jominy Testing
- Abrasive saw

- Mounting press
- Grinder/Polisher
- Microscope with camera
- Three mobile computer workstations with LABVIEW data acquisition hardware and software.
- Strain gages and accessories for installation
- Bridge completion and differential channel interface units
- Accelerometers and simple devices for calibration
- ECP Rectilinear Plant: for vibration experiments
- Unbalanced motor vibrational experimental apparatus

Fluid/Thermal Lab

The fluid thermal lab is well equipped with a variety of facilities for fluid mechanics, heat transfer, and thermodynamic testing. It supports the ME 349 Fluid/Thermal Lab, which is the capstone laboratory experience in the mechanical side of the ME curriculum. The equipment includes:

- Two wind tunnels. The tunnel used in ME 349 features a 12" x 12" test section, variable speed with maximum velocity of 145 ft/s.
- Particle image velocimetry experiment. The experiment (Dantec EduPIV) is designed to measure flow velocities inside a water tank for various user defined flows.
- Heat exchanger test stand with double pipe, shell and tube configurations
- Thermal conduction experiment
- Pipe flow experiment
- Internal combustion gas engine experiment
- 2 PCs with data acquisition systems and LabView
- Instrumentation in the above experiments include
    - Pressure transducers
    - Particle image velocimetry
    - Manometer
    - Lift and Drag force measurement (wind tunnel)
    - Thin film heat transfer gages
    - Thermocouples
    - Flow rate measurement (heat exchanger)
    - x-y positioning instrument (wind tunnel)
    - Optical pyrometer

Instrumentation and Controls Lab

This laboratory supports the ME 360L Instrumentation and Measurements Systems Lab, ME 460L Automatic Feedback Control Lab, and ME 436 Mechatronic System Design classes. It contains the following equipment:

- Six student workstations consisting of:
    - PC workstations with LABVIEW
    - Data acquisition hardware
    - Power supply

    - Function generator
    - Handheld multimeter
- Six power supplies
- Instructor computer workstation
- Six PLC Trainers
- Tecquiment Servo Trainer
- Ball and Beam Control trainer
- Several printed circuit trainers

A.3.2. Technology Building

The Technology Building includes the following labs:

Electrical Circuits and Electronics Lab

This laboratory supports the ENG 250L Electrical Circuits and Electronics and ME 350L Electromechanical Machinery Labs. It consists of the following equipment:

- Ten student workstations plus one instructor work station each with:
    - PC workstation
    - Tektronix DPO2012B oscilloscope
    - HP bench top digital multi-meter
    - HP dual, 0-30V, regulated power supply
    - Function generator
- Five Hampden electric machine workstations each with:
    - DC/AC 3 phase variable voltage power supplies
    - Dynamometer with digital torque and speed readouts
    - DC instrumentation set
    - AC instrumentation set with watt meters
    - DC load bank
    - DC machine
    - 3-phase Synchronous machine
    - 3-phase induction motor
    - 1-phase induction motor
    - Hitachi 3-phase, variable frequency drive

Power Lab

The Power Lab houses several operational and several display (static) power generation units. This lab supports classes taken by students in the School of Engineering such as EPO 312 Turbines. The working equipment includes:

- Alturdyne 80 kW gas turbine
- 200 kW Three Phase Resistive Load Bank
- Southwest WindPower 200 W Wind Turbine with 3 phase resistive load and anemometer (located on the roof)
- Solar photovoltaic panel (100 W) on a rotating frame with load bank

- Parabolic Solar Steam Generator
- Student-built Wind Tunnel (3 ft by 3 ft test section, 0-30 mph wind speed) to support the Collegiate Wind Competition
- Computer with LABVIEW data acquisition to measure wind speed and output power

The display equipment includes:

- 12-cylinder locomotive Diesel engine
- Steam Turbine with Reduction Gear

A.4. Simulators

Cal Maritime has several simulation facilities which are used to train the USCG license students, as well as those seeking careers in the Power Industry. The use of marine and facilities simulators allows the faculty to work with the students on scenarios and simulations that are difficult or unsafe to replicate on a working vessel. This gives the students the experience and confidence they need to work on these types of power plants as graduates – whether as an operating engineer or as a design engineer.

The simulators support specialized practical training courses that are required for the MET and FET programs and the ME License Option. These courses are not required of all ME students and are not considered part of the Core ME Program. For the students that do take them, these courses provide “value added” to their ME training. They teach students to understand how complicated energy systems work, how they react when a fault is introduced, and how to diagnose and troubleshoot them. The students work in small teams in these courses and alternate as the leader or “Chief Engineer” who is responsible for the systems and their safe and efficient operation. Hence these courses are also opportunities for the students to develop and practice their teamwork and leadership skills.

Cal Maritime also has a Simulation Center which opened in 2008. While this building serves primarily students in other majors, the building represents the interest and dedication Cal Maritime and the California State University have for establishing state of the art, hands on facilities on this campus. A $13 Million project, the Center includes Ship-handling Simulators, a Crisis Management Simulator, and LNG and Tank-Loading Simulators, among others. The following simulators are located in the Technology Center or in the stand-alone Steam Simulation Building.

A.4.1. Steam Plant Simulator

The Steam Plant Simulator is the only one of its kind, and the only full mission simulator at any of the seven US Maritime Academies. The Full Mission Simulator consists of four main areas: The engine control room, the main engine room, the emergency generator room, and the instructor station. The engine control room houses the controls and most automation consoles for propulsion, boiler operation and electrical generation and distribution. The engine room houses two marine boiler fronts, with two burners each, and associated equipment such as pumps and control valves. The emergency generator room houses the emergency generator and associated distribution panels. The instructor station is behind one-way glass and is where the instructor can introduce the issues for the students to resolve during the simulation.

The Steam simulator also includes six computer workstations containing the same power plant system as the Full Mission (FM) Simulator. The students work independently on these workstations prior to working as a team in the FM Simulator on similar simulation scenarios. Students are assessed both independently and as a team.

Students take two courses in steam simulation. The first introduces them to the systems, where they essentially enter a ship that has just been released from a shipyard and has no power. During the semester, the students run through and are assessed on their ability to establish electrical power throughout the vessel, light the boilers, raise steam, create vacuum in the condenser and get steam to the main propulsion turbines and electrical generators. During the second semester, the students must bring the ship to an at sea readiness, and then troubleshoot and resolve a myriad of engineering plant problems and situations.

Additionally, the simulation building holds a full mockup of a typical marine boiler with cutaways to allow visual access to its internal components, as well as steam valve cutaways and various steam turbine parts.

A.4.2. Diesel Plant Simulator

Cal Maritime has two Marine Diesel Simulators. The first is a four-room system. One room has eight computer workstations where students simulate different modes of operation of a diesel engine. An instructor's control workstation is in the next room, where he or she can monitor and present different scenarios for the student to answer. A one-way mirror allows the instructor to view student progress. On the other side of the instructor's workstation is a full-mission room, where there is a mockup of a shipboard engine room operating system console, and seven different generator consoles. One-way mirrors allow the instructor to look in on this room also. Upstairs from the full-mission room are simulators for local engine room control, the emergency diesel generator, a shipboard electrical distribution circuit breaker panel, and panels for monitoring the bilge and sludge system, and fuel and lube oil purification.

The second Marine Diesel Simulator was designed, built, and installed on the Cal Maritime Campus by Chevron Shipping. While this simulator is used primarily for active Marine Engineers, for training and education, the Cal Maritime Faculty have access to use this simulator to work alongside active industry professionals and bring other educational opportunities to the students.

A.5. Manufacturing Spaces

Manufacturing is a key aspect of the ME Program. The university has two facilities where manufacturing instruction is occurring and one more that will be coming online in Fall 2019.

All ME students take EPO 215 Manufacturing Processes, where they learn to use the machine shop, EPO 213 Welding Lab, and ME 429 Manufacturing Processes Lab, where they learn advanced fabrication techniques and specialized methods that they can apply to the fabrication of their senior design project). During ME 494 Project Design II, the students use the equipment in the machine and weld shops extensively for fabrication of their prototypes.

A.5.1. Machine Shop

The Machine Shop is used by students for the manufacturing of metal parts. It currently has

- Three-axis CNC machine
- Two-axis CNC lathe
- Five milling machines
- Three drill presses
- Two band saws
- Ten bench grinders and a surface grinder

The Machine Shop will receive new equipment in Fall 2019 thanks to a large alumni donation, which will include five axis CNC machine and new lathes. In the Mechanical Engineering curriculum, the machine shop supports EPO 215 Manufacturing Processes I, where they learn to use the machine shop and ME 429 Manufacturing Processes Lab, where they learn advanced fabrication techniques and specialized methods that they can apply to the fabrication of their senior design project (ME492 and ME494)

A.5.2. Weld Shop

The Weld Shop is used to train students in welding processes. It has 20 workstations, with each workstation tied to its own arc welder and each station vented to a common dust and fume collector. Each station is also plumbed with oxygen and acetylene lines for brazing and cutting operations. The Weld Shop also has a two-axis CNC plasma cutter, a metal shear, a sheet metal brake, a hydraulic press and a bench grinder. All Mechanical Engineering students receive training to use the Machine Shop in EPO 215 Manufacturing Processes I and to use the Weld Shop in EPO 213 Welding. Upon completion of those courses, students are then allowed to use the facility for classes that require welding, such as for the senior design project.

A.5.3. Maker Space

Opening in Fall 2019, the Maker Space is designed to provide students at Cal Maritime a facility to gain experience with rapid prototyping processes, such as additive manufacturing. The space will have two Flashforge Creator Pro and one MakerBot Replicator fused deposition modeling printers. In addition, it will also contain electronic fabrication stations as well as tools and craft supplies needed for student projects. The plan will be to make the facility open to all students upon completion of the appropriate training.

A.6. Training Ship

The Training Ship Golden Bear (TSGB) is a 500-foot vessel that Cal Maritime uses for shipboard training of cadets, both in-port and at-sea. The vessel makes a sea-going voyage each year. The voyage is two months in duration. During this time, the ship is used as a real-life working platform to train cadets in watch standing, operations, repairs and maneuvering.

Aboard the TSGB there are several laboratories and classrooms used for hands-on and academic instruction of curricula. The Engineering Lab offers hands-on training in the troubleshooting, maintenance and repair of various shipboard components such as diesel engines, water-making evaporators, oil and fuel purifiers, air and refrigeration compressors, and various valve and pump-types. Classrooms aboard the vessel offer space to work on smaller projects such as breadboard assembly of electronic components. There is also a Machine Shop with a welding area onboard. The Machine Shop has one engine lathe and one knee-type milling machine, along with a bench grinder. The welding area offers a platen with a curtain for stick welding and oxygen/acetylene gas operations to be performed.

Not to be discounted is the vessel's engine room itself, with two Enterprise R5 V-16 direct-reversing, medium-speed diesel engines. There are three MaK diesel generator sets, three A/C refrigeration chiller units, three oil purifiers, two fuel purifiers, three oily water separators of various types, three air compressors for starting and reversing engines, a friction-type clutch, reduction gear set, Kingsbury thrust bearing, and numerous pumps, valves and actuators of various types. An automated centralized control system console affords watch standers the opportunity to monitor and control most every system in the engine room. In other spaces there are two steam generators, an emergency diesel generator, a battery room, steering gear room with two 7-cylinder piston rocker cam hydraulic pumps and rams, three ship's service rotary air compressors and various winches and windlasses. All of these and many other components and systems are monitored and maintained by engineering cadets.

Each student in the School of Engineering is required to participate in at least one cruise on the TSGB and take a series of operational training classes to prepare them for it. Whether Cal Maritime graduates choose design or operations, the experience aboard the TSGB is paramount in their engineering education. This training, occurring during the summer after their first year of classes, brings engineering systems to life. Here the students learn how equipment, machinery and controls work in synergy and gain an appreciation for the sights, sounds and feel of operational systems. The faculty stress a safety culture, and emphasize engine room management, leadership and teamwork skills.

Like the Simulators, the TSGB training and experience as not considered part of our Core ME Program. However, it is "value added" to the ME degree in that it gives them real world experience working with machines and systems, many of which they have studied on a theoretical or laboratory basis in their ME courses. This sea experience is required for all ME students, allows License Option students to obtain their USCG Third Assistant Engineer's License, and is central to the University's mission.

B. Computing Resources

Describe any computing resources (workstations, servers, storage, networks including software) in addition to those described in the laboratories in Part A, which are used by the students in the program. Include a discussion of the accessibility of university-wide computing resources available to all students via various locations such as student housing, library, student union, *off-campus, etc. State the hours the various computing facilities are open to students. Assess the adequacy of these facilities to support the scholarly and professional activities of the students and faculty in the program.*

The computing resources on the Cal Maritime campus are generally managed by the Information Technology (IT) Department. The following will discuss the computing resources and the IT Department's roles in the following areas: network infrastructure, software, workstation access, and adequacy of computing resources.

B.1. Network Infrastructure

Cal Maritime has a full redundant network infrastructure that has 10Gbps backbones and 10Gbps connectivity through wired Ethernet connections throughout the campus. These landline connections provide internet service to all classrooms and labs as well as staff and faculty offices. In addition, WiFi access points located throughout the campus provide wireless internet access to all students, staff, faculty, and guests. The Training Ship Golden Bear has its own independent internet connection and network. While docked on campus, this connection is provided by a physical connection. While at sea, this connection is provided by a satellite internet access. The ship has its own internal network infrastructure that includes wireless access through most of the common access areas.

B.2. Software

A standard image is used for all student-accessed workstations on campus. These workstations run the Windows 7 operating system and have their hard drives refreshed with a standard hard disk image at the beginning of every academic year. The following is a list of software currently on the image:

Adobe Creative Cloud
(Including Acrobat)
ArcGIS / ESRI Arc
Arduino + Processing
Atmel Studio
Audacity
AutoCAD 2018
Basic Stamp
CargoMax 2
Comic Life 2
Creo
Eagle
EES
Garmin BaseCamp
Google Earth Pro
HSMWorks Ultimate
IIS
InfraRecorder
Ltspice IV
Lyx, MiKTeX, TeXstudio
Mathematica
MATLAB & Simulink
Microsoft Office 365
OpenCPN
Read&Write
Rhino 5
RStudio
SnagIt
Solar Energy System
Analysis
SPSS
SOLIDWORKS
TI Connect
VI Package Manager
Zotero Standalone

Faculty may request that software be installed on their Cal Maritime issued computer as well. Faculty machines run Windows 7 or 10 or Mac OS X.

B.3. Workstation Access

The campus has two main computer laboratories, Classroom 105 and Lab 101. These computer labs each have one instructor workstation and 24 student workstations. Classroom 105 was refurbished in 2015 and includes two projectors and three TV screens, as well as a new sound system, acoustic tiling, and new furnishings. The computers in Classroom 105 are Dell Optiplex 7040 desktops with Intel Core i7 processors, 16GB RAM, and 1 TB HDD. Lab 101 has one projector and a sound system. The computers in Lab 101 are Dell Optiplex 9010 desktops with Intel Core i5 processors, 16GB RAM, and 1TB HDD.

The computer labs are used for instruction throughout out the day. Classroom 105 is available to students 24 hours, 7 days a week via ID card access outside of hours where the classroom is being used for instruction. Lab 101 is available to students during school hours (except during instruction) as well as Sunday through Thursday from 7pm to 11pm. The computers in the library are Dell Optiplex 790 desktops with Intel Core i5 processors, 8GB RAM, and 500 GB HDD.

In addition to the computer labs, students have access to workstations in other campus facilities. Computers are available in the Student Engagement & Academic Success (SEAS) Center, Library, and in smaller numbers in other locations throughout the campus. The SEAS Center is equipped with 5 Windows 7 workstations. Students have access to these computers during school hours and Sunday through Thursday from 7 pm until 11pm. Students have access to 14 Windows 7 workstations in the library which is open 82 hours a week during the semester and remains open an additional 28 hours a week during finals. Hours during the semester are Monday through Thursday 7:30am-11pm, Friday 7:30am – 5:30pm, Saturday 10:30am – 4:30pm, and Sunday 2:00pm – 10pm. In addition, students may check out one of 29 Windows 7 laptops for use outside of the library. This has been helpful as a resource when computing is required in classes not held in the computer labs. Small banks of 2-6 workstations can be found in the Student Services Building and the 2nd Floor of the Laboratory Building, which are available during school hours.

The campus provides a WePA print kiosk service for students with kiosks located in various locations across campus where students congregate. Students can submit their print jobs to the printer from their computer or at the kiosk.

B.4. Adequacy of Computing Resources

Since the last ABET visit, the IT Department has worked with Academic Affairs to help improve the computing resources available to faculty, not only for teaching, but for scholarly and professional activities as well. Due to the size of the campus, initiatives aimed at improving computer resources in general for faculty, apply to the ability to carry out scholarly and professional activities. Following an external review of campus IT in 2014, additional resources were provided to the IT Help Desk to better support not only the faculty, but the campus community as a whole. Currently, the Help Desk has four full time personnel and several student assistants. In addition, there is a dedicated Help Desk employee supporting the simulation facilities. In addition, there is a Manager of Learning and Academic Technology who supports the Brightspace learning management (LMS) system. Another policy that came out of the review was the establishment of a Computer Refresh Program for all faculty. Faculty are provided a new computer on a regular interval of 5 years. This allows faculty to have up to date computing capabilities and also allows IT to ensure that faculty can run the most recent software versions. Lastly, the IT Department supports the growing software demands of the faculty by leveraging software agreements available to the entire CSU system, providing opportunities that would otherwise be unavailable to a campus this size. An example of this would be the academic license of MATLAB, which has allowed faculty to work on MATLAB related scholarly and professional activities.

C. Guidance

Describe how students in the program are provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories.

Guidance for the use of tools, equipment, and laboratories mostly occurs in the classroom because these are integral part of several courses. First and foremost, safety training is a standard critical part of student training. In the labs, the instructor will show the students how to use equipment safely and then supervise as they take over. In some instances, where there is deemed a higher risk of danger to the students or the equipment, the instructor will operate the equipment while the students collect data.

For the machine and weld shop, students receive guidance in courses dedicated to machining and welding. Students in EPO 215 Manufacturing Processes I are given a briefing on safe working practices in the machine shop and the safe operation of each type of machine tool in the shop. Similarly, students are required to take EPO 213 Welding, their freshman year, in which they are trained in using the tools in the Welding Shop. Students must pass EPO 213 and 215 before they are able to use the Machine and Weld Shops for projects in future courses. Even with the training, students are only allowed to use these shops with appropriate supervision.

Guidance in terms of computing resources are more distributed over the students' academic career. During freshman orientation, they are introduced to the campus network, email system, course registration and records system (PeopleSoft), learning management system (Brightspace) and other computer resources. During their first two years, the students complete two courses requiring extensive computer usage, ENG 210 Introduction to Computer Programming and ME 220 Computer Aided Engineering. The instructors provide the necessary computing skills so that by the end of the course, the students can demonstrate competency in the usage of SolidWorks and MATLAB. If there are hardware or software related issues regarding campus infrastructure (network, email, anti-virus, licensing, etc.) they can contact (phone or email) IT Support, and an IT staff member will assist them. If there is an issue regarding how to use software, then that can be resolved by asking the professor during class or office hours.

D. Maintenance and Upgrading of Facilities

Describe the policies and procedures for maintaining and upgrading the tools, equipment, computing resources, and laboratories used by students and faculty in the program.

The Mechanical Engineering program and School of Engineering on the whole have to ensure that the tools, equipment, labs, and additional resources meet the needs and demands of engineering education for the current environment. This has been and continues to be achieved through strategic planning, fund raising, and development of relationships. A major change since the last accreditation visit is that the primary responsibility of planning and maintenance of engineering related facilities now falls under the School of Engineering. This change in management has allowed the development of a more engineering-focused plan, which provides much more attention and detailed planning amongst those who are involved with the facilities the most.

Complementing the school level planning, the Mechanical Engineering Department has also developed a programmatic 5-year plan for the laboratory spaces. The last laboratory plan was written in 2017 for the 2017-2021 timeframe. This plan is limited to labs directly under the purview of the Mechanical Engineering program. The document includes a summary of the current state of the laboratories and plans for the next 5-year period. In the most current plan, items to work on going forward included computing updates for the labs and improvements to the support for the machine shop.

The School of Engineering has identified all facilities and equipment that will need maintenance or repair and prioritized them. Priority is decided by factors such as safety, number of students impacted, and alternative resources available. As funding becomes available, the identified items are addressed. In the review period, some upgrades that have occurred include the aforementioned development of the Maker Space, replacement of the oscilloscopes in the Electrical Circuits and Electronics Lab, and the addition of a particle image velocimetry experiment to the Fluid Mechanics Lab. Complementing the campus' funds, the School of Engineering is committed to raising funding for facilities and equipment through charitable gifts and the Office of University Advancement. This effort has been developing. In 2019, a significant donation was made to the School of Engineering by an alumnus from the engineering program interested in enhancing engineering education. This donation allowed the school to cover a major upgrade of our machining and welding labs, such as the addition of a new 5-axis CNC machine, 3 new vertical mills, and 20 new welding helmets.

The policies and procedures for computing resources are primarily controlled by the IT Department with close collaboration to the School of Engineering. For example, while the software needed for campus computing is acquired and updated by the IT Department, the identification of the software is done in close conjunction with Academic Affairs and School of Engineering. Similarly, the software image that is pushed out during the annual refresh is a coordinated effort between the IT Department, Manager of Academic and Learning Technologies, and the faculty. The actual maintenance and upgrading of the computing resources on the campus is carried out by the IT Department. Similarly, the refresh of computers is managed by the IT Department as well.

Going forward, both the school and program are committed to continuing to address and update the maintenance and growth of the facilities available. The school will also continue to participate in the Campus Physical Master Plan to help shape the development of the new academic facilities. This not only includes the planning of the classrooms and lab spaces but also ensures that these spaces include the necessary equipment to meet the changing needs of the engineering industry going forward.

E. Library Services

Describe and evaluate the capability of the library (or libraries) to serve the program including the adequacy of the library's technical collection relative to the needs of the program and the faculty, the adequacy of the process by which faculty may request the library to order books or subscriptions, the library's systems for locating and obtaining electronic information, and any other library services relevant to the needs of the program.

The Cal Maritime Library supports the learning and research needs of the California Maritime Academy's School of Engineering students and faculty by offering a wide array of services and resources. The Library provides a variety of spaces for quiet study, collaborative group work, and research. The library features seating for 100 students, including two group study rooms. In addition, there is a library classroom with seating for 25 students. The library is open 82 hours a week during the semester and remains open an additional 28 hours a week during finals. With an average gate count of 500 visitors per day during the academic year, the library is a popular place for students due to its central location on campus. It is equipped with tools to facilitate research and study, including 14 desktop and 29 laptop computers, charging stations, wireless printing, and mobile white boards. The computers contain the same software as other campus labs that support engineering courses, such as Arduino, SolidWorks, and AutoCAD. The course reserve collection contains textbooks provided by professors and study materials for professional licensing exams.

The Library's physical collection consists of approximately 50,000 books and media items. The Library's online subscriptions include over 50 research databases covering the general education and discipline-specific curriculum and research interests of students and faculty. Key engineering-specific databases include Engineering Village and ScienceDirect. Students, faculty, and staff may also borrow books and media from a shared collection of over 29 million titles via CSU+, a resource sharing service made up of the 23 California State University libraries. These materials are usually delivered in two to four business days. For material not available within our CSU network, the library facilitates requests via the national WorldCat service. To develop a collection relevant to our users, the library welcomes acquisition requests from students, faculty, and staff. The Library also manages a popular equipment-lending program, including cameras, calculators, and iPads.

The library's website, http://library.csum.edu, is the portal for discovering the resources available to the campus community. It also provides remote access to subscription databases. The Library website includes a "discovery" system (Ex Libris' Primo) that allows searching across multiple library resources at once, including the catalog and most databases. The website also provides instructional content in the form of subject and course research guides.

The Library's staff includes two faculty librarians, with approval to hire a third in 2018-19. With the addition of a third faculty librarian, each of Cal Maritime's three schools will have a dedicated liaison librarian with relevant subject knowledge for all areas of library services. The School of Engineering liaison librarian is Amber Janssen, MLIS.

Students and faculty have many options to get help with their research. Librarians and staff are available in-person on a drop-in or appointment basis, or by email or phone. Students may also access many instructional and research guides via the library's website.

The Library's instruction program includes credit-based courses, curriculum-integrated instruction, online tutorials and research guides, and one-on-one consultations. Instruction librarians collaborate with other faculty to address specific information literacy learning outcomes throughout the curriculum of each major and department. For engineering students, the Library offers engineering-specific, in-class research workshops integrated across the curriculum. Mechanical Engineering students receive information fluency instruction in key courses in their freshman, junior, and senior years.

F. Overall Comments on Facilities

Describe how the program ensures the facilities, tools, and equipment used in the program are safe for their intended purposes. (See the 2019-2020 APPM section I.E.5.b.(1).)

Safety is a critical part of operations in the School of Engineering. This can be challenging at times, given that students are not only in the labs and machine shops, but also spend two summer cruises aboard the TSGB. The safety policies and procedures in place are discussed below as well as steps the school is taking to strengthen safety practices and address any future issues that may arise.

Safety and personal protective equipment (PPE) policies help ensure a safe environment, particularly in the laboratories and aboard the ship. These facilities all include first aid kits that are kept supplied as needed. Labs that require PPE have clear requirements in place and is one of the first topics of discussion on the first day. When PPE is needed, it is either provided or students are expected to bring their PPE to class in order to participate. Similarly, students are briefed in the use of PPE aboard the TSGB in their classes and prior to watch aboard the ship. PPE guidelines aboard the ship are clearly outlined by the United States Coast Guard (USCG). The personnel responsible for the students aboard the ship have an Engineers License certified by the USCG and have demonstrated competency with respect to safety practices aboard seafaring vessels.

The Machine Shop and Welding Laboratory have additional support given the safety risks associated with those facilities. A key part of safety is ensuring that the students are fully trained to use the facility. Students using the Machine Shop and Welding Laboratory are required to complete training in courses that are a part of the program's curriculum (EPO 213 Welding, EPO 215 Manufacturing Processes, and ME 429 Manufacturing Processes Laboratory). However, the staff employed for these facilities are not only responsible for teaching courses. They also ensure that both facilities are maintained in full and safe working order. They develop safety protocols and ensure that students and faculty observe those safety protocols. Regular walkthroughs are conducted by the staff to help identify potential safety hazards. For example, in a recent walkthrough, a potential safety hazard was identified at an exit that, while accessible, has limited clearance. This issue was remedied immediately, which illustrates the value of regular safety reviews. Other changes have been implemented to address potential safety concerns before they become an issue. In AY 2018-19, the welding helmets used by the students were replaced with auto-darkening welding helmets, addressing concerns about visual access prior to and during welding.

In addition to internal safety monitoring, all facilities on the Cal Maritime campus meet the safety requirements set forth by the California State University system. This includes regular audit and inspection by the Office of the Chancellor, the last of which was conducted in 2019.

The School of Engineering is committed to expanding the availability of the Machine and Weld Shops to students while continuing to ensure safety is not compromised. Procedures currently require that one of these staff be present when students want to use either facility, which does limit the hours of access to these facilities. The school has secured funding for a dedicated full-time staff to the shops and whose responsibility would be solely to the facility without teaching, thereby expanding the time those facilities would be available to students and will be hiring for the position in Fall 2019.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

Describe the leadership of the program and discuss its adequacy to ensure the quality and continuity of the program and how the leadership is involved in decisions that affect the program.

A.1. Program Leadership and Organization

Cal Maritime has recently (Summer 2018) implemented a significant change in its academic leadership organization. Until that time, all academic departments and programs were under one Academic Dean who reported directly to the Provost and VP Academic Affairs. As the campus grew and became more complex, it became clear that this was not as effective a leadership model as could be. After several years of debate and discussion, the President approved the organizational change to a three school model.

The School of Engineering comprises both the Mechanical Engineering Department and the Engineering Technology Department as illustrated in the school's organizational chart (Figure 8.1). The Dean of Engineering was hired in June 2018 and was given leadership and responsibility of the school.

The management of the Mechanical Engineering program resides with the department chair. The chair is selected by the president based on factors including a vote by the department faculty. The department chair reports to the Dean and duties include:

- Providing information and advice on the budget to the Dean
- Managing the department budget
- Approving expenditures by the department
- Working to ensure that faculty receive the support needed to teach effectively
- Providing reviews of faculty performance and recommendations for retention, promotion and tenure (as one part of a larger process which is currently under review due to the new Schools)
- Facilitating the assessment process and its use to improve the curriculum
- Scheduling classes and faculty assignments
- Serving as the department representative on various committees
- Serving as the liaison between the department and its constituencies (industry, students, etc.)

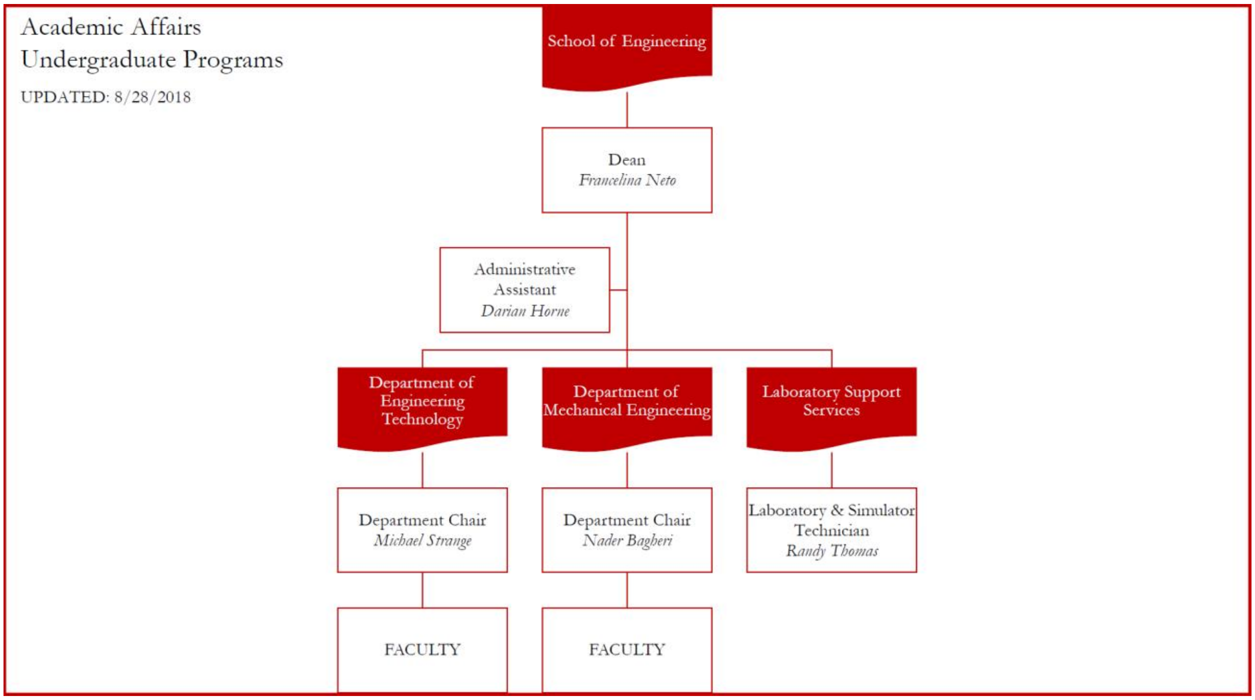


Figure 8.1. School of Engineering organizational chart

The faculty of the Mechanical Engineering Department are responsible for the program quality, assessment, evaluation, and improvement of the Mechanical Engineering program. As part of this responsibility, the faculty take primary responsibility of the courses they teach. This includes assessment and revision of course objectives and outcomes. The department chair convenes regular meetings of the department faculty throughout the semester where the faculty may bring forth any concerns or changes within the program.

A.2. Program's Role in Curriculum Decision Making

To help illustrate the role of the program's leadership within the campus, the process to modify an existing course or create a new course or program is illustrated. The overall body that reviews changes to the curriculum for the entire campus is the Curriculum Committee (CC) of the Academic Senate. The Curriculum Committee is made up of one faculty representative from each department. The committee serves three primary functions:

a) Reviews and decides on all curriculum change proposals,
b) Developing academic policies related to the curriculum and curriculum changes, and
c) Archiving the curriculum and all curriculum changes.

Requests for changes in the curriculum, including new programs or courses, or significant modification of existing programs or courses, are evaluated and voted on by the Curriculum Committee. Implementation of a new course requires the approval by the department, the Department Chair, the Dean for the appropriate school(s), the Curriculum Committee, and the Provost.

Curriculum change requests are discussed in an open forum and are voted upon by the members of each department affected by the change. The process occurs as follows:

1. Proposals for changes to the existing curriculum may be initiated by a faculty member, an academic administrator, or a student.
2. A Curriculum Change Request is required to start the process. The request requires discussion of the purpose for the request, assessment and evaluation methods, impact on graduation requirements, and fiscal implications. The request is then submitted to the appropriate department chair(s).
3. The chair(s) of all affected departments will conduct an internal review of the request. A vote of the proposed change is conducted within each affected department. The form, the results of the vote, and any concerns or comments are recorded on the Department Chair Questionnaire and forwarded to the appropriate Dean.
4. The Dean will review the proposal and all related documents. The Dean may choose to provide additional written commentary and forward all the documents to the Chair of the Curriculum Committee.
5. The Curriculum Committee Chair will call for a meeting to consider the proposal and vote on it. The committee recommendation will then be forwarded to the appropriate academic administrator.
6. The administration reviews the committee's finding and, if appropriate, gives final approval and implementation of the curriculum change.

This process demonstrates that while the Department Chair and Dean of Engineering represent the program's leadership, the faculty and the university community are involved in the decision-making process.

B. Program Budget and Financial Support

B.1. Budget Process

1. *Describe the process used to establish the program's budget and provide evidence of continuity of institutional support for the program. Include the sources of financial support including both permanent (recurring) and temporary (one-time) funds.*
3. *To the extent not described above, describe how resources are provided to acquire, maintain, and upgrade the infrastructures, facilities, and equipment used in the program.*

Cal Maritime has a comprehensive budgeting process with a high level of transparency. With the recent division of the academic programs into three schools, this process is being replicated at a finer level within each school. The timeline, including the State of California and the California State University budget development, is illustrated in Figure 8.2.

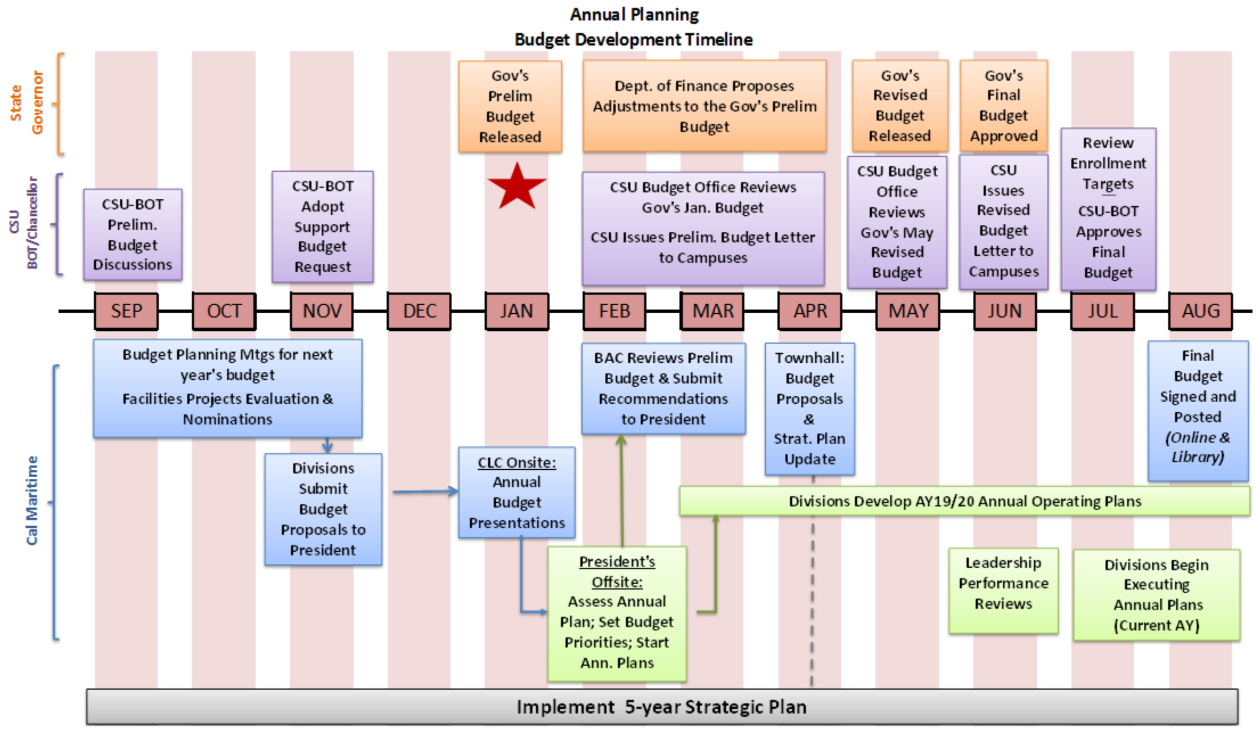


Figure 8.2. Cal Maritime fiscal year budget process.

The budgets for the campus divisions of Academic Affairs, Student Affairs, Administration and Finance, Advancement, and Marine Programs are created from the up-flow of requests to the VPs from departments, and in cabinet the Vice Presidents address division-level priorities in accordance with strategic planning priorities. The President retains central year-end operating balances to be used for campus-wide, non-recurring strategic initiatives. These budget proposals are assessed at a campus cabinet offsite meeting. At this meeting, a preliminary budget is created. The preliminary budget then moves to the Budget Advisory Committee (BAC), which is designed to advise the President on budget allocation issues. The BAC consists of two faculty appointed by the Academic Senate, one student appointed by ASCMA, one student appointed by the Corps leadership, two staff members and the President's Cabinet. The BAC meets at least once per semester, but generally in February and March meets every week. The committee's budget proposal is presented at the Budget Town Hall in April to the campus. Vice presidents present their budget requests (which are tied to the strategic plan) and feedback is invited. The feedback is used to refine the budget. The finalized university budget is placed on online and in reserve in the library.

Once the allocation to the division of Academic affairs is established, the Provost and Vice-President of Academic Affairs, with input from the Deans, allocate the funding for the academic programs. There is a certain amount funded annually for operations of the School of Engineering. With the new three-school division, departmental spending has been tracked closely in the 2018-2019 AY (with the Dean of Engineering involved in all spending) so that realistic budgets can be predicted going forward, when more control will fall to the department chairs.

The Dean of Engineering works with the department chair on the allocation of the operational or program budget. This money is allocated on the basis of need rather than any formula derived process such as FTE or other objective restriction. Because of this process, the Mechanical Engineering (and Engineering Technology) departments get the lion's share of support in areas such as lab consumables and supplies. Funds are also allocated for items such as travel, student assistant support, accreditation expenses, specialized training (conferences) and other supplies. The Dean covers all costs for items such as faculty computers, furniture, copying, paper, and other office supplies.

Recurring funding sources are dominated by the State of California's contributions. In addition, the school of engineering controls an approximately $3M endowment from the American Bureau of Shipping which generates approximately $52k each year.

One-time funding from philanthropy has increased in recent years due to a focused attention on cultivating alumni and industry relationships by the Cal Maritime Foundation. Approximately $290k was secured for the 2019-2020 AY for school of engineering equipment upgrades.

B.2. Institutional Instructional Support

2. *Describe how teaching is supported by the institution in terms of graders, teaching assistants, teaching workshops, etc.*

Teaching at Cal Maritime is rarely supported by graders or teaching assistants, the general philosophy being that class sizes should be small enough that faculty do not need assistants.

Instructors are supported in a variety of ways if they seek to improve their teaching effectiveness. Faculty development funds can be used to support outside activities, and while they are often targeted at research activities, they are also used for training in teaching, assessment, and other instructional topics. This is discussed further in Section E. The Faculty Development Coordinator is a part-time faculty appointment tasked with running on-campus instructor training activities in a wide variety of topics, from training on advising software to faculty learning communities that explore topics of interest as a group.

4. *Assess the adequacy of the resources described in this section with respect to the students in the program being able to attain the student outcomes.*

The Mechanical Engineering Program is one of only six degree programs at the California Maritime Academy, and typically includes 20 to 25% of the entire student body. As such, the program is an integral component of the academy mission and receives appropriate consideration in all aspects including support for services, recruiting, equipment, travel and faculty development.

The senior administration officials of the Academy, including the President, the Provost and Vice-President of Academic Affairs, and the Dean of Engineering strongly support the educational goals and objectives of the department and have shown tremendous support for the program to obtain and maintain EAC/ABET Accreditation. The President and the Dean of Engineering have degrees in Engineering, and fully understand the extra support needed for this type of high cost education. They are also committed to allocating the resources needed to run such programs.

Of course, there is always more that can be done with greater resources, but the ME department has been very successful in the past few years to be funded at an appropriate level to its needs when compared to the overall resources of the Academy as a whole.

C. Staffing

Describe the adequacy of the staff (administrative, instructional, and technical) and institutional services provided to the program. Discuss methods used to retain and train staff.

C.1. School of Engineering Staff

There is a wide variety of staff (administrative, instructional and technical) and services provided to the Mechanical Engineering program through the School of Engineering. The staffing and support (presented in Table D-2) are adequate for the program size and requirements of the program.

C.1.1. Administrative Staff

The School of Engineering has an administrative support coordinator who helps coordinate the Dean's activities as well as departmental purchases, faculty travel, student evaluations, and a large number of similar tasks. In addition to the engineering support coordinator there are other administrative staff who assist the program in particular roles, such as coordinating faculty development funding and overseeing the curriculum change process. At the time of this report, the current technical support staff will be retiring at the end of June 2019. As a result, a search to fill the position is underway.

C.1.2. Instructional Staff

Faculty in the Mechanical Engineering program have the primary role of instruction. The members and qualifications of the faculty are discussed in Criterion 6. Cal Maritime's typically small class sizes mean that there is not a large dependency on support staff for direct instruction. The faculty are supported by staff to assist with on-line course preparation, as well as staff who maintain and troubleshoot instructional electronics, computer hardware, and laboratory equipment.

C.1.3. Technical Staff

Currently, the Laboratory & Simulator Technician is the school's technical support. This person maintains and upgrades laboratory equipment, and purchases supplies for instructional laboratories. In 2019, support was established for a second technical support staff position in the School of Engineering to oversee the machine shop, weld shop, and the new Makerspace. This non-instructional position will ensure consistent safety and access policies to those facilities. It will also reduce the reliance on instructors to allow students to work on projects outside of class hours. At the time of this report, the current technical support staff will be retiring at the end of June 2019. As a result, a search to fill both positions is underway.

C.2. University Staff

This section will briefly discuss staff outside of the School of Engineering that directly impact attainment of student outcomes. The roles have also been discussed in earlier criterion in this report.

C.2.1. University Advising

Since 2016, university advisors have been available to support student success by helping students navigate university requirements, policies, and resources to achieve their academic goals. Students also meet with faculty academic advisors for degree and course advising, while the university advisors focus on:

- Developing a plan to complete all University requirements for graduation in an efficient and timely manner.
- College management skills (i.e. goal setting, time management, study skills),
- Informing students about campus resources and services, and
- Partnering together with faculty/program advisors for course planning

Further discussion of the university advising program was introduced in Criterion 1 under Advising and Career Guidance.

C.2.2. Career Services

Career Services continues to be a great asset to our engineering students. Career Services assists engineering students in finding full time jobs and summer internships. Career Services holds workshops, trainings, and other engineering focused career related meetings to prepare engineering graduates for employment. Further discussion of the university advising program was introduced in Criterion 1 under Advising and Career Guidance.

C.2.3. Learning and Academic Technology

The technological needs for instruction in the ME department are being met. The Manager of Learning and Academic Technology assists faculty with technology use for academics. This includes the management and training of faculty in the use of Brightspace (learning management system), management of academic related software, on-line course preparation, and management of campus learning spaces. This position is under academic affairs and serves as an advocate for academic affairs regarding technology issues. They also serve as academic affair's liaison to the Information Technology Department.

C.3. Staff Training and Retention

Cal Maritime staff are supported in training and professional development through the Department of Human Resources, with an overarching goal "to provide quality training and professional development opportunities that enhance knowledge, develop skills, and enrich both the employee and the organization."

The professional development activities available to staff (and all employees) include compliance training, continuing education, and professional development. There is university-wide funding to support professional development for faculty and staff from the office of the President. In addition, the CSU system offers online courses for personal and professional development available through the CSU Learn portal.

D. Faculty Hiring and Retention

D.1. Faculty Hiring Process

1. *Describe the process for hiring of new faculty*

The faculty hiring process generally begins with the identification of a need. This identification typically begins in the department, through discussion among faculty members and the chair. From these discussions, a set of criteria are defined for the new position. The chair will then make a recommendation to their Dean for a new hire. The justifications for the new position are considered, as well as the budgetary considerations.

As part of the campus budget process, the three school deans work with the provost to determine the greatest campus needs for tenure track faculty and make recommendations to the president and cabinet for a final decision of university wide new faculty hires.

Once the request has been approved, a search committee is created, and the chair of the search committee completes the training on running an unbiased faculty search. The search committee, department chair and the Dean will work with Human Resources (HR) to create an advertisement for the position and determine a marketing strategy as far as using a search firm or where to advertise for the position. Then, the search committee comes up with a plan for the interview process and determine a screening criterion. The interview questions are prepared, and HR approval is obtained. The search committee will then review applications and choose a list of candidates to be interviewed. Based on phone interviews, a short list is developed, and the viable candidates are invited for campus interview. During the campus interview, the candidates meet with the search committee, Dean and Provost. Candidates are also typically required to provide a teaching demonstration, and to meet with students and faculty from the department. Electronic or written feedback is sought from all people who interact with the candidate. Based on the feedback from all the sources, the search committee creates a list of acceptable candidates, along with their strengths and weaknesses, and makes a recommendation for hire and checks references. Following additional background checks, an offer of employment is then made to the selected candidate by the School Dean after consultation with the Provost and Vice President of

Academic Affairs. Once the contract is signed, the candidate is welcomed as a new faculty member.

Adjunct faculty and lecturers who are not on the tenure track follow a simpler and modified process. They are hired based on either past practice (faculty union contracts) or immediate needs due to other openings for course offerings. The department chair and the Dean handle these openings on a case by case basis with discussion with the provost as needed.

D.2. Faculty Retention

2. *Describe strategies used to retain current qualified faculty.*

The Mechanical Engineering faculty has been very stable. It is rare for a faculty member to leave the department, except through retirement. The strong retention rate seems to be the result of hiring faculty that are attracted to the small size, the emphasis on undergraduate teaching, and the practical applications that are part of the curriculum at Cal Maritime. The small size allows for close interactions and support among faculty, close contact between students and faculty, and a sense that the faculty have a strong input to the direction of the program. New faculty are encouraged to pursue development of their teaching skills. They are also provided feedback through periodic evaluations.

Faculty Development funds are available for conference travel and some release for scholarship or other efforts for the overall benefit of the campus. The campus adheres as much as possible to the contracted sabbatical policy and Mechanical Engineering faculty have been able to take advantage of this program.

E. Support of Faculty Professional Development

Describe the adequacy of support for faculty professional development, how such activities such as sabbaticals, travel, workshops, seminars, etc., are planned and supported.

Faculty development funds are primarily used for travel to conferences and other scholarly activities. At the beginning of the academic year, a set amount is free for the department chairs to award to their faculty. The Mechanical Engineering Department received $3000 in 2018-2019. This funding (Department Faculty Development Fund) provides a low-effort means for faculty to secure funding for development.

At the midpoint of the academic year, leftover department funds and other sources of funding are transferred into the Academy-Wide Faculty Development Fund. These funds are awarded by the Provost with the recommendation of the Faculty Development Committee. Faculty use a common application to request these funds. For the last few years, nearly every application has been approved.

Table 8.1 shows the University-wide totals for the last few years.

Table 8.1. Annual faculty development award amounts during the review period (2014-2018)

Faculty Development Awards	
Academic Year	Total Awarded
2017-2018	$119,288
2016-2017	$79,754
2015-2016	$81,484
2014-2015	$50,715

Figure 8.3 is a flow-chart summarizing professional development opportunities for faculty. In addition to faculty development funds, which are primarily used for the dissemination of research results, there are other sources dedicated to the generation of research and the professional development necessary to advance the expertise of the faculty member.

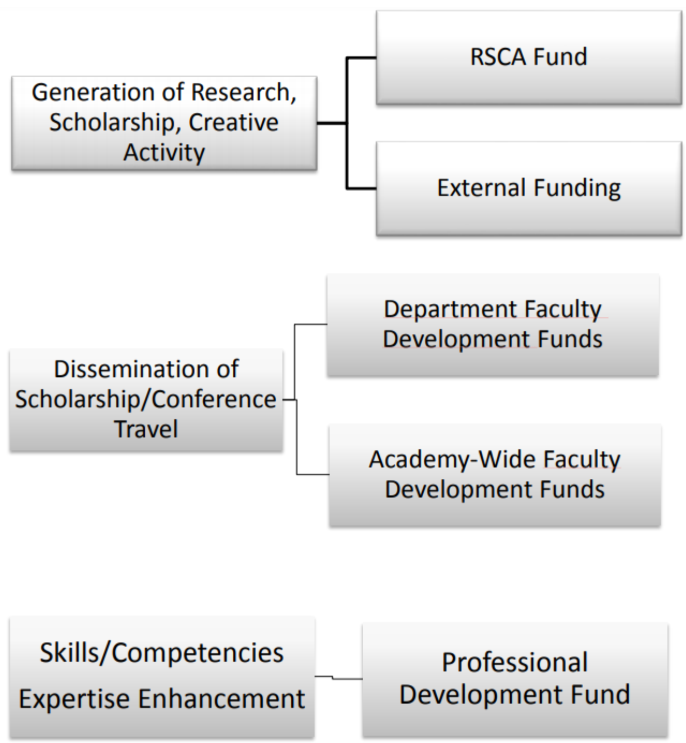


Figure 8.3. Flowchart of professional development opportunities.

Cal Maritime faculty members seeking internal money for research may apply for Research, Scholarship, and Creative Activity (RSCA) funds. The sources for this fund are the Chancellor's Office and Cal Maritime. These funds, provided by the Office of the Chancellor and Cal Maritime, are distributed to each CSU campus based on FTEF and are to be used for research, scholarship and creative activity in support of the undergraduate and graduate instructional mission of the CSU. Of course, faculty are also encouraged to seek outside funding.

Faculty members seeking money for professional development (skills development, professional competencies, pedagogical enhancement, curriculum redesign, etc.) are encouraged to apply through the University-wide Professional Development Fund. These applications are reviewed by the Coordinator for Faculty Development and the Library Dean, whom make a recommendation to the Provost.

The President's Mission Achievement Grant program is designed to provide resources to the faculty to engage in activity that facilitates our institutional mission. Each year the Foundation will set aside a certain amount to be added to this effort, the amount being determined by Foundation performance in the previous year. The maximum amount will be $5,000 per grant. Initial priority will be placed on applications that:

a. Provide significant benefit to the institution not just the grantee (i.e. projects that will have institution-wide as well as personal impact regarding the mission)

b. Promote Intellectual Learning in our students, facilitate Leadership Development in students, or enhance the ability of the institution and students to function with Global Awareness

c. Have matching resources as evidence of commitment (e.g. faculty development funds, departmental funds, personal funds, outside funding sources, in-kind contributions).

Cal Maritime supports faculty who are eligible to receive sabbatical leaves to conduct research, scholarly and creative activity, instructional improvement or faculty retraining. Any full-time faculty member, including lecturers, is eligible for a sabbatical leave if (s)he has served full-time for six years at the Academy. The sabbatical leaves may occur in either the fall or the spring semester at full-pay or at half-pay for both the fall and spring semester. During the review period, four of the program's tenure track faculty received sabbatical: Thomas Nordenholz (Fall 2013), Nader Bagheri (Spring 2014), Jim Gutierrez (Fall 2016), and Mike Holden (Fall 2017).

PROGRAM CRITERIA

Describe how the program satisfies any applicable program criteria. If already covered elsewhere in the Self-Study Report, provide appropriate references.

A. Curriculum

A discussion of how the Mechanical Engineering program curriculum satisfies the curriculum requirements of the ABET Mechanical Engineering program criteria is included in Compliance with General and Program Criteria in Criterion 5, Section A.5.

B. Faculty

The ME faculty are responsible for teaching the upper-level professional engineering classes. Table 6.1 shows a summary of faculty background and credentials along with their level of activities in professional societies, research, and consulting. Curriculum vitae for the ME faculty are also included in Appendix B and can be referred to for further information on faculty experience and credentials. The Faculty Qualifications section of Criterion 6 gives more information on faculty, including a detailed discussion of professional activities in Section D.

Tenure-track faculty members are under probationary status and are reviewed every other year starting in the second year of their employment. The tenured faculty members are reviewed every five years. Faculty members are reviewed in teaching, scholarly and creative activities, and services to the Academy and community. These regular reviews assess the competency of faculty in their respective areas of responsibilities. This process in turn ensures a consistent level of performance in all areas by the faculty.

APPENDICES

APPENDIX A – COURSE SYLLABI

A. Courses Taught by the Mechanical Engineering Program

The numbers in brackets correspond to the program Student Outcomes of the Mechanical Engineering program, which can be found in Criterion 3.

All graduates receiving a Bachelor of Science in Mechanical Engineering degree from the Cal Maritime are expected to have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

1. *Course number and name:* ENG 110 Introduction to Engineering and Technology

2. *Credits and contact hours:* 1 unit, 1 contact hour/week

3. *Instructor's or course coordinator's name:* Michael Holden

4. *Text book, title, author, and year:* W. C. Oakes and L. L. Leone, **Engineering Your Future: A Brief Introduction to Engineering, 5th ed**. Oxford University Press, 2014.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Introduction to the engineering and technology professions and curricula, including the professional responsibilities of engineers and engineering technologists, the organization of the engineering and technology profession, and the library and Internet research, along with outside speakers from the profession.
   b. *Prerequisites:* None
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Be informed about the engineering profession and its benefits [4,7]
   b. Be informed about the benefits provided by membership in professional societies. [4,7]
   c. Learned about the process of becoming a professional engineer. [4,7]
   d. Be exposed to the viewpoints and experiences of professional engineers in the areas of mechanical engineering, marine engineering, and facilities engineering. [4,7]
   e. Know strategies for academic success (time management, interaction with faculty and peers, test preparation). [7]
   f. Know some fundamentals of information fluency. [7]
   g. Better understand the curriculum and expectations of the engineering program. [4]

7. *Brief list of topics to be covered*
   a. The Engineering Profession
      i. Engineering Disciplines
      ii. Engineering and Engineering Technology
      iii. Class Discussion with a Marine Engineer
      iv. Class Discussion with a Facilities Engineer
      v. Salaries and Career Paths
   b. Studying Engineering at Cal Maritime
      i. Discussion of the curriculum and its options
      ii. Class discussion with senior engineering students
      iii. Decision points in the curriculum
   c. Strategies for Academic Success
      i. Time Management
      ii. Interaction with Faculty

iii. Group Studying
iv. Tutoring and Other Available Resources

d. Professional Development
    i. Professional Registration
    ii. Graduate Study

8. *Course number and name:* ENG 210 Engineering Computer Programming

9. *Credits and contact hours:* 2 units, 2 contact hours/week

10. *Instructor's or course coordinator's name:* Frank Yip

11. *Text book, title, author, and year:* W. J. Palm, **Introduction to MATLAB for Engineers, 3rd ed**. New York, McGraw-Hill, 2011.

12. Specific course information

   a. *Brief description of the content of the course (catalog description)*
      An introduction to the use and engineering applications of MATLAB, and an introduction to computer programming using MATLAB. Main topics include array and matrix manipulation, plotting in 2 and 3 dimensions, solving linear systems of equations, and solving nonlinear equations. In addition, the basic programming constructs, including input and output formatting, functions, conditional statements, and loops are introduced. A basic introduction to linear algebra is also included.
   b. *Prerequisites:* None
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

13. Specific goals for the course

   a. Use MATLAB to process sets of numerical data, including mathematical operations and plotting. [1,6]
   b. Write an efficient, well structured, and well documented program in MATLAB. [1]
   c. Apply loops and logical statements inherent in a programming language that they can apply to other computer languages. [1]
   d. Solve basic Linear Algebra problems (including matrix equations and matrix inverses) using MATLAB. [1]
   e. Translate basic code between C and MATLAB [1]

14. Brief list of topics to be covered

   a. Introduction to MATLAB
   b. Arrays in MATLAB
   c. Plotting with MATLAB
   d. Pseudocoding
   e. Program layout and logical expressions
   f. IF/THEN/ELSE and other program control options
   g. MATLAB scripts and logical flows
   h. Character strings and indexing
   i. FOR loops and indexing
   j. WHILE loops and strategies for repetitive practices
   k. User-defined functions; recursive functions
   l. More advanced plotting and data processing tools

m. Linear algebra in MATLAB
n. Applications of MATLAB to linear algebra problems
o. MATLAB, C and other high-level languages
p. MATLAB as a tool for engineering

1. *Course number and name:* ENG 250 Electrical Circuits and Electronics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Michael Holden

4. *Text book, title, author, and year:* A. R. Hambley, **Electrical Engineering: Principles & Applications Plus Mastering Engineering, 6th ed**. Prentice Hall, 2013.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      This course covers the theory and analysis of DC and AC circuits. Real and ideal sources, power transfer and power factor. Resistor, capacitor, and inductor circuits, transient response, frequency response and transfer functions. Single phase and multiphase power systems, and amplifier circuits and semiconductor devices.
   b. *Prerequisites:* PHY 205
      Co-requisites: ENG 250L
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Learn about fundamental electrical principles, Ohm's Law, resistance, capacitance and inductance in DC and AC circuits [1,2]
   b. Learn circuit analysis using Kirchoff's laws and Node and Mesh Analysis. [1]
   c. Learn circuit analysis using phasors for AC steady-state circuits. [1]
   d. Understand, model and analyze common electrical devices operating in both transient and steady-state conditions. [1]
   e. Use/apply modern engineering tools/techniques to solve/model/analyze electrical circuits. [1]

7. *Brief list of topics to be covered*
   a. Overview of Electrical Engineering
   b. Basic Circuit Elements
      i. Circuits, current, charge, voltage, energy and power, Kirchoff's Laws for current and voltage.
      ii. Ideal and real voltage and current sources, resistance, conductance, resistivity.
   c. Resistive Networks
      i. R network analysis using series and parallel equivalents, node voltages and mesh currents.
      ii. Thevenin and Norton equivalents.
      iii. Superposition principle
      iv. Wheatstone bridge
   d. Capacitance and Inductance
      i. C theory, physical characteristics, dielectrics and permittivity
      ii. L theory, magnetic flux, flux linkage and permeability, practical inductors

        iii. Mutual inductance and transformers
e. Transient Response
    i. First-order RC and RL circuits, step response, steady state DC response
    ii. General first-order response
    iii. 2nd-order RLC circuit responses
f. Steady-state Sinusoidal Analysis
    i. Cosine waves and phasors
    ii. Voltage, current and impedance
    iii. Power, apparent power, reactive power, power factor
    iv. Thevenin and Norton equivalents in AC circuits. Maximum power transfer.
    v. 3 phase systems, line and phase voltages and currents
g. Frequency Response
    i. Gain and phase, transfer functions
    ii. Bode plots

8. *Course number and name:* ENG 250L Electrical Circuits and Electronics Lab

9. *Credits and contact hours:* 1 unit, 2 contact hours/week

10. *Instructor's or course coordinator's name:* Sarah Szewczyk

11. *Text book, title, author, and year:* A. R. Hambley, **Electrical Engineering: Principles & Applications Plus Mastering Engineering, 6th ed**. Prentice Hall, 2013.

12. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Supports instruction and theory of ENG 250 using hands-on circuit and electronics analysis. Use of meters, scopes and breadboard techniques to construct and measure transient and steady-state responses. MATLAB simulations used in response prediction.
    b. *Prerequisites:* PHY 205
    Co-requisites: ENG 250
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

13. *Specific goals for the course*
    a. To get an overall hands-on experience with working with electrical circuits and taking measurements. [1]
    b. To improve abilities to analyze and convey technical information. [3]

14. *Brief list of topics to be covered*
    a. Resistive Networks
    b. Capacitance and Inductance
    c. Transistor circuits
    d. Operational Amplifiers
    e. Transient Response
    f. Frequency Response
    g. Gain and phase, transfer functions
    h. Bode plots
    i. Microcontroller basics
    j. Mosfets and PWM

1. *Course number and name:* ENG 300 Engineering Numerical Modeling and Analysis

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Jim Gutierrez

4. *Text book, title, author, and year:* H-H Lee, **Finite Element Simulations with ANSYS Workbench 18**, SDC Publications, 2018.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Applications of the Finite Element Method to engineering and solid mechanics problems will be covered using a commercially available finite element code. Topics include solid modeling of classical structural and heat transfer problems such as plane stress, plane strain, asymmetry, general 3-D solid mechanics problems, geometric non-linearity, material non-linearity, parametric design studies, steady-state and transient heat transfer, and multi-physics problems. Additionally, topics in numerical integration and numerical solutions to a system of differential equations will be covered.
    b. *Prerequisites:* ME 220, ME 332
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Provide the fundamental knowledge for developing representative 2D and 3D numerical models to classical engineering problems [1]
    b. Convert complex physical models to idealized models to obtain accurate approximate solutions. [1]
    c. Apply appropriate boundary conditions. [1, 6]
    d. Interpret numerical results of finite element models. [1, 6]

7. *Brief list of topics to be covered*
    a. Mechanics of Materials Review: Axial, Bending, Torsion, Shear
    b. Mohr's Circle, Principle Stresses
    c. Failure Theories, Elasticity Equations
    d. Introduction to the Finite Element Method
    e. Boundary Conditions, Loads, Materials, and Element Types
    f. Beam/Frame Models
    g. Idealized 2D Simulations
        i. Plane Stress
        ii. Plane Strain
        iii. Axisymmetric
    h. 3D Simulations
    i. Idealized 3D Simulations
    j. Shell Model
    k. Interface/Contact Analysis

l. Optimization/Parametric Analysis
m. Heat Transfer Problems
    i. Steady State Simulations
    ii. Transient Simulations
n. Multi-Physics Problems

1. *Course number and name:* ME 220 Computer Aided Engineering

2. *Credits and contact hours:* 2 units, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Tomas Oppenheim

4. *Text book, title, author, and year:* P. Tran, **Solidworks 2017 Basic Tools. Getting Started with Assemblies and Drawings.** SDC Publications, 2017.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      This course develops skills in the fundamentals of the engineering design philosophy and familiarizes students with virtual product development and fundamentals of parametric design and solid modeling using advanced engineering software tools. Complex component design, assembly design and the development of working drawing are also covered.
   b. *Prerequisites:* None
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Students will be generating solid models/ basic part design using advanced engineering tools. [2]
   b. Students will be able to generate basic 3D assembly models using advanced engineering tools. [2,7]
   c. Students will be able to generate part drawings using advanced engineering tools. [2]

7. *Brief list of topics to be covered*
   a. Engineering Views of 3D Parts
   b. Engineering Drawings
   c. Tolerances and Selected Topics in Geometric Dimensioning &Tolerancing Extruding
   d. Revolving
   e. Fillets/Chamfers
   f. Cutting
   g. Ribs and Shells
   h. Loft Boss/Base
   i. Extruding along a Path
   j. Patterning and Mirroring
   k. Threading
   l. Assemblies
   m. Engineering Drawings

1. *Course number and name:* ME 230 Engineering Materials

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Jim Gutierrez

4. *Text book, title, author, and year:* W. Callister, D. Rethwisch, **Fundamentals of Material Science and Engineering: An Integrated Approach, 4th ed.** Wiley, 2011

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Examination of the properties of materials from the atomic level through the molecular levels, looking at crystal structure. Emphasis is on metals, but nonmetals are discussed. Mechanical properties, creep, fatigue, corrosion, and failure characteristics are discussed. Phase Diagrams and thermal processing are also studied. Applying material properties in design is also discussed.
    b. *Prerequisites:* CHE 110
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Identify crystalline structure of a metallic or ceramic material [1]
    b. Identify type of material structure [1]
    c. Determine the stress and strain of a material [1]
    d. Interpret stress-strain diagrams [1]

7. *Brief list of topics to be covered*
    a. Introduction to Materials
    b. Atomic Structure
    c. Crystalline Structure of Metals
    d. Polymers
    e. Diffusion
    f. Mechanical Properties
    g. Deformation and Strengthening Mechanisms
    h. Failure
    i. Composite Materials
    j. Corrosion

1. *Course number and name:* ME 232 Engineering Statics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Thomas Nordenholz

4. *Text book, title, author, and year:* A. M. Bedford, W. Fowler, **Engineering Mechanics: Statics, 5th ed.** Pearson, 2008.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Analysis of particles and rigid bodies at rest, using vector methods. Topics include the concepts of forces, moments, and equivalent force systems; calculation and use of centroids; equilibrium of rigid bodies; force analysis of trusses, frames, and machines; internal forces in structural members; and friction.
    b. *Prerequisites:* PHY 200
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Analyze and simplify force systems, using vector methods where necessary. [1]
    b. Draw a free body diagram of any part of any complex mechanical system (with friction); that is, to isolate that part and identify all external forces and moments acting on it. [1]
    c. Methodically apply the laws of equilibrium to calculate unknown forces acting on a body. [1]
    d. Dissect a complex mechanical system in order to analyze all of the internal or external forces acting on it. [1]
    e. Learn the concept of centroids and how to calculate centroid locations. [1]

7. *Brief list of topics to be covered*
    a. Vectors
        i. Vector Operations and Definitions
            1. Scalars and Vectors
            2. Rules for Manipulating Vectors
        ii. Cartesian Components
            1. Two Dimensions
            2. Three Dimensions
        iii. Dot Products
        iv. Cross Products
    b. Forces
        i. Types of Forces
        ii. Equilibrium and Free Body Diagrams
        iii. Two Dimensional Force Systems
        iv. Three Dimensional Force Systems
    c. Systems of Forces and Moments

        i. Two Dimensional Description of the Moment
        ii. The Moment Vector
        iii. Couples
        iv. Equivalent Systems
d. Objects in Equilibrium
        i. Equilibrium Equations
        ii. Two Dimensional Applications
        iii. Three Dimensional Applications
        iv. Two Force Members
e. Structures in Equilibrium
        i. Trusses
        ii. Method of Joints
        iii. Frames and Machines
f. Centroids and Centers of Mass
        i. Centroids of Areas
        ii. Composite Areas
        iii. Distributed Loads
        iv. Centroids of Volumes
        v. Centers of Mass
g. Internal Forces and Moments
        i. Axial Force, Shear Force, and Bending Moments
h. Friction
        i. Theory of Dry Friction
        ii. Applications

1. *Course number and name:* ME 240 Engineering Thermodynamics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* William Tsai

4. *Text book, title, author, and year:* Y. A. Çengel and M. A. Boles, **Thermodynamics: An Engineering Approach, 9th ed**. New York, McGraw-Hill, 2018.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
   Study of the basic principles of thermodynamics and their applications to engineering processes and cycles. Topics include study of the first and second laws and the application of these laws to thermodynamic systems, with emphasis on power and refrigeration cycles.
   b. *Prerequisites:* PHY 200
   Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Solve for the properties of pure substances in different states. [1]
   b. Apply conservation laws (mass balance and energy balance) to solve problems with closed and open system processes. [1]
   c. Apply entropy balance to solve for problems with isentropic and actual processes. [1]
   d. Model and analyze complete thermodynamic cycles (e.g. Rankine, Brayton, and refrigeration). [1]
   e. Identify and discuss the global, economic, environmental, and societal contexts of the application of thermodynamics cycles. [4]

7. *Brief list of topics to be covered*
   a. Introduction to Thermodynamics
   b. Defining Systems and Properties
   c. Energy in a System and Process
   d. Properties of Water and R-134a
   e. Properties of an Ideal Gas
   f. Conservation Laws and Efficiency
   g. Energy Analysis in Closed Systems
   h. Introduction to Open Systems
   i. Steady Flow Devices
   j. Cycles and the 2nd Law of Thermodynamics
   k. Carnot Cycle
   l. Entropy
   m. Isentropic Processes
   n. Isentropic Efficiency
   o. Liquid Pumps

p. Rankine Cycle
q. Improvements to the Rankine Cycle
r. Brayton Cycle
s. Improvements to the Brayton Cycle
t. Refrigeration Cycle

1. *Course number and name:* ME 330 Engineering Dynamics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Ali Moradmand

4. *Text book, title, author, and year:* A. Bedford and W. L. Fowler, **Engineering Mechanics: Dynamics, 5th ed**. Pearson, 2007.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
       Analysis of particles and rigid bodies in motion using vector methods, calculus, and analytical geometry. Topics include kinematic analysis of motion and relative motion, kinetic analysis of forces and motion, rotation and translation of rigid bodies, work-energy methods, and impulse-momentum methods.
    b. *Prerequisites:* ME 232, MTH 212
       Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Model real engineering systems as particles and/or rigid bodies. [1]
    b. Apply Newton's Laws methodically to calculate forces and motions of mechanical systems. [1]
    c. Apply energy and momentum methods to calculate forces and motions of mechanical systems. [1]
    d. Develop the ability to decide which methods of analysis to use for various problem types. [1]
    e. Use computers to help analyze the dynamics of mechanical systems. [1]

7. *Brief list of topics to be covered*
    a. Motion of a Point
    b. Forces, Orbital Mechanics
    c. Potential Energy, Conservation of Energy
    d. Linear Momentum
    e. Rigid Body Rotation
    f. Planar Dynamics
    g. Rotational Energy and Momentum

1. *Course number and name:* ME 332 Mechanics of Materials

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Jeff Hadian

4. *Text book, title, author, and year:* R. Craig, **Mechanics of Materials, 3rd ed.** Wiley, 2011.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Application of stress and strain in design and analysis of simple structural members under load. Stresses and deformations in members with a single load in tension, torsion, shear or bending moment are analyzed, followed by the transformation of stresses and effects of combined loads. The analysis of statically indeterminate structures is also included.
    b. *Prerequisites:* MTH 212, ME 230, ME 232
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Students will learn to interpret the meaning of stress and strain at a point in a structure. [1]
    b. Students will learn the derivations and limitations of the deformation/stress theories of tension, torsion, bending, and shear. [1]
    c. Students will learn how to apply these theories, along with considerations of equilibrium and geometry of deformation, in order to determine the stress distribution and deformation of certain structures under certain loading conditions. [1]
    d. 4. Students will learn how stress depends on plane orientation, and they will learn how to calculate and interpret principal stress and maximum shear stress. [1]

7. *Brief list of topics to be covered*
    a. Stress and Strain: Introduction to Design
    b. Axial Deformation
    c. Torsion
    d. Equilibrium of Beams
    e. Stresses in Beams
    f. Deflection of Beams
    g. Transformation of Stress and Strain
    h. Mohr's Circle
    i. Pressure Vessels
    j. Stresses Due to Combined Loading

1. *Course number and name:* ME 339 Material/Mechanical Lab

2. *Credits and contact hours:* 2 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Thomas Nordenholz

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Principles and applications of materials science, solid mechanics, and dynamics learned through experimental inquiry. Students will perform a series of experimental studies involving material properties, and structural response to loading, and motion. Results will be analyzed and compared with theoretical predictions. The theory, procedures, results, and discussion of the experiments will be presented in written form.
    b. *Prerequisites:* ME 332, ME 360
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Perform several standard material tests and investigations and interpret results. [6]
    b. Install and calibrate strain gages and accelerometers, estimate the uncertainty of their measurements, acquire strain and acceleration data electronically, and analyze and interpret the data. [6]
    c. Apply the theories of material science, statics, mechanics of materials, and dynamics to systems under experimental study, and assess the abilities of these theories to predict results. [1]
    d. Present experimental procedures, theory, results, and conclusions clearly and effectively in written form. [3]

7. *Brief list of topics to be covered*
    a. Tension and Hardness Testing
    b. Heat Treatment of Steel
    c. Measurement of Stress and Strain with a Strain Gage Rosette
    d. Measurement of Rigid Body Motion with Accelerometers

1. *Course number and name:* ME 340 Engineering Fluid Mechanics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Nader Bagheri

4. *Text book, title, author, and year:* F. White, **Fluid Mechanics, 8th ed**. McGraw Hill, 2015.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Analysis of particles and rigid bodies in motion using vector methods, calculus, and analytical geometry. Topics include kinematic analysis of motion and relative motion, kinetic analysis of forces and motion, rotation and translation of rigid bodies, work-energy methods, and impulse-momentum methods.
    b. *Prerequisites:* MTH 212, ME 232
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Have a good understanding about fluid properties, velocity/pressure fields, and pressure/gravitational forces. [1]
    b. Apply conservation laws (mass balance, momentum and energy balances) in integral/differential/experimental/simplified forms to fluid systems. [1]
    c. Understand, model, analyze, and solve fluid systems. [1]

7. *Brief list of topics to be covered*
    a. Introduction
        i. The Concept of a Fluid
        ii. Dimensions and Units
        iii. Properties of the Velocity Field
        iv. Thermodynamic Properties of a Fluid
        v. Viscosity and Other Secondary Properties
    b. Pressure Distribution in a Fluid
        i. Pressure and Pressure Gradient
        ii. Equilibrium of a Fluid Element
        iii. Hydrostatic Pressure Distributions
        iv. Application to Manometry
        v. Hydrostatic Forces on Plane and Curved Surfaces
        vi. Hydrostatic Forces in Layered Fluids
        vii. Buoyancy and Stability
    c. Integral Relations for a Control Volume
        i. Basic Physical Laws of Fluid Mechanics
        ii. Reynolds Transport Theorem
        iii. Conservation of Mass
        iv. Linear Momentum Equation

v. Energy and Bernoulli Equations

d. Differential Relations for a Fluid Particle
   i. Acceleration Field in a Fluid
   ii. Differential Equation of Mass Conservation
   iii. Differential Equation of Linear Momentum
   iv. Boundary Conditions for the Basic Equations
e. Dimensional Analysis and Similarity
   i. Principle of Dimensional Homogeneity
   ii. Pi Theorem
   iii. Non-dimensionalization of the Basic Equations
   iv. Modeling and its Pitfalls
f. Viscous Flows in Ducts
   i. Reynolds Number Regimes
   ii. Internal vs. External Viscous Flows
   iii. Head Loss – Friction Factor
   iv. Laminar and Turbulent Flow in Pipes
   v. Types of Pipe Flow Problems: Pressure, Head, Flowrate, and Diameter
   vi. Flow in Non-Circular Ducts
   vii. Minor Losses in Pipe Systems
   viii. Multiple-Pipe Systems
g. Flow Past Immersed Bodies
   i. Reynolds Number and Geometry Effects
   ii. Momentum Integral Estimates
   iii. Boundary Layer Equations
   iv. Flat Plate Boundary Layer
   v. Experimental External Flows
h. Turbomachinery
   i. Centrifugal Pump
   ii. Pump Performance Curves and Similarity Rules
   iii. Mixed and Axial Flow Pumps
   iv. Specific Speed
   v. Matching Pumps to System Characteristics

1. *Course number and name:* ME 344 Heat Transfer

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* William Tsai

4. *Text book, title, author, and year:* F.P. Incropera, D.P. DeWitt, T.L. Bergman and A.S. Lavine, **Fundamentals of Heat and Mass Transfer, 8th ed**. New York, John Wiley and Sons, 2017.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Study of the fundamental mechanisms of the transfer of energy in the form of heat, including conduction, convection, and radiation. Topics include steady and transient conduction, free and forced convection, radiation, and heat exchanger analysis and design.
    b. *Prerequisites:* ME 240, ME 340, MTH 215
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Apply Fourier's Law of conduction, Newton's Law of Cooling and radiation heat transfer laws to heat transfer problems. [1]
    b. Compute resistance, heat rates, and temperature in steady-state, one-dimensional configurations involving conduction [1]
    c. Solve 2D and/or 3D conduction problems using numerical methods [1]
    d. Compute convection coefficients and solve for heat rate and temperature for different flow types (i.e. forced external, forced internal, and free). [1]
    e. Model and analyze radiation heat exchange between two bodies. [1]

7. *Brief list of topics to be covered*
    a. Introduction to Heat Transfer
    b. Modeling 1-D Steady Heat Transfer as a Circuit
    c. Control Volume Analysis
    d. Heat Diffusion Equation
    e. Lumped Capacitance Method
    f. Volumetric Heat Generation
    g. 1-D Radial Conduction
    h. Extended Surfaces
    i. Cooling Fins
    j. Analytical Solutions for 2-D Steady State Conduction
    k. Finite Difference Method in Heat Transfer: 2-D Steady-State
    l. Finite Difference Method in Heat Transfer: 2-D Unsteady
    m. Introduction to Forced External Convection
    n. External Convection Correlations
    o. Internal Convection

p. Convection in Pipes
q. Free Convection
r. Heat Exchangers: LMTD Method
s. Heat Exchangers: Effectiveness-NTU Method
t. Introduction to Radiation
u. Blackbody Radiation
v. Emitted Radiation from Real Surfaces
w. View Factors

1. *Course number and name:* ME 349 Fluid/Thermal Laboratory

2. *Credits and contact hours:* 2 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* William Tsai

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Principles and applications of fluid mechanics, thermodynamics, and heat transfer through a series of laboratory experiments. Experiments to demonstrate fluid flow measurements, the first and second laws of thermodynamics, conduction and convection heat transfer, heat exchanger analyses and performance, and gas turbine and gasoline cycles. Acquisition and statistical analyses of experimental data and professional laboratory reports are also included.
    b. *Prerequisites:* ME 344, ME 360
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Be able to understand the function of and use of common instrumentation for fluid and thermal measurements [6]
    b. Be able to methodically plan and conduct an experimental study. [6]
    c. Locate and ethically use relevant and appropriate information sources. [7]
    d. Be able to reduce and quantitatively estimate measurement uncertainties through calibration and statistical analyses of data. [1, 6]
    e. Be able to effectively communicate information from experiments in reports and oral presentations [3]
    f. Be able to function in a team to collect data and develop required deliverables for the experiment [5]

7. *Brief list of topics to be covered*
    a. Introduction to Wind Tunnel Operations
    b. Pitot Tube Familiarization
    c. Introduction to Thermal Instrumentation
    d. Uncertainty Analysis for Heat Transfer Measurements
    e. Research Skills for Experiment Development
    f. Pressure Measurements
    g. Familiarization with Airfoil Experiment
    h. External Convection Laboratory Report Due
    i. Load Cell Measurements
    j. Introduction to Drag and Drag Measurements
    k. Airfoil Laboratory Report Due
    l. Introduction to Truck Drag Experiment
    m. Ethical Use of Information in Presentations

n. Brayton Cycle and Turbine Demonstration

1. *Course number and name:* ME 350 Electro-Mechanical Machinery

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Antony Snell

4. *Text book, title, author, and year:* A. Hambley, **Electrical Engineering, Principles and Applications, 6th ed.** Pearson, 2013.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    This course covers the fundamentals of magnetism, magnetic circuits, and transformers. Included are principles and operation of series, shunt, compound DC generators and motors; single-phase and three-phase AC generators, synchronous and induction AC motors, DC and AC motor controllers, and stepper motors; and system protective devices and safety.
    b. *Prerequisites:* ENG 250, ENG 250L
    Co-requisites: ME 350L
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Use phasors to represent voltage and current and do power calculations for single-phase and 3-phase AC circuits. [1]
    b. Compute electro-magnetic forces and to work with magnetic circuits. [1]
    c. Work with ideal and real transformer models. [1]
    d. Model various types of DC machines, examine their performance characteristics and conduct power balances and efficiency calculations. [1]
    e. Model synchronous motors and generators and use phasor calculations for torque, power and efficiency calculations in synchronous machines. [1]
    f. Model induction motors and use phasors to calculate torque, power and efficiency of induction motors. [1]

7. *Brief list of topics to be covered*
    a. Electrostatic force
    b. Biot law
    c. Magnetic flux and flux density, B
    d. Lorentz force
    e. Field intensity, H
    f. Permeability
    g. Linear DC machine
    h. DC machines rotary machines
    i. Ampere's Law, magneto-motive force
    j. Flux around a straight conductor and forces on parallel wires
    k. Flux in a toroidal core
    l. Magnetic circuits
    m. Faraday's Law, Lenz's Law, induction, self inductance, mutual inductance

n. Transformers
o. Review of AC circuits
p. AC machines, power calculations, synchronous generators, frequency and voltage
q. 3-phase power, unbalanced and balanced loads. Y and delta connections
r. Synchronous generators torque, phasor models,
s. Synchronous machines, torque and power
t. Induction motors

1. *Course number and name:* ME 350L Electro-Mechanical Machinery Lab

2. *Credits and contact hours:* 1 unit, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Antony Snell

4. *Text book, title, author, and year:* T. Snell, **Electro-Mechanical Machines Laboratory Manual.** 2012.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    This course covers the fundamentals of magnetism, magnetic circuits, and transformers. Included are principles and operation of series, shunt, compound DC generators and motors; single-phase and three-phase AC generators, synchronous and induction AC motors, DC and AC motor controllers; and system protective devices and safety.
    b. *Prerequisites:* ENG 250, ENG 250L
    Co-requisites: ME 350L
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Recognize the difference in construction and operation of various DC and AC electro-mechanical machine types.
    b. Understand and draw circuit diagrams and follow them to make connections to both DC and AC machines [6]
    c. Take measurements of voltage, current, power, torque and speed for both DC and AC machines. [6]
    d. Enter measurements into a spreadsheet, make tables and graphs, and carry out power and efficiency calculations for both DC and AC machines. [1,6]
    e. Present their results in a clear and unambiguous manner. [3,6]

7. *Brief list of topics to be covered*
    a. DC Machines
        i. Introduction
        ii. Voltage vs. Speed and Voltage vs. Field for Generator
        iii. Torque and Voltage vs. Input Current for Motor
        iv. Comparison of Series Field and Shunt Field for Generator
        v. Torque, Speed, and Current of Shunt Motor vs. Series Motor
        vi. Speed Control of Separately-Excited Motor
        vii. Speed Control of Series Motor
    b. 3-phase Synchronous Machines
        i. Introduction
        ii. Voltage vs. Speed and Voltage vs. Field for Generator
        iii. Torque vs. Current and Power for Synchronous Machine
        iv. V-Curves
    c. 3-phase Induction Motors

i. Introduction
ii. Torque, Speed, and Power of Induction Motors

1. *Course number and name:* ME 360 Instrumentation and Measurement Systems

2. *Credits and contact hours:* 2 units, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Michael Holden

4. *Text book, title, author, and year:* A. J. Wheeler and A. R. Ganji, **Introduction to Engineering Experimentation, 3rd ed.** Pearson, 2009.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Measurement techniques for mechanical testing: types of signals, dynamic response of measurement systems, frequency response, uncertainty analysis, types of instruments, basic input circuits, signal conditioning, computer based data acquisition, sampling, A/D conversion, time and frequency analysis, statistical analysis of data.
    b. *Prerequisites:* ENG 210, ENG 250, ENG 250L
    Co-requisites: ME 360L
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Have knowledge of data acquisition systems and components [1]
    b. Specify signal conditioning specifications [1, 2]
    c. Compute descriptive statistics for experimental data [1,2,6]
    d. Students will be able to understand probability concepts and read statistical distribution tables. [1]
    e. Students will be able to quantify the uncertainty of experimental data. [6]
    f. Students will be able to carry out linear regression and understand measurements of correlation for paired data sets. [1]

7. *Brief list of topics to be covered*
    a. Introduction to Measurement Systems
    b. Calibration
    c. Electrical Signals/Signal Conditioning
    d. Computer Data Acquisition
    e. Sampling
    f. Frequency Domain Analysis
    g. Statistics
    h. Probability
    i. Parameter Estimation, Curve Fitting
    j. Propagation of Uncertainty
    k. Uncertainty
    l. Signal Filtering, Frequency Response
    m. Measuring Engineering Properties

1. *Course number and name:* ME 360L Instrumentation and Measurement Systems Lab

2. *Credits and contact hours:* 1 unit, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Michael Holden

4. *Text book, title, author, and year:* R. H. Bishop, **Learning with LabView 8.** Pearson Prenctice Hall, 2006.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Data acquisition using a PC and LabView. Construction and use of basic input circuits. Use of signal conditioning to improve the quality of measurements. Calibration and use of common instruments, including strain gages, thermocouples, photovoltaic cells, RTDs, and accelerometers. Examination of the dynamic response of instruments. Time domain and frequency domain analysis of data. Presentation of data. Uncertainty estimates of measured data. Output of control signals. A final project is required.
    b. *Prerequisites:* ENG 210, ENG 250, ENG 250L
    Co-requisites: ME 360
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Have knowledge of data acquisition systems and components. [6]
    b. Use LabView to perform data acquisition and analysis. [6]
    c. Design and implement an engineering experiment. [6]
    d. Write a laboratory report. [3]

7. *Brief list of topics to be covered*
    a. Introduction to LabView VI
    b. LabView DAQ Assistant
    c. Calibration
    d. FFT Analysis
    e. Digital Filter
    f. Analog Filter
    g. Photocounters
    h. Analog Output

1. *Course number and name:* ME 392 Mechanical Design

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Tomas Oppenheim

4. *Text book, title, author, and year:* R. Budynas and J.K. Nisbett, **Shigley's Mechanical Engineering Design, 11th ed**. McGraw Hill, 2011.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Two parts are covered in this course. Part one represents the general overview of fundamentals on applied loads, material properties, stress and stains, stress concentrations, static as well as dynamic failure theories, and some tribiological considerations. Part two will relate these fundamentals to various machine elements, such as columns, thin and thick-walled cylinders, shafting and associated parts, bearings, gears fasteners and power screws, springs, brakes and clutches, and flexible machine elements. A design project from the text will be assigned to each group.
    b. *Prerequisites:* ME 332
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Students will be able to perform stress/strain analysis in simple and combined loading cases implementing various failure theories. [1]
    b. Students will be able to perform static failure analysis for ductile as well as brittle materials. [1]
    c. Students will be able to design a machine component or assembly for dimension, for material selection, and for various loading conditions. [1]

7. *Brief list of topics to be covered*
    a. Stress Element
    b. Pure axial loading and deflection
    c. Axial Loads and deflection due to transverse loading
    d. Shear stresses due to transverse loading
    e. Shear Stresses due to torsion
    f. Combined loading – calculating applied stresses at specified points
    g. Calculating principal stresses at specified points from combined loading cases
    h. Stress Concentrations
    i. Buckling
    j. Static Failure Theories
    k. Fatigue Failure Theories
    l. Introduction to SolidWorks Simulation Packages (Finite Element Analysis)

1. *Course number and name:* ME 394 Fluid/Thermal Design

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Nader Bagheri

4. *Text book, title, author, and year:* W. S. Janna, **Design of Fluid Thermal Design, 4th ed**. CL Engineering, 2009.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Analysis and design aspects of fluid/thermal systems. Piping systems with economics of pipe size selection. Sizing of pumps for piping systems. Double pipe, shell and tube, and cross flow heat exchangers, configuration, selection, analysis, and design.
    b. *Prerequisites:* ME 344
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Have a better understanding about conservation laws: mass balance, momentum balance, and energy balance. [1]
    b. Apply conservation laws to fluid/thermal systems. [1]
    c. Model, analyze, solve, and design fluid/thermal systems. [1, 2]
    d. Use and apply modern engineering tools and techniques to solve, design, and optimize problems. [1]

7. *Brief list of topics to be covered*
    a. The Engineering Design Process
        i. Design Constraints
    b. Properties and Basic Equations
        i. Fluid Properties
        ii. Viscosity and Pressure Measurements
        iii. Conservation Laws/Differential Equations of Motion
    c. Piping Systems I
        i. Pipe and Tubing Standards and Specifications
        ii. Hydraulic and Effective Diameter
        iii. Series Pipe Systems
        iv. Minor Losses
        v. Moody Chart and Modified Moody Chart
    d. Piping System II
        i. Optimum Economic Diameter and Velocity
        ii. Tube Cost Analysis/Optimization
        iii. Equivalent Length of Fittings
        iv. System Curve Construction
    e. Selected Topics

i. Parallel Piping System Analysis
ii. Unsteady Draining Tank Problems
iii. Stresses in Pipes and Vessels

f. Pumps and Piping Systems
    i. Pump Performance Charts and Pump Selection
    ii. Cavitation, MPSH, and Suction Lift/Head
    iii. Specific Speed, Pump Type, and Similarity Laws
    iv. Series/Parallel Pumps
    v. Fan Selection, Fan/Blower Compressibility Effects
g. Conduction/Convection Fundamentals
    i. Conduction in Plane/Cylindrical Walls
    ii. Combined Conduction-Convection Problems
    iii. Critical Radius of Insulations
h. Double Pipe Heat Exchanger
    i. Overall Heat Transfer Coefficient
    ii. Effectiveness and Capacitance
    iii. Heat Exchanger Calculations and Analysis: LMTD and E-NTU Methods
    iv. Heat Exchanger Design and Analysis
i. Shell and Tube Heat Exchangers
    i. Heat Exchanger Calculations and Analysis: LMTD and E-NTU Methods
    ii. Optimum Outlet Temperature Analysis
    iii. Heat Exchanger Selection and Design
j. Cross Flow Heat Exchangers
    i. Heat Exchanger Calculations and Analysis: LMTD and E-NTU Methods
    ii. Heat Exchanger Selection and Design

1. *Course number and name:* ME 429 Manufacturing Processes Lab

2. *Credits and contact hours:* 1 unit, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Steffan Long

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Principles of manufacturing processes in areas of metal removal, forming, joining, casting, and fundamentals of numerical control. Study of manufacturing includes design aspects, material considerations, review of latest methods, and numerical controlled machining utilizing computer graphics and solid modeling.
    b. *Prerequisites:* ME 220, EPO 215
    Co-requisites: ME 494
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Exposure to the knowledge, techniques, and tools used in modern manufacturing. [2]
    b. Proper and safe use of engine lathes, milling machines, CNC machining center and CNC lathe. [7]
    c. Perform proper and accurate use of precision measurement instruments. [6]

7. *Brief list of topics to be covered*
    a. Safety Briefing
    b. Precision Measuring Tools
    c. Tool Geometry and Grinding
    d. Lathe Safety
    e. Dimensioning and GD&T
    f. CNC

1. *Course number and name:* ME 430 Mechanical Vibrations

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Thomas Nordenholz

4. *Text book, title, author, and year:* D. J. Inman, **Engineering Vibrations, 4th ed.** Pearson, 2013.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Analysis of mechanical systems undergoing vibration. Topics include free response of vibrating systems, response to harmonic excitation, response to general excitation, analysis of multi-degree of freedom systems using matrix methods, and techniques to suppress vibration. In addition, a series of laboratory experiments are done to demonstrate the theory learned in class.
   b. *Prerequisites:* ME 330, MTH 215
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
   a. Derive the differential equations governing the motion of mechanical systems. [1]
   b. Learn several analytical and computational techniques to obtain solutions to the equations of motion of discrete, linear, free and forced vibrating systems. [1]
   c. Describe, both qualitatively and quantitatively, the motion of free and forced linear vibrating systems, and to determine how the motion depends on the different system parameters. [1]
   d. Perform some experiments of simple vibrating systems, obtain the necessary measurements using a Data Acquisition System, conduct the necessary analysis, and present the necessary information in a clear, self explanatory written form. [3, 6]

7. *Brief list of topics to be covered*
   a. 1 DOF Free Vibration
      i. 1 DOF Free Undamped Motion
      ii. 1 DOF Free Damped Motion
      iii. Modeling
      iv. Energy Methods
      v. Numerical Solution
      vi. Measurement
   b. 1 DOF Harmonically Forced Virbation
      i. Undamped
      ii. Damped
      iii. Frequency Response
      iv. Base Excitation
      v. Vibration Isolation

vi. Rotating Unbalance

c. 1 DOF General Forced Response
    i. Step Response
    ii. Response to an Arbitrary Periodic Input

d. Multiple DOF Systems
    i. 2 DOF Free Undamped
    ii. 2 DOF Forced Undamped
    iii. Matrix Basics, Eigenvalue Problem
    iv. Modal Analysis
        1. Free Undamped
        2. Free Damped
        3. Forced

1. *Course number and name:* ME 432 Machinery Design

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Sepandarmaz Momeni

4. *Text book, title, author, and year:* R. L. Norton, **Design of Machinery, 5th ed. McGraw-Hill**, 2011.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    This course will cover kinematics and dynamics of machinery and the synthesis of mechanisms to perform desired motions and tasks of mechanisms using linkages, gears, cams, and actuators. Analysis of mechanisms will be studied to determine their rigid-body dynamic behavior. Position, velocity, and acceleration of mechanisms and force analysis of mechanisms will be covered. ProE Mechanism, which is a virtual prototyping tool for mechanism analysis and design, will be demonstrated. Students will use ProE/Creo to design, animate, analyze, and optimize complex three dimensional mechanisms.
    b. *Prerequisites:* ME 330, ME 332
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
    a. Analyze kinematical design of linkages. [1]
    b. Analyze the dynamics of mechanisms. [1]
    c. Use/apply modern engineering tools/techniques to solve mechanism design problems. [1,2]
    d. Design mechanisms to perform a specific task. [2]

7. *Brief list of topics to be covered*
    a. Kinematics Fundamentals
        i. DOF's, Types of Motion, Links, Joints, Kinematic Chains
        ii. Mechanisms and Structures
        iii. Linkage Transformation, Intermittent Motion
    b. Graphical Linkage Systems
        i. Function, Path, and Motion Generation
        ii. Quick Return and Dwell Mechanisms
    c. Position Analysis
        i. Position and Displacement
        ii. Translation, Rotation, and Complex Motion
        iii. Graphical Position Analysis of Linkages
        iv. Toggle Positions
    d. Velocity Analysis
        i. Graphical Velocity Analysis, Instantaneous Centers
        ii. Analytical Solutions for Velocity Analysis

iii. Velocity of Any Point on a Linkage

e. Acceleration Analysis
    i. Analytical Solutions for Acceleration Analysis
    ii. Acceleration at any Point on a Linkage
f. Cam Design
    i. Cam Terminology
    ii. Double Dwell and Single Dwell Cam Design
g. Gear Trains
    i. Fundamental Law of Gearing
    ii. Contact Ratio, Gear Types
    iii. Simple, Compound, and Planetary Gear Trains
h. Dynamic Force Analysis
    i. Balancing
    ii. Static and Dynamic Balancing

1. *Course number and name:* ME 436 Mechatronic System Design

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Michael Holden

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Introduction to a multidisciplinary field that combines electronics, control systems, mechanical design and simulation. Simulation and design of mechatronic systems with sensors, electronic controllers and mechanical actuators. Selection and mathematical modeling of system elements including common sensors, actuators and various electronic controllers.
    b. *Prerequisites:* ENG 250, ME 330
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
    a. Demonstrate an ability to understand common sensor design specifications. [2]
    b. Integrate a microcontroller into a mechatronic design. [1]
    c. Write a C program for a microcontroller. [1]
    d. Write a ladder logic program for a PLC and understand how to integrate a PLC into a mechatronic system. [1]
    e. Interface a controller with analog and digital sensors and data sources. [1]
    f. Numerically simulate a system from its defining differential equations. [1]
    g. Design and simulate a mechatronic system using the components introduced in class. [2]

7. *Brief list of topics to be covered*
    a. Sensors:
        i. Analog sensors
        ii. Analog to digital
        iii. Digital sensor communications
        iv. Filter design
        v. Sensor calibration
    b. Actuators:
        i. DC Motor control
        ii. Robot kinematics
    c. Controllers:
        i. Arduino programming
        ii. C Libraries and Objects
        iii. Ladder Logic Programming
    d. Simulation:
        i. Kinematics and Dynamics

ii. Euler integration
iii. GPS Navigation Exergy

1. *Course number and name:* ME 440 Advanced Fluid Mechanics and Thermodynamics

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Nader Bagheri

4. *Text book, title, author, and year:* Y. A. Çengel and M. A. Boles, **Thermodynamics: An Engineering Approach, 8th ed**. New York, McGraw-Hill, 2014.

   F. White, **Fluid Mechanics, 8th ed**. McGraw Hill, 2015.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Advanced topics in gas dynamics including compressible flow analysis of converging-diverging nozzles, normal shock waves, compressible duct flow with friction; and advanced topics in thermodynamics including irreversibility, availability, and 2nd-law analysis of thermodynamic systems, gas and vapor mixtures, chemical reactions, and thermodynamics of propulsion systems with applications.
   b. *Prerequisites:* ME 240, ME 340
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
   a. Apply mass, energy, entropy, and exergy balances to thermal systems. [1]
   b. Learn about Thermodynamic Property Relations and the enthalpy, internal energy, and entropy changes of real gases. [1]
   c. Apply the 1st and 2nd laws to gas mixtures, gas-vapor mixtures, chemical reactions, and compressible flows. [1]
   d. Understand, model, analyze, solve, and design fluid/thermal processes/systems. [1, 2]

7. *Brief list of topics to be covered*
   a. 1st Law of Thermodynamics
      i. Closed Systems
      ii. Control Volumes
      iii. 1st Law Efficiencies
   b. Entropy
      i. Entropy Balance
   c. Exergy
      i. Exergy Balance
      ii. Closed Systems
      iii. Control Volumes
      iv. 2nd Law Efficiency
      v. Exergy Destruction
   d. Thermodynamic Property Relations

        i. Cyclic and Reciprocity Relations
        ii. Maxwell Relations
        iii. Clapeyron Equation
        iv. Enthalpy, Internal Energy, and Entropy Changes of Real Gases
    e. Gas Mixtures
        i. Mass and Mole Fractions
        ii. Ideal and Real Gases
        iii. Properties of Gas Mixtures
    f. Gas-Vapor Mixtures and Air-Conditioning
        i. Specific and Relative Humidity
        ii. Dew-Point and Wet Bulb Temperature
        iii. Psychrometric Chart
        iv. Air Conditioning Processes
    g. Chemical Reactions
        i. Theoretical and Actual Combustion Processes
        ii. Enthalpy of Formation and Enthalpy of Combustion
        iii. 1^{st} Law Analysis of Reacting Systems
        iv. Adiabatic Flame Temperature
        v. Entropy Change of Reacting Systems
        vi. 2^{nd} Law Analysis of Reacting Systems
    h. Thermodynamics of High-Speed Gas Flows
        i. Stagnation Properties, Sound Velocity, Mach Number
        ii. Isentropic Flow Through Nozzles
        iii. Normal and Oblique Shocks
        iv. Expansion Waves
        v. Compressible Duct Flow with Friction
    i. Thermodynamics of Propulsion Systems
        i. Turbojets, Turbofans, Turboprops, Ramjets, Rockets

1. *Course number and name:* ME 442 Heating, Ventilating, and Air Conditioning

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* William Tsai

4. *Text book, title, author, and year:* F.C. McQuiston, J. D. Parker, and J. D. Spitler, **Heating, Ventilating, and Air Conditioning: Analysis and Design**. Hoboken, NJ, Wiley, 2005.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Analysis and design of air conditioning systems for industrial and commercial applications. Topics include specification of comfort conditions, climate data, calculation of heating and cooling loads, heat transmission through structures, solar heating, infiltration, loads due to people, lighting and equipment, ventilation requirements, fan performance and selection, air distribution and duct design.
    b. *Prerequisites:* ME 240, ME 340
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
    a. Define and understand suitable comfort and ventilation requirements for a building using accepted standards. [1, 4]
    b. Calculate heating and cooling loads for a building, using accepted methods. [1]
    c. Analyze system requirements for heating and cooling [1]
    d. Define the components for an HVAC system that meets the specified requirements based on professional standards and human comfort [1,2]

7. *Brief list of topics to be covered*
    a. Psychrometrics and HVAC
    b. HVAC System Layouts
    c. Comfort Considerations
    d. Ventilation Requirements and Filtering
    e. Outdoor Conditions
    f. Infiltration
    g. Thermal Resistances and U-Factors
    h. Solar Irradiation
    i. Cooling Load Calculations and the RTS Method
    j. Air Distribution and Diffusers
    k. Fans

1. *Course number and name:* ME 444 Energy Systems Design

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Nader Bagheri

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Applications of fundamentals of thermodynamics, fluid mechanics, heat transfer in design, analysis, and selection of power production systems including steam power plants, gas turbines, and auxiliary power units; and heat exchange systems. Topics also include economic evaluation and preliminary cost of estimation of energy systems. A term paper that requires oral presentation and written report on a topic related to green/renewable energy is also required.
    b. *Prerequisites:* ME 344
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Selected Elective

6. *Specific goals for the course*
    a. Apply conservation laws to thermal/power systems. [1]
    b. Understand, model, analyze, solve, and design thermal/power systems. [1, 2]
    c. Conduct and present independent research report, and to communicate more effectively. [3]

7. *Brief list of topics to be covered*
    a. Cycle Modeling and Analysis
        i. Gas Turbine Model
        ii. Single-Pressure Heat Recovery System Generator
        iii. Steam Connections
    b. 1^{st} and 2^{nd} Law Analyses of Power Cycles
        i. Cogeneration
        ii. Combined Gas-Vapor Power Cycles
        iii. Geothermal Systems
    c. Thermodynamic Modeling/Design
        i. Cogeneration Systems
        ii. Economic Model of the Cogeneration Systems
        iii. Purchased Equipment Cost
        iv. Cost Indexes: Marshal and Swift, Eng. News-Record Constructions
        v. Chemical Engineering Plant Cost
    d. Selection Design
        i. Pumps/Fans/Compressors/Turbines
    e. Economic Evaluation
        i. Cost of Electricity
        ii. Levelizing Equations

iii. Economic Evaluation Methods

f. System Performance Characteristics and Selection
    i. Construction Cost
    ii. Fuel Cost
    iii. Operation and Maintenance Cost
    iv. Availability and Forced Outage Rates
    v. Generation Mix
    vi. Economic Scheduling Principle
    vii. Load Distribution
g. Steam Turbine Systems
    i. Turbine Cycle Heat Balance
    ii. Part Load Operation
    iii. System Performance/Selection
h. Gas Turbines, Combined Cycles, and Cogeneration
    i. Gas Turbine Plants/Factors Affecting Performance
    ii. Combined Cycles
    iii. Waste Heat Recovery Boilers
    iv. Combined-Cycle Heat Balance and System Considerations
    v. Cogeneration
    vi. Steam Costing

1. *Course number and name:* ME 460 Automatic Feedback Control

2. *Credits and contact hours:* 2 units, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Antony Snell

4. *Text book, title, author, and year:* K. Ogata, **Modern Control Engineering, 5th ed.** Pearson, 2009.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Applications of fundamentals of thermodynamics, fluid mechanics, heat transfer in design, analysis, and selection of power production systems including steam power plants, gas turbines, and auxiliary power units; and heat exchange systems. Topics also include economic evaluation and preliminary cost of estimation of energy systems. A term paper that requires oral presentation and written report on a topic related to green/renewable energy is also required.
   b. *Prerequisites:* MTH 215, ME 360, ME 360L
      Co-requisites: ME460L
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Analyze the time-responses of first-order and second-order systems and know the significance of terms such as static-gain, time-constant, natural-frequency and critical damping ratio, and their relationship to performance criteria such as rise-time, settling time and overshoot [1]
   b. Work with block diagrams of dynamical systems. [1]
   c. Derive mathematical models of dynamical systems. [1]
   d. Derive transfer functions and appreciate their uses: stability, frequency-response, static-gain. [1]
   e. Construct and work with Bode plots. [1]
   f. Analyze/synthesize closed-loop control systems, including benefits of integral and derivative terms. [1]

7. *Brief list of topics to be covered*
   a. Time-domain responses of 1st and 2nd order systems. Static gain, time constant, natural frequency and damping.
   b. Steady-state response to step, and sinusoid input.
   c. The effects of gain, time constant, natural frequency and damping on the step response and frequency response will be examined.
   d. Frequency response and bode plots.
   e. Block diagram representations and simulations
   f. Derivation of state-space models for electro-mechanical systems
   g. Derivation of transfer function from state space or from differential equations
   h. Stability, static gain and frequency response from transfer functions

i. Determination of closed-loop transfer functions and examination of internal stability
j. Resolution of design conflicts in the frequency domain.
k. Use PI control for zero steady-state errors including derivative terms in PID control to improve damping.
l. Loop-shaping design using Bode plots

1. *Course number and name:* ME 460L Automatic Feedback Control Laboratory

2. *Credits and contact hours:* 1 unit, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Antony Snell

4. *Text book, title, author, and year:* None

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Study of dynamic system modeling for various types of engineering systems. Analysis of dynamic systems using Laplace transform and state space methods. Open and closed loop stability. Design of feedback controllers using root-locus and frequency response techniques. Extensive use of MATLAB for analysis and simulation.
   b. *Prerequisites:* MTH 215, ME 360, ME 360L
      Co-requisites: ME460
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Simulate/analyze the dynamics of a physical system using computer tools such as Matlab/Simulink. [1,6]
   b. Use a microcontroller such as Arduino interfaced with appropriate actuators to control a physical system [1,6]
   c. Communicate details of their project in a report that may be understood by other engineers [3]

7. *Brief list of topics to be covered*
   a. Introduction to Simulink
   b. Simulation of a Mechanical System
   c. Introduction to Arduino
   d. Interfacing Digital and Analog Inputs
   e. Interfacing LEDs, Motors and Servo Devices
   f. Group Projects that Incorporate Arduino, Feedback Measurements, and Control Signal Generation for an Actuator in a Mechanical System

1. *Course number and name:* ME 490 Engineering Design Processes

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Tomas Oppenheim

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    The tasks of engineering design processes are introduced and practiced. These tasks include identifying objectives and constraints, establishing functions, generating concepts, evaluating design alternatives, designing product architecture, selecting materials, and using mathematical modeling. Auxiliary techniques such as engineering statistics, dimensional analysis, design optimization, engineering economics, and project management will also be studied.
    b. *Prerequisites:* ME 332, ME 340, ME 360
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Prepare presentations and reports that clearly and persuasively communicate the design definition, background literature, and analysis [1,3]
    b. Learn the necessary tools to design and build their senior design projects [7]

7. *Brief list of topics to be covered*
    a. Introduction to Information Fluency
    b. Introduction to Possible Design Projects
    c. Discussion of Quantitative Design Constraints
    d. Finding Patents/Standards
    e. Technical Presentations
    f. Technical Writing
    g. Design Constraints Presentations
    h. Design Constraints Report Due
    i. Learning to Use Mathematical/Physical Models to Quantitatively Analyze Physical Systems
        i. Motor Sizing
        ii. Optimization/Multivariable Plot
            1. Sizing for a Single Cylinder Engine
    j. Group Annotated Bibliography Due
    k. Familiarization with Analysis Tools Needed for Senior Design Projects

1. *Course number and name:* ME 492 Project Design I

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Tomas Oppenheim

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Capstone projects will be assigned to groups of student teams who will implement the process of engineering design. They will identify a reasonable set of objectives, constraints, functions, and design specifications. They will subsequently generate design concepts and evaluate their alternatives to select the design that best meets the user's requirements. The teams will then work on product architecture, material selection, and mathematical modeling and engineering analysis. Finally, they will be required to present and submit a preliminary design report for their senior projects.
    b. *Prerequisites:* ME 490, Senior Class Standing
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Design a project assembly in a Computer Aided Software, providing both the assembly and engineering drawing views. [2]
    b. Quantitatively analyze the design performance for feasibility using both back of the envelope type calculations and computer software. [1,2]
    c. Communicate the design clearly and effectively via oral presentations and a final report. [3]
    d. Effectively work in a team to carry their project design from concept to design. [5]
    e. Research information pertinent to the project conception phase. [7]
    f. Recognize and consider public health, safety, global, cultural, social, environmental, and economic factors as it relates to their design. [2,4]

7. *Brief list of topics to be covered*
    a. Design Constraints
    b. CAD Drawings and Assemblies
    c. Analysis
    d. Final Presentation and Report
    e. Literature Review

1. *Course number and name:* ME 494 Project Design II

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Tomas Oppenheim

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    n this course students will perform tasks to complete the preliminary designs initiated in ME 492 - Project Design I, a project that will result in final and detailed designs. The tasks include refining the preliminary design, addressing design for assembly, design reliability and safety considerations, detailed drawings and bill of materials, prototyping and testing, product cost evaluation, and final design review. Finally, the students will present and submit a final report for their senior design projects.
    b. *Prerequisites:* ME 492
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Manufacture and assemble their designs as part of the engineering design process. [2]
    b. Prototype, test, and evaluate designs [2,6]
    c. Communicate the design clearly and effectively via oral presentations and a final report [3]
    d. Effectively work in a team to carry their project design from concept to design [5]

7. *Brief list of topics to be covered*
    a. Gantt Chart
    b. Design Assembly
    c. Assembly Evaluation

B. Required Courses Taught by the Sciences and Mathematics Department

1. *Course number and name:* CHE 110, General Chemistry

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Steven Runyon

4. *Text book, title, author, and year:* P. Flowers, Klaus Theopold, R. Langley, W. R. Robinson, and O. College, **Chemistry**. Houston, Texas: Openstax, Rice University, 2018.
    a. Homework: https://www.saplinglearning.com/

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    This course is an in-depth introduction to fundamental chemical principles and scientific thought. Topics covered include scientific method, scientific calculations, properties of matter, periodic trends, atomic and molecular structure, chemical reactions and stoichiometry, thermochemistry, gases, solutions, and radioactivity.
    b. *Prerequisites:* None
    Co-requisites: CHE 110L General Chemistry Lab
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Use theories, principles, and models, in conjunction with the scientific method to analyze problems in chemistry.
    b. Describe, explain, and model chemical and physical process at the atomic and molecular level in order to explain macroscopic properties.
    c. Solve quantitative problems in chemistry to demonstrate reasoning clearly and completely. Integrate multiple ideas in the problem-solving process. Check results to make sure they are physically reasonable.
    d. Make connections between chemical theories and principles to real-world applications.

7. *Brief list of topics to be covered*
    a. Scientific method
    b. Scientific calculations
    c. Properties of matter
    d. Periodic trends
    e. Atomic and molecular structure
    f. Chemical reactions and stoichiometry
    g. Thermochemistry
    h. Gases
    i. Solutions

1. *Course number and name:* CHE 110L, General Chemistry Lab

2. *Credits and contact hours:* 1 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Steven Runyon

4. *Text book, title, author, and year:* S. Runyon, **General Chemistry Laboratory Manual: 2nd Edition**. Vallejo, CA, 2017.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    This course is an in-depth introduction to fundamental chemical principles and scientific thought. Topics covered include scientific method, scientific calculations, properties of matter, periodic trends, atomic and molecular structure, chemical reactions and stoichiometry, thermochemistry, gases, solutions, and radioactivity.
    b. *Prerequisites:* None
    Co-requisites: CHE 110 General Chemistry
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. Specific goals for the course
    a. Perform general chemistry laboratory experiments using standard chemistry glassware and equipment.
    b. Demonstrate appropriate safety procedures.
    c. Apply basic experimental techniques to verify scientific principles introduced in CHE 110.
    d. Navigate safely and effectively around the chemistry lab.
    e. Document experimental approach and results in a laboratory notebook.
    f. Discuss scientific results and propagation of errors in written form in formal laboratory reports.

7. Brief list of topics to be covered
    a. Scientific method
    b. Scientific measurement and uncertainty
    c. Error analysis
    d. Density
    e. Electrolytes and solutions
    f. Qualitative chemical analysis
    g. Reaction stoichiometry
    h. Acid/base titration
    i. Gas stoichiometry
    j. Thermochemistry
    k. Atomic spectroscopy
    l. Visible spectroscopy
    m. Laboratory safety

1. *Course number and name:* MTH 210, Calculus I

2. *Credits and contact hours:* 4 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Brent Pohlmann

4. *Text book, title, author, and year:* G. B, **Thomas' calculus. Early Transcendentals. Single Variable, 12th ed.** Boston, MA: Addison-Wesley, 2010.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Introduction of functions and limits, differentiation, applications of differentiation, integration, and applications of the definite integral.
    b. *Prerequisites:* MTH 100 or equivalent with a C- or higher
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Understand functions, including exponential, logarithmic, trigonometric, and inverse trigonometric functions.
    b. Understand and compute limits and their geometrical consequences.
    c. Compute derivatives, using various techniques.
    d. Comprehend derivatives and understand how they relate to the real world.
    e. Apply derivatives to actual problems from engineering.
    f. Apply derivatives to actual problems from engineering.

7. *Brief list of topics to be covered*
    a. Elementary functions
    b. Limits
    c. Continuity
    d. Derivatives
    e. Techniques for Evaluating Derivatives
    f. Applications of the Derivative
    g. Introduction to Integration
    h. Riemann sums
    i. Fundamental theorem of calculus

1. *Course number and name:* MTH 211, Calculus II

2. *Credits and contact hours:* 4 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Taiyo Inoue

4. *Text book, title, author, and year:* G. Strang, E. Herman, and O. College, **Calculus. Volume 2**. Houston, Texas: Openstax, Rice University, 2016.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    An introduction to additional methods of integration and improper integrals. Presented are trigonometric and hyperbolic functions and their inverses; infinite sequences and series; and a brief introduction to linear, ordinary first, and second-order differential equations.
    b. *Prerequisites:* MTH 210 or equivalent with a C- or higher
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Apply definite integrals in the solution of practical problems in geometry, science and engineering.
    b. Evaluate integrals by using different integration methods.
    c. Understand differential equations and use them in mathematical modeling.
    d. Comprehend and evaluate infinite sequences and series and be able to determine whether they converge or diverge.
    e. Use analytic geometry in practical problems in science and mathematics.

7. *Brief list of topics to be covered*
    a. Review of limits
    b. Continuity
    c. Derivatives
    d. Important classes of functions
    e. Integration and the fundamental theorems of calculus which link integration to derivatives.
    f. Some geometric applications of the definite integral.
    g. Scientific applications of the integral.
    h. Methods of integration such as integration by parts, partial fraction decomposition, numerical integration.
    i. Elementary functions
    j. Differential equations: first and second order linear differential equations
    k. Infinite sequences and series: tests for convergence, Taylor series
    l. Introductory analytic geometry
    m. Numerical techniques

1. *Course number and name:* MTH 212, Calculus III

2. *Credits and contact hours:* 4 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Brent Pohlmann

4. *Text book, title, author, and year:* G. B, **Thomas' calculus. Early Transcendentals. Single Variable, 12th ed.** Boston, MA: Addison-Wesley, 2010.

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    An introduction to the algebra and calculus of vectors. Presented are functions of several variables and partial differentiation, as well as multiple integration and vector analysis.
    b. *Prerequisites:* MTH 211 or equivalent with a C- or higher
    Co-requisites: None
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Perform and apply vector operations, including the dot and cross product of vectors, in the plane and space. Graph and find equations of lines, planes, cylinders, and quadratic surfaces.
    b. Differentiate and integrate vector-valued functions. For a position vector function of time, interpret these as velocity and acceleration.
    c. Evaluate limits and determine the continuity and differentiability of functions of several variables.
    d. Find arc length and curvature of space curves, including the use of unit tangents and unit normal; identify and interpret tangential and normal components of acceleration.
    e. Find partial derivatives, directional derivatives, and gradients and use them to solve applied problems.
    f. Find differentials of functions of several variables and use them to solve applied problems.
    g. Find equations of tangent planes and normal lines to surfaces that are given implicitly or parametrically.
    h. Use the chain rule for functions of several variables (including implicit differentiation).
    i. For functions of several variables, find critical points using first partials and interpret them as relative extrema/saddle points using the second partials test. Find absolute extrema on a closed region. Apply these techniques to optimization problems.
    j. Use Lagrange multipliers to solve constrained optimization problems.
    k. Evaluate multiple integrals in appropriate coordinate systems such as rectangular, polar, cylindrical, and spherical coordinates and apply them to solve problems involving volume surface area, density, moments, and centroids.
    l. Use Jacobians to change variables in multiple integrals.

m. Evaluate line and surface integrals. Identify when a line integral is independent of path and use the Fundamental Theorem of Line Integrals to solve applied problems.
n. Use Jacobians to change variables in multiple integrals.
o. Evaluate line and surface integrals. Identify when a line integral is independent of path and use the Fundamental Theorem of Line Integrals to solve applied problems.
p. Find the curl and divergence of a vector field, the work done on an object moving in a vector field, and the flux of a field through a surface.
q. Introduce and use Green's Theorem, the Divergence (Gauss') Theorem, and Stokes Theorem.

7. *Brief list of topics to be covered*
   a. Vectors and the geometry of space
   b. Vector-valued functions and motion in space
   c. Partial derivatives
   d. Multiple integrals
   e. Integration in vector fields

1. *Course number and name:* MTH 215, Differential Equations

2. *Credits and contact hours:* 4 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Julie Simons

4. *Text book, title, author, and year:* Jiří Lebl, **Notes on Diffy Qs : Differential Equations for Engineers.** Charleston, S.C.: Createspace Independent Publishing Platform, 2018.

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
      Introduces first-order differential equations and second order differential equations with constant coefficients. Laplace transforms, small systems of linear differential equations, and numerical methods are presented, along with an introduction to second-order differential equations.
   b. *Prerequisites:* MTH 211 or equivalent with a C- or higher
      Co-requisites: None
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Classify differential equations by order, linearity, and homogeneity.
   b. Solve first order linear differential equations.
   c. Solve linear equations with constant coefficients.
   d. Use separation of variables, variation of parameters, the method of undetermined coefficients, power series, Laplace transforms, and numerical methods to solve differential equations.
   e. Determine whether a system of functions is linearly independent using the Wronskian.
   f. Model real-life applications using differential equations.
   g. Solve systems of linear differential equations using matrix techniques and eigenvalues.

7. *Brief list of topics to be covered*
   a. First order ODEs
   b. Second order ODEs
   c. Systems of linear ODEs
   d. Boundary value problems
   e. Laplace transforms
   f. Introduction to nonlinear systems

1. *Course number and name:* PHY 200, Engineering Physics I

2. *Credits and contact hours:* 3 units, 3 contact hours/week

3. *Instructor's or course coordinator's name:* Jaya Punglia

4. *Text book, title, author, and year:* None

5. *Specific course information*
   a. *Brief description of the content of the course (catalog description)*
   Covered are forces, torques, and static equilibrium; constant, accelerated, and periodic linear and rotational dynamics; gravity; fluid statics and dynamics; elasticity; temperature, thermal expansion, and heat transfer.
   b. *Prerequisites:* MTH 210
   Co-requisites: PHY 200L
   c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
   a. Demonstrate addition and subtraction of vector quantities using the component vectors in two or three dimensions.
   b. Set up and solve velocity and acceleration problems by applying the one and two dimensional kinematic equations and vector addition.
   c. Demonstrate mastery of Newton's laws by solving problems involving statics, including friction and normal forces.
   d. Develop specific scenarios, such as designing a water slide or roller coaster that will demonstrate their mastery of the energy concepts.
   e. Determine the momentum of a bullet or a car, and determine the initial velocity of a bullet that is fired into a ballistic pendulum using the conservation of linear momentum.
   f. Determine the mass of the moon, the mass of the sun, and the magnitude of the forces that hold the earth in orbit around the sun and the moon in orbit around the Earth using Newton's Law of Gravitation.
   g. Construct on paper different gearing ratios to accomplish desired angular velocities and accelerations and to be able to see the relation between the linear and rotational motion.
   h. Determine the kinetic energy, moment of inertia, and total mechanical energy of an object that is rotating while it is undergoing 2-D translation
   i. Predict the periodic motion of oscillating systems such as a mass on a spring and pendulum.

7. *Brief list of topics to be covered*
   a. Introduction to mathematical concepts and dimensional analysis
   b. Vector addition
   c. Kinematics in 1-D
   d. Kinematics in 2-D
   e. Forces and Newton's Laws of Motion

f. Work and energy
g. Impulse and momentum
h. Rotational kinematics
i. Rotational dynamics
j. Simple harmonic motion
k. Fluids and Archimedes Principle

1. *Course number and name:* PHY 200L, Engineering Physics I Lab

2. *Credits and contact hours:* 1 unit, 2 contact hours/week

3. *Instructor's or course coordinator's name:* Nelson Coates

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Laboratory physics course designed to enhance conceptual learning of physics by adding a hands-on learning component. The course will cover experiments based on the theory provided in PHY 200, including the study of forces, torques and static equilibrium; constant, accelerated, periodic, linear and rotational dynamics; gravity; fluid statics and dynamics; elasticity; temperature, thermal expansion and heat transfer.
    b. *Prerequisites:* MTH 210
    Co-requisites: PHY 200
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Understand scientific principles and their relationship to the physical universe.
    b. Use theories, principles and models, in conjunction with the scientific method to analyze problems in science.
    c. Acquire and utilize mathematical and computational techniques to both analyze and comprehend problems in science.
    d. Be more proficient independent learners and effective communicators.

7. *Brief list of topics to be covered*
    a. Introduction to Physics Lab
    b. Linear Motion: Position, Velocity, and Acceleration
    c. Composition and Resolution of Vectors
    d. Measurement of Gravity with a Pendulum
    e. Projectile Motion
    f. Frictional Forces
    g. Archimedes' Principle
    h. Conservation of Energy with Two Objects
    i. The Ballistic Pendulum and Collisions
    j. Uniform Circular Motion
    k. Torque and Equilibrium

1. *Course number and name:* PHY 205, Engineering Physics II

2. *Credits and contact hours:* 4 units, 4 contact hours/week

3. *Instructor's or course coordinator's name:* Nelson Coates

4. *Text book, title, author, and year:* None

5. *Specific course information*
    a. *Brief description of the content of the course (catalog description)*
    Laws of thermodynamics and the thermodynamics process; electrostatic and electromagnetic fields and forces; electric potential; capacitance, resistance and inductance; direct current circuits and instruments; R-L-C exponential circuits, alternating current circuits, and electromagnetic waves.
    b. *Prerequisites:* MTH 211
    Co-requisites: PHY 200
    c. *Required, elective, or selected elective (as per Table 5-1):* Required

6. *Specific goals for the course*
    a. Understand scientific principles and their relationship to the physical universe.
    b. Use theories, principles and models, in conjunction with the scientific method to analyze problems in science.
    c. Acquire and utilize mathematical and computational techniques to both analyze and comprehend problems in science.
    d. Be more proficient independent learners and effective communicators.
    e. Do well in Fundamentals of Engineering Exam, Circuits and related courses.

7. *Brief list of topics to be covered*
    a. Structure of the Atom, Conductors, Insulators
    b. Coulombs law, Electric Fields and Lines
    c. Calculating Electric Fields, Dipoles, Electric Flux
    d. Electric Flux and Gauss's Law
    e. Gauss's Law Review
    f. Electric Potential Energy and Electric Field
    g. Capacitors and Capacitance,
    h. Energy in Capacitors, Current and Resistance
    i. Ohms Law and Electrical Energy and Power
    j. DC Circuits, Resistors in Series and Parallel, Kirchoff's Rules
    k. RC Circuits, Magnetic Fields, Lines, and Forces
    l. Torque in DC Motors, Sources of Magnetic Fields
    m. Biot-Savart Law, Ampères Law, Solenoids
    n. Electromagnetic Induction, Faraday's Law
    o. Faraday's Law, Lenz's Law
    p. Maxwell's Equations and Electromagnetic Waves

APPENDIX B – FACULTY VITAE

A. Mechanical Engineering Program Faculty

1. Name: Nader Bagheri

2. Education
   Ph.D., Mechanical Engineering, University of California, Davis, 1989
   M.S., Mechanical Engineering, University of California, Davis, 1984
   B.S., Mechanical Engineering, CSU Fresno, 1981

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   - Professor, 1996-Present, full-time
   - Associate Professor, 1990-1996, full-time
   - Department Chair, 1996-2004, 2011-Present
   - ABET Coordinator, 1997-2012

   University of California, Davis, Mechanical and Aerospace Engineering Department
   - Summer Lecturer, 1997-Present, part-time

   CSU Sacramento, Mechanical Engineering Department
   - Lecturer, 1989-1990

   University of California, Davis, School of Engineering
   - Associate Instructor, 1985-1989

4. Non-academic experience
   California National University
   - Consultant, 1998-2015, part-time
   - Developing on-line course modules

   Consulting Contracts for Lawrence Livermore National Labs, NASA-Ames Research Center, Architects & Engineers at University of California, Davis, and Environmental Science Associates, 1987-1989, part-time

5. Certifications or professional registrations
   Professional Engineer, Mechanical Engineering, State of California, 2001

6. Current membership in professional organizations
   ASME

7. Honors and awards
   Tau Beta Pi Engineering Honor Society, 1981

8. Service activities (within and outside of the institution)

- Energy and Sustainability Committee member: December 2017-Present
- Faculty Development Committee member: Fall 2011-Present
- Annual Preview Day/Cal Maritime Day mechanical engineering program presenter: Fall 2011-Present
- Maritime Policy and Management (MPM) department RTP Committee member: Spring 2015/2017, and Fall 2016
- International Experience Support Faculty for the MPM Department: May 2014
- Student Opinion Form Committee member: Spring 2013
- ABET Assessment Coordinator: 1997-2012
- Mechanical Engineering Department RTP Committee Chair: Fall 2008
- Academic Senate Primary Committee Member for Retention, Tenure, and Promotion: 2005-06
- Vice Chancellor-Research Search Committee Member: University of California, Davis, Spring 2005
- Curriculum Committee Chair and Member: Fall 1993-Fall 2004
- Faculty Development Committee Member: Fall 1996-December 2004

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

- Bagheri, N., Pronchick, S., and Holden, M., "Capstone Engineering Design Process at Cal Maritime: Development, Implementation, and Assessment", Presented at the Maritime Education Summit, Galveston, Texas, March 2011.
- Bagheri, N., and Holden, M., "Mechanical Engineering Assessment System at Cal Maritime: Development, Implementation, and Results", Presented at the Maritime Education Summit, Galveston, Texas, March 2011.

10. Briefly list the most recent professional development activities

- Women in Maritime Leadership Conference, CSU Maritime, March: Spring 2017, 2018, 2019
- Cal Maritime Annual Leadership Offsite Retreat, Sonoma State University, March 2018
- New and Experienced Department Chair Workshop, CSU Long Beach, October 2016
- Academic Impression Collaborative Leadership in Higher Education Conference, St. Louis, MO, July 2016
- International Association of Maritime Universities reviewer, 2016
- Air flow studies of wind barriers in dry cooling systems in power plants, University of California, Davis, spring 2014 sabbatical leave activity
- ASME International Conference on Energy Sustainability, and Fuel Cell Science, Engineering and Technology Conference, San Diego, CA, July 2012
- ASME Heat Transfer and Fluid Engineering Conference, Puerto Rico, July 2012
- ASME International Gas Turbine Conference, Copenhagen, Denmark, June 2012

1. Name: Jim Gutierrez

2. Education
   Ph.D., Mechanical Engineering, University of California, Davis, 1998
   M.S., Mechanical Engineering, University of California, Davis, 1991
   B.S., Mechanical Engineering, California State University, Sacramento, 1985

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
      Professor, 2011-Present, full-time
      Associate Professor, 2006-2011, full-time
      Assistant Professor, 2001-2006, full-time

4. Non-academic experience
   California Department of Transportation, Office of Earthquake Engineering
      Senior Bridge Engineer, 2001-Present, part time
      Fiber Reinforced Composite Specialist, Integrate Composite Material into Infrastructure, Non-Linear Numerical Analysis.

      Branch Chief, 1998-2001, full-time
      Material Testing, Fracture Mechanics, Non-Destructive Testing and Evaluation of Bridges.

      Civil Engineer, 1993-1998, full-time
      Soil Structure Interaction, Geotechnical Earthquake Engineering, Numerical Analysis (FEA), Systems Development.

   Aerojet TechSystems, Division of Research and Engineering
      Senior Mechanical Engineer, 1985-1993, full-time
      Structural Analysis and Design of Rocket Propulsion Systems, Numerical Analysis

5. Certifications or professional registrations
   Professional Engineer, Mechanical Engineering, State of California
   Professional Engineer, Civil Engineering, State of California

6. Current membership in professional organizations
   Tau Beta Pi

7. Honors and awards
   N. Kamdar and J. Gutierrez, Lawrence Livermore National Laboratory, Entrepreneurial Academy, Faculty Advisor Design Team, 1st Place Innovation/Entrepreneurial Competition, 2011.

8. Service activities (within and outside of the institution)

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

   Chief Editor of the 1st Edition of the AASHTO LRFD Guide Specifications for the Design of Bonded FRP Systems, 2012.

10. Briefly list the most recent professional development activities

   - Introduction to ANSYS Mechanical (ver. 18), 12/17
   - Introduction to LS DYNA, Impact Dynamics (FEA) Training Course, 6/16
   - ANSYS 17.0 Update Workshop, 5/16
   - HASS (CNC) Milling Center Training, 9/15
   - HASS (CNC) Programming and Modeling with Fusion, 7/15
   - Introduction to ANSYS Fluent, 9/14
   - HAAS (CNC) Vertical Milling Machine Training, 6/14
   - HAAS (CNC) Lathe Programming, 3/14

1. Name: Michael Holden

2. Education
   B.S., Aeronautical Engineering and Mechanical Engineering (double major), English Minor, UC Davis, 1992
   M.S. Aeronautics and Astronautics, Stanford University, 1994
   Ph.D., Aeronautics and Astronautics, Stanford University, 1999

3. Academic experience

   CSU Maritime Academy, Mechanical Engineering Department
      Professor, 2016-Present, full-time
      Associate Professor, 2011-2015, full-time
      Assistant Professor, 2007-2011, full-time

   San Francisco State University, Mechanical Engineering Department
      Assistant Professor, 2003-2007, full-time

   Stanford University, Aeronautics and Astronautics Department
      Graduate Research Assistant/Teaching Assistant, 1992-1999, part-time

4. Non-academic experience
   MLB Company
      1998-2003 Vice President, Technology
      Autonomous Aircraft Manufacturer, developed flight control software, telemetry systems.

5. Certifications or professional registrations

6. Current membership in professional organizations

7. Honors and awards
   Sabbatical Award Fall 2017

8. Service activities (within and outside of the institution)
   Conference Chair, e-Navigation Underway North America Conference 2018 (Vallejo, CA)
   Chair, University-Wide Faculty Development Committee
   Retention, Tenure, Promotion Committee for ME, Library, and ET departments

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

Elizabeth McNie, Tamara Burback, Dan Weinstock, Steve Browne, Michael Holden, "Training and Educating Autonomous Ship Operators: Implications for a Maritime University", The Journal of Ocean Technology, Summer 2019

Blue Room Lecture, "Autonomous Vessels at Cal Maritime", San Francisco Maritime Museum, September 2018

Cal Maritime Scholar Presentation, "Who's the Captain Now?", November 2017

Jacob Steiner, Rose Hendrix, Alec Safreno, Michael E. Holden, "A Student-Run Autonomous Oceanographic Research Vessel", Poster at the 23rd Biennial Conference of the Coastal and Estuarine Research Foundation, November 2015

Michael E. Holden, "Social Media Data Distribution", Poster presented at the 23rd Biennial Conference of the Coastal and Estuarine Research Foundation, November 2015

Kamdar, Nipoli, and Michael Holden. "Engineering an Understanding of Economics." Presented at the Industry, Engineering, and Management Systems Conference, Cocoa Beach, Florida, April 2014

Holden, M. and Kamdar, N., "Does Keeping it Real Really matter? Lessons Learned from Experiments with Authentic Learning", presented at the International Assembly for Collegiate Business Education (IACBE) Western Regional Assembly Meeting, California Maritime Academy, October 2013

Kamdar, Nipoli, and Michael Holden. "Engineering an Understanding of Economics" *The Journal of Management and Engineering Integration* 7.2 (2014): 11-19. Print.

10. Briefly list the most recent professional development activities

Women in Maritime Leadership conference in 2019, the ABET symposium in April 2018, the CSU COAST annual conference in April 2018, Sabbatical Fall 2017, Cal Maritime Future Conference V in January 2016, CERF Conference 2015.

1. Name: Thomas Nordenholz

2. Education
   Ph.D., Mechanical Engineering, University of California, Berkeley, 1998
   M.S., Mechanical Engineering, University of California, Berkeley, 1995
   B.S., Mechanical Engineering, State University of New York, Buffalo, 1990

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   - Professor, 2008-Present, full-time
   - Associate Professor, 2004-2008, full-time
   - Assistant Professor, 1998-2004, full time

4. Non-academic experience
   Zimitar, Inc.
   - Contractor, 2012-2014, part-time
   - *High Efficiency Structural Flowthrough Rotor With Active Flap Control,* US Department of Energy Award: DE-EE0005492

5. Certifications or professional registrations

6. Current membership in professional organizations

7. Honors and awards

8. Service activities (within and outside of the institution)

   - Academic Senate Chair, California State University Maritime Academy, 2016-2019
   - Pi Tau Sigma Faculty Advisor, 2012-Present
   - Senior Project Design Technical Advisor, 1999- Present
   - Academic Advisor, Fall 1999 - Present
   - Retention Tenure and Promotion Committees, Various

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

   - *Offshore Wind Energy: Industry Overview, Research Directions, CMA Projects*, Cal Maritime Scholars Presentation, 2015
   - *The Collegiate Wind Competition*, California State University Maritime Academy Donors Appreciation Luncheon, March 2019
   - Cal Maritime Collegiate Wind Competition Technical Reports, 2013-2019, US Department of Energy Collegiate Wind Competition

10. Briefly list the most recent professional development activities

- Principal Investigator and Faculty Advisor, US Department of Energy Collegiate Wind Competition, 2013-present. Was selected for participation and funding in four successive US DOE subcontracts:
    - Subcontract AFC-3-23003-05 (2013-2015)
    - Subcontract AFC-5-52004-02 (2015-2017)
    - Subcontract AFC-7-70044-02 (2017-2019)
    - Subcontract Pending for 2019-2020.
- Cal Maritime teams under my direction have competed in every year of the Collegiate Wind Competition since its inception in 2014. We finished 2nd in 2015, 4th in 2017, 1st in 2018, and 3rd in 2019.

1. Name: Tomas Oppenheim

2. Education
   Ph.D., BioNano/Engineering, University of Cambridge, 2011
   B.S., Mechanical Engineering, Loyola Marymount University, 2007

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   Assistant Professor, 2015-Present, full time

   University of California, Merced, Mechanical Engineering Department
   Post-Doc, 2013-2014, full time

   Ecole Polytechnique Federal de Luasanne, Mechanical Engineering Department
   Post-Doc, 2011-2012, full time

4. Non-academic experience

5. Certifications or professional registrations
   Engineer-in-training, State of California, 2006

6. Current membership in professional organizations
   ASEE

7. Honors and awards

   - Haas Grant, 2018
   - CSUPERB Grant, 2017

8. Service activities (within and outside of the institution)

   - Curriculum Committee, 2017-2019
   - General Education Committee, 2017-2019
   - Alcohol, Tobacco, and Other Drugs Committee, 2016-2018
   - Peer Reviewer for CSUPERB Grants, 2018

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

   - Tomas Oppenheim, Jenny Trieu, Adelyn Tsu, Karunesh Ganguly. "A Three-Dimensional Quantitative Model of Finger and Hand Kinematics During Functional Tasks." In preparation, 2018.
   - Kaelan Schorger, Tomas Oppenheim. "Development of an Affordable Prototype Pneumatic Hand Prosthesis and Control System". In preparation, 2018.

- Tony Lewis, Tomas Oppenheim. "Integrating a Business Minor with an Engineering Course of Study." *The Journal of Management and Engineering Integration*, 2016.
- Chun Tang, Tomas Oppenheim, Vincent C. Tung, Ashlie Martini. "Structure–stability relationships for graphene-wrapped fullerene-coated carbon nanotubes." *Carbon*, 2013.

10. Briefly list the most recent professional development activities

- Laney College Manual Machining and Computer Numerically Controlled Courses, 2017-Present
    - Mach 220 Manual Machining II
    - Mach 30 Intro to CNC Programming
    - Mach 31 (Mastercam CNC Programming) and Mach 281 Pump Manufacturing
    - Fall 2019 Mach 230 Manual Machining III
- College of Alameda
    - Autotech Summer 2019: Computer Control and Ignition Systems

1. Name: Antony Snell

2. Education
   Ph.D., Aerospace Engineering, University of Minnesota, 1991
   M.S., Marine Mechanical Engineering, University College London, 1984
   B.S., Mechanical Engineering, University College London, 1983

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   - Professor, 2010-Present, full-time
   - Associate Professor, 2005-2010, full time
   - Assistant Professor, 2001-2005, full time

   University of California, Davis, Mechanical and Aerospace Engineering Department
   - Assistant Professor, 1991-1999, full time

4. Non-academic experience

   Aerojet-Gencorp
   - Control Systems Analyst, 2001, full time

   Under Control Inc.
   - Chief Control Systems Engineer, 1999-2001, full time

   Ministry of Defence (UK),
   - Mechanical Engineer, 1985-1986, full time
     Transmissions and Shafting Systems

   Expert witness, 2014-2015 & 2009-2011, part time

   Schilling Robotics
   - Consultant, 2000, 2003-2004, part-time
     Work in multibody dynamics simulations, ROV dynamic analysis, and robotic arm kinematics, part time

   Under Control Inc.
   - Consultant, 1998-1999, Controls and system dynamics, part time

   Aerojet-Gencorp
   - Consultant, 1997-1998, part time
     Controls and gas system modeling, part time

   Honeywell, Inc.
   - Consultant, 1987, full time
     Flight control design

5. Certifications or professional registrations

6. Current membership in professional organizations
   AIAA (Senior Member), ASME, SAE

7. Honors and awards

   - First Class Honors in B.Sc. at University College London, June 1983.
   - Distinction in M.Sc. at University College London, December 1984.

8. Service activities (within and outside of the institution)

   - Chair of Academic Senate Committee for Retention, Tenure, and Promotion, 2014 and 2016-19
   - Chair of Faculty Professional Leave Committee, 2014, 2016-17
   - Member Faculty Professional Leave Committee, 2018
   - Chair and member Cal Maritime, Institutional Review Board, 2011-2019
   - Faculty Advisor to Society of Automotive Engineers, Cal Maritime Chapter, 2003-2019
   - Accompanied student team to SMUD Solar Regatta competition, May 2016
   - Accompanied student team to Baja SAE West competition, May 2019

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
   None

10. Briefly list the most recent professional development activities

   - PG& E workshop on heat-pumps for water heating, June 2017
   - Percentage of time available for research or scholarly activities, 25% UNPAID
   - Percentage of time committed to the program, 100%

1. Name: William Tsai

2. Education
   Ph.D., Mechanical Engineering, University of California, Berkeley, 2009
   M.S., Mechanical Engineering, University of California, Berkeley, 2006
   B.S., Mechanical Engineering, University of California, Berkeley, 2003

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   Assistant Professor, 2013-Present, full time

4. Non-academic experience
   The Aerospace Corporation
   Member of the Technical Staff, 2010-2013, full time
   Providing technical support in the area of fluid mechanics for the United States Air Force Space and Missile Systems Center

5. Certifications or professional registrations

6. Current membership in professional organizations
   AIAA, ASEE, ASME, ASHRAE

7. Honors and awards

8. Service activities (within and outside of the institution)

   - Institution Wide Assessment Council, 2017-Present
   - ASME Student Club Faculty Advisor, 2015-Present
   - AIAA Thermophysics Technical Committee, 2014-Present

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

   - W. Tsai and A. Janssen. "Reinforcing Information Fluency: Instruction Collaboration in Senior Capstone Laboratory Course." Presented at the ASEE Conference and Exposition, 2018. Paper No. 22412.

   - R. Darfler and W. Tsai. "Method for a Low Cost Hydrokinetic Test Platform: An Open Source Water Flume." Presented at the ASEE Conference and Exposition, 2017. Paper No. 18156.

10. Briefly list the most recent professional development activities

- 2019 MITx Course: Additive Manufacturing for Innovative Design and Production
- 2018 CSU Course: Introduction to Teaching Online
- 2018 ASEE Conference Attendance
- 2017 ABET Conference Attendance
- 2017 ASEE Conference Attendance
- 2016 ASEE Conference Attendance

B. Adjunct Faculty and Lecturers

1. Name: Jeff Hadian

2. Education
   Ph.D., Engineering Science and Mechanics, Virginia Tech, 1992
   M.S., Mathematics, University of Nebraska, 1985
   M.S., Civil Engineering, University of Nebraska, 1982
   B.S., Civil Engineering, University of Nebraska, 1981

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   Adjunct Professor, 2014-Present, part time

   Foothill College, Mathematics Department
   Lecturer, 2000, part time

   Virginia Tech, Engineering Science and Mechanics Department
   Teaching Assistant, 1986-1991, part time

   University of Nebraska, Mathematics Department
   Instructor, 1982-1984, part time

4. Non-academic experience
   Lockheed Martin Space Company
   Loads and Dynamics Engineer, 2017-Present, full time
   Stress Analysis Engineer, 2005-2017, full time

5. Certifications or professional registrations

6. Current membership in professional organizations

7. Honors and awards

   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2015
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2014
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2013
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2012
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2011
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2010
   - Engineering Special Recognition Award, Lockheed Martin Space Company, 2009
   - SPOT Award, Lockheed Martin Space Company, 2008
   - Certificate of Recognition, National Aeronautics and Space Administration, 1997

8. Service activities (within and outside of the institution)

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

10. Briefly list the most recent professional development activities

1. Name: Steffan Long

2. Education
   Machine Technology Certificate, Diablo Valley College, 2002
   B.A., Language Studies, University of California at Santa Cruz, 1989

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering and Engineering Technology Departments
   Lecturer, 2017-Present, full-time

4. Non-academic experience
   Chris French Metal, Inc.
   Shop Foreman, August 2009-August 2017
   As the lead fabricator, and shop foreman, I was responsible for all projects being on schedule and within budget. This required continuous communication with management and design teams, collaboratively creating strategies for successful project completion and field installation. To accommodate growth, we move the shop twice, increasing our square footage from 900 to over 10,000. I was heavily involved in the design, layout and set up of each shop. In addition, I administered fabrication tests and consulted with management on new hires.

   Delphi Productions
   Metal Shop Supervisor, January 2002-August 2009
   As supervisor, I oversaw daily operations and supervised employees, determined material and consumable needs and procured necessary supplies. In addition, I coordinated with internal departments and project managers to manufacture products within defined budget parameters and timelines.

   Orantes Architectural Metals
   Shop Foreman, August 2000-September 2001
   Managed daily operation of shop and supervised employees. I was the lead fabricator on a wide array of architectural projects, as well as being the jobsite foreman on numerous and varied installations.

5. Certifications or professional registrations

6. Current membership in professional organizations

7. Honors and awards

8. Service activities (within and outside of the institution)

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

10. Briefly list the most recent professional development activities
    a. Instruction in G-code programming for CNC milling machine

1. Name: Sepandarmaz (Sepand) Momeni

2. Education
   Ph.D., Mechanical Engineering, University of Toronto, 2008
   M.S., Mechanical Engineering, Tehran University, 1999
   B.S., Mechanical Engineering, Tehran University, 1996

3. Academic experience
   CSU Maritime Academy, Mechanical Engineering Department
   - Adjunct Professor, 2019, part time

   University of Toronto, Mechanical and Industrial Engineering Department
   - Adjunct Professor, 2013-2016, part time
   - Instructor, 2003-2006

   Azad University
   - Instructor, 1999-2001, part time

   Tehran University
   - Instructor, 1996-1999, part time

4. Non-academic experience
   iSenseCloud Inc.
   - Vice President of Engineering, 2017-Present, full-time
   - Contractor/Management Consultant, 2015-2017, full-time

   Mistras Group, Inc.
   - NDE Research Scientist, 2010-2015, full-time
   - Sensor Engineer – Scientist, 2008-2010, full-time

5. Certifications or professional registrations

6. Current membership in professional organizations
   ASME, IEEE, ASNT

7. Honors and awards

   - University of Toronto Fellowship, 2002-2006
   - McAllister Scholarship and University of Toronto Fellowship, 2004
   - McAllister Scholarship and University of Toronto Fellowship, 2003
   - Frank Howard Graduate Scholarship and University of Toronto Fellowship, 2004

8. Service activities (within and outside of the institution)

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
   B. A. Zrate, A. Pollock, S. Momeni, O. Ley, “Structural health monitoring of liquid-filled tanks: A Bayesian approach for location of acoustic emission sources.” Smart Materials and Structures (22), 2013.

10. Briefly list the most recent professional development activities

1. Name: Ali Moradmand

2. Education
   Ph.D., Physics, Auburn University, 2013
   M.S., Physics, Auburn University, 2010
   B.S., Physics, University of South Alabama, 2007

3. Academic experience
   CSU Maritime Academy, Sciences and Mathematics Department
   Lecturer, 2015-Present, full-time

4. Non-academic experience
   Jet Propulsion Laboratory
   Postdoctoral Scholar, Astrophysics, 2014-2015, full-time

5. Certifications or professional registrations

6. Current membership in professional organizations

7. Honors and awards

8. Service activities (within and outside of the institution)
   - Lecturer Delegate for California Faculty Association
   - Faculty Judge for MATE ROV Competitions
   - Judge/Coordinator for Student Photo Contest
   - Coordinator for CSU EO 1110 Remedial Mathematics Curriculum Design

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

   A. Moradmand, M. A. O. El Ghazaly, D. P. Mahapatra, A. Chutjian, "Measurement of absolute single and double charge exchange cross sections for Si (7−10)+ ions at 0.88-2.5 keV/u impacting He and H2", Astrophysical Journal, 2018.

   C. W. McCurdy, T. N. Rescigno, C. S. Trevisan, R. R. Lucchese, B. Gaire, A. Menssen, M. S. Schöffler, A. Gatton, J. Neff, P. M. Stammer, J. Rist, S. Eckart, B. Berry, T. Severt, J. Sartor, A. Moradmand, T. Jahnke, A. L. Landers, J. B. Williams, I. Ben-Itzhak, R. Dörner, A. Belkacem, and T. Weber, "Unambiguous observation of F-atom core-hole localization in CF 4 through body-frame photoelectron angular distributions," Physical Review A, 2017.

J. R. Machacek, D. P. Mahapatra, D. R. Schultz, Y. Ralchenko, A. Moradmand, M. A. O. El Ghazaly, A. Chutjian, "Solar-wind ion driven X-ray emission from cometary and planetary atmospheres: measurements and theoretical predictions of charge-exchange cross sections and emission spectra for $O^{6+} + H_2O$, CO, CO_2, CH_4, N_2, NO, N_2O, and Ar", Astrophysical Journal, 2015.

10. Briefly list the most recent professional development activities
    - CSU Anti-Racism Workshop
    - 2019 LGBT Safe Zone Training

11. Name: Sarah Szewczyk

12. Education
    B.S., Electrical Engineering, University of Washington, 2012
    B.A., Linguistics, University of California, Los Angeles, 2003

13. Academic experience
    CSU Maritime Academy, Mechanical Engineering Department
        Lecturer, 2019, part time

14. Non-academic experience
    Pacific Gas and Electric
        Planning Engineer, 2015-Present, full-time

    Tacoma Power
        Power Systems Engineer, 2012-2014, full-time

15. Certifications or professional registrations
    Professional Engineer, Electrical Engineering, State of California

16. Current membership in professional organizations
    IEEE PES, SWE

17. Honors and awards

18. Service activities (within and outside of the institution)
    - Habitat for Humanity
    - Volunteer Arduino instructor
    - Volunteer instructor for engineering and arts learning at Gray Area Foundation for the Arts in San Francisco

19. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation

20. Briefly list the most recent professional development activities

1. Name: Frank L. Yip

2. Education
   Ph.D., Theoretical Chemistry, University of California, Berkeley, 2008
   M.S., Chemistry, University of California, Berkeley, 2004
   A.B., Chemistry, Princeton, 2002

3. Academic experience
   CSU Maritime Academy, Sciences and Mathematics Department
      Associate Professor, 2017-Present, full-time
      Assistant Professor, 2012-2017, full-time

4. Non-academic experience
   Universidad Autonoma de Madrid-Departamento de Quımica
      Postdoctoral Investigator, 2010-2012, full time

   Lawrence Berkeley National Laboratory-Chemical Sciences
   Division and Ultrafast X-ray Sciences Laboratory
      Postdoctoral Investigator, 2008-2010, full-time

5. Certifications or professional registrations
   Secondary Education for Physical Sciences, New Jersey Department of Education, June 2002

6. Current membership in professional organizations
   American Physical Society (APS), Sigma Chi Scientific Research Society

7. Honors and awards
   Outstanding Scholarship Award, California State University-Maritime Academy, August 2016.
   - Travel award to the XXVIV International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC), July 2015, Toledo, SPAIN.
   - Travel award to the 46th Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting of the American Physical Society (APS), Columbus, OH. June 2015.
   - Travel award to the 45th Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting of the American Physical Society (APS), Madison, WI. June 2014.
   - Travel award to the 17th; International Symposium on Polarisation and Correlation in Electronic and Atomic Collisions (e, 2e) meeting of the XXVIII ICPEAC. August 2013, Hefei, China.
   - Travel award to the 44th Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting of the American Physical Society (APS), Quebec City, Quebec, Canada. June 2013.
   - Travel award to the Gordon Research Conference of Photoions, Photoionization & Photodetachment, Galveston, TX. February 2012.Travel award to the European

COST Workshop on Applied Numerical and Computational Methods in Atomic and Molecular Physics, Dublin, Ireland. April 2011.
- Travel award to the 10th European Conference on Atomic and Molecular Physics (ECAMP), Salamanca, Spain. July 2010.

8. Service activities (within and outside of the institution)
   - CSU-Louis Stokes Alliance for Minority Participation (LSAMP) Program, October 2014 - present, Program Coordinator.
   - Unity Council, September 2013 - present, member-at-large, May 2015 - Present, Executive Committee appointee
   - Curriculum Committee, August 2013 - present.
   - Instructionally Related Activities Committee, January 2013 - present.
   - Summer Term Task Force faculty representative, September 2013 - June 2015.
   - Departmental Search Committee, Spring and Summer 2013, Fall 2013, Spring 2014, Spring 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017, Fall 2018.
   - Living Learning Community Faculty Mentor, August 2015 - Present.
   - Latino Club Faculty Advisor, August 2015 - November 2017.
   - Faculty Learning Community, August 2012 - April 2014, August 2017 - Present.

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
   - R.Y. Bello, F.L. Yip, T. N. Rescigno, R.R. Lucchese, and C.W. McCurdy, "Role of initial-state electron correlation in one-photon double ionization of atoms and molecules", Physical Review A, 99, 013403 (2019).
   - Z.L. Streeter, F.L. Yip, R.R. Lucchese, B. Gervais, T. N. Rescigno and C.W. McCurdy, "Dissociation dynamics of the water dication following one-photon double ionization. I. Theory", Physical Review A, 98, 053429 (2018).
   - F.L. Yip, T.N. Rescigno and C.W. McCurdy, "Fully differential single-photon double photoionization of atomic magnesium", Physical Review A, 94, 063414 (2016).
   - F.L. Yip, A. Palacios, F. Martın, T. N. Rescigno and C.W. McCurdy, "Two-photon double ionization of atomic beryllium with ultrashort laser pulses", Physical Review A, 92, 053404, (2015).
   - F.L. Yip, C.W. McCurdy and T.N. Rescigno, "Hybrid Gaussian discrete-variable representation for one- and two-active-electron continuum calculations in molecules", Physical Review A, 90, 063421 (2014).

   - Poster presentation on "Fully differential single photon double photoionization of atomic carbon", F.L. Yip, T.N. Rescigno and C.W. McCurdy, at the 49th Annual Meeting of the Division of Atomic, Molecular and Optical Physics of the American Physical Society. May 2018, Ft. Lauderdale, Florida.
   - Invited speaker on "Double photoionization of quasi two-electron atoms", F.L. Yip, C.W. McCurdy, and T.N. Rescigno, at the International Symposium on (e,2e), Double Photoionization and Related Topics and 19th International

Symposium on Polarization and Correlation in Electronic and Atomic Collisions satellite meeting of the XXX International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC). July 2017, Palm Cove, Australia.

- Poster presentation on “Fully differential single photon double photoionization of atomic magnesium”, F.L. Yip, C.W. McCurdy and T.N. Rescigno, at the XXX International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC). July 2017, Cairns, Australia.
- Contributed presentation on “Double photoionization of H2 using a hybrid Gaussian-discrete variable representation basis for molecular continuum processes”, F.L. Yip, T.N. Rescigno and C.W. McCurdy, at the 48th Annual Meeting of the Division of Atomic, Molecular and Optical Physics of the American Physical Society. June 2017, Sacramento, California.
- Contributed presentation on “Fully differential single-photon double ionization of magnesium”, F.L. Yip, T.N. Rescigno and C.W. McCurdy, at the 47th Annual Meeting of the Division of Atomic, Molecular and Optical Physics of the American Physical Society. May 2016, Providence, Rhode Island.
- Poster presentation on “Hybrid Gaussian-discrete variable representation for continuum electrons in molecules”, F.L. Yip, C.W. McCurdy and T.N. Rescigno, at the XXVIV International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC). July 2015, Toledo, Spain.
- Poster presentation on “Time-dependent double photon double ionization of atomic beryllium with ultrashort pulses”, F.L. Yip, A. Palacios, F. Martın, T.N. Rescigno and C.W. McCurdy, at the XXVIV International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC). July 2015, Toledo, Spain.
- Contributed presentation on “Hybrid Gaussian-discrete variable representation for continuum electrons in molecules”, F.L. Yip, C.W. McCurdy and T.N. Rescigno, at the 46th Annual Meeting of the Division of Atomic, Molecular and Optical Physics of the American Physical Society. June 2015, Columbus, Ohio.

10. Briefly list the most recent professional development activities

APPENDIX C – EQUIPMENT

Please list the major pieces of equipment used by the program in support of instruction.

A comprehensive list of the equipment available in the Mechanical Engineering program was presented in the discussion of the following Criterion 6 in the discussion of the Laboratories and Manufacturing Spaces.

APPENDIX D – INSTITUTIONAL SUMMARY

Programs are requested to provide the following information.

1. The Institution

a. *Name and address of the institution*
California State University Maritime Academy
200 Maritime Academy Drive
Vallejo, CA 94590

b. *Name and title of the chief executive officer of the institution*
RADM Thomas A. Cropper
President, California State University Maritime Academy

c. *Name and title of the person submitting the Self-Study Report.*
Francelina Neto
Dean, School Engineering

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

ABET
EAC: Mechanical Engineering Program
Initial Accreditation: 2002
Most Recent Accreditation: 2014

ETAC: Facilities Engineering Technology Program
Initial Accreditation: 1999
Most Recent Accreditation: 2014

ETAC: Marine Engineering Technology Program
Initial Accreditation: 1977
Most Recent Accreditation: 2014

International Assembly for Collegiate Business Education (IACBE)
For the International Business and Logistics Program
Initial Accreditation: 2002
Most Recent Accreditation: 2014

Western Association of Schools and Colleges (WASC)
For the University
Initial Accreditation: 1974
Most Recent Accreditation: 2013

2. Type of Control

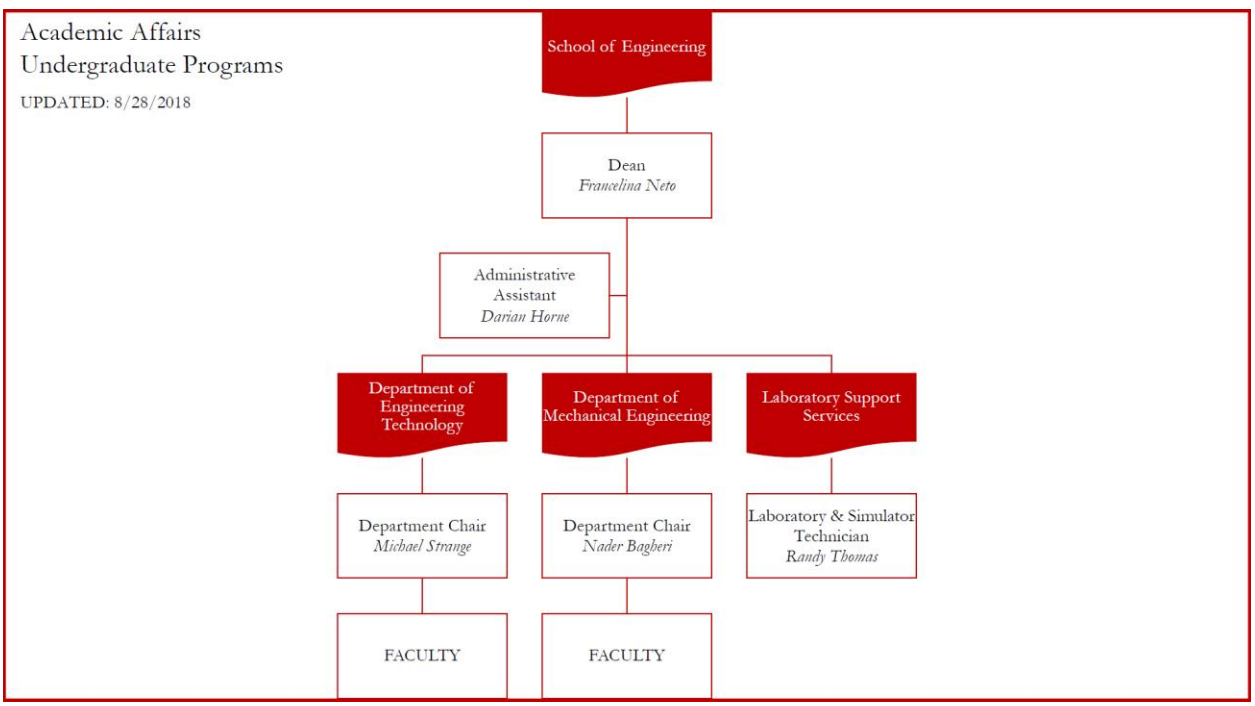
Description of the type of managerial control of the institution, e.g., private-non-profit, private-other, denominational, state, federal, public-other, etc.

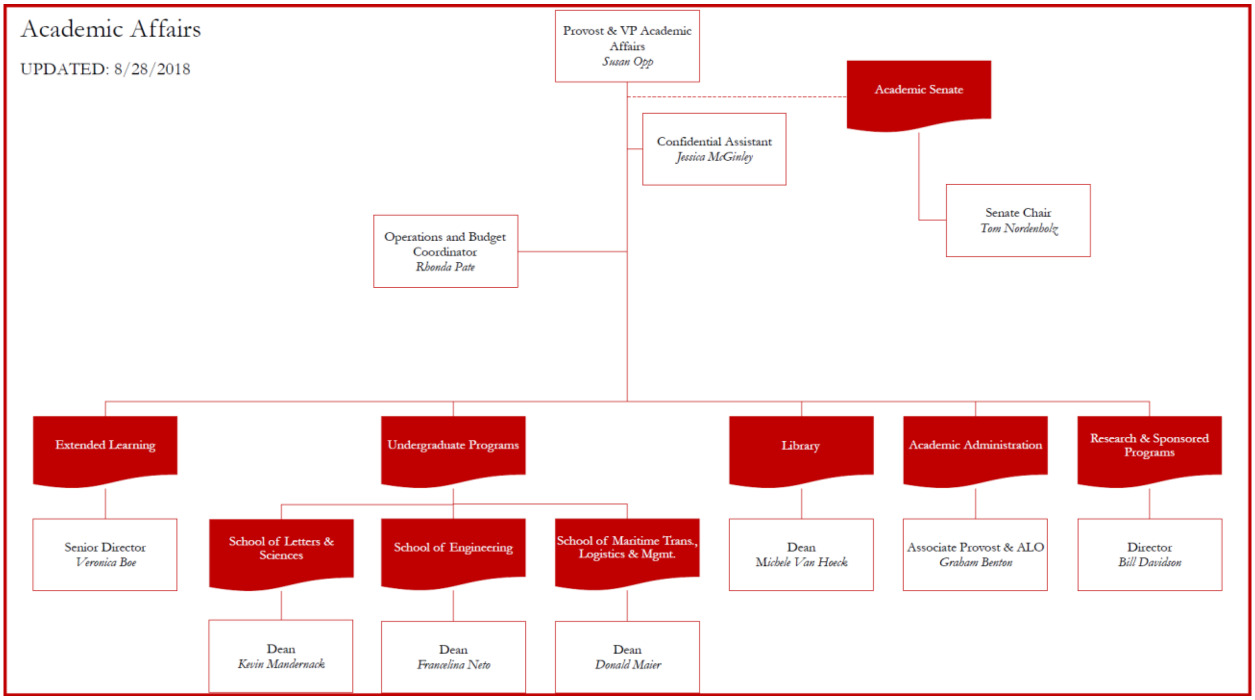
California State University Maritime Academy is a state public institution. It is one of 23 campuses of the California State University system. The system is the responsibility of Chancellor Timothy White and is governed the 25-member Board of Trustees, of which all but one are appointed by the Governor of the State of California.

3. Educational Unit

Describe the educational unit in which the program is located including the administrative chain of responsibility from the individual responsible for the program to the chief executive officer of the institution. Include names and titles. An organization chart may be included.

The program is headed by the department chair, Nader Bagheri. The department chair reports to the Dean of Engineering, Francelina Neto. The Dean reports to the Provost, Sue Opp. The Provost reports to the President, RADM Thomas A. Cropper. Organizational charts for Academic Affairs and the School of Engineering.





4. Academic Support Units

List the names and titles of the individuals responsible for each of the units that teach courses required by the program being evaluated, e.g., mathematics, physics, etc.

Michael Strange
Chair, Department of Engineering Technology

Kevin Mandernack
Dean, School of Letters and Sciences

Cynthia Trevisan
Department Chair, Department of Sciences and Mathematics

Colin Dewey
Department Chair, Department of Culture & Communications

5. Non-academic Support Units

List the names and titles of the individuals responsible for each of the units that provide non-academic support to the program being evaluated, e.g., library, computing facilities, placement, tutoring, etc.

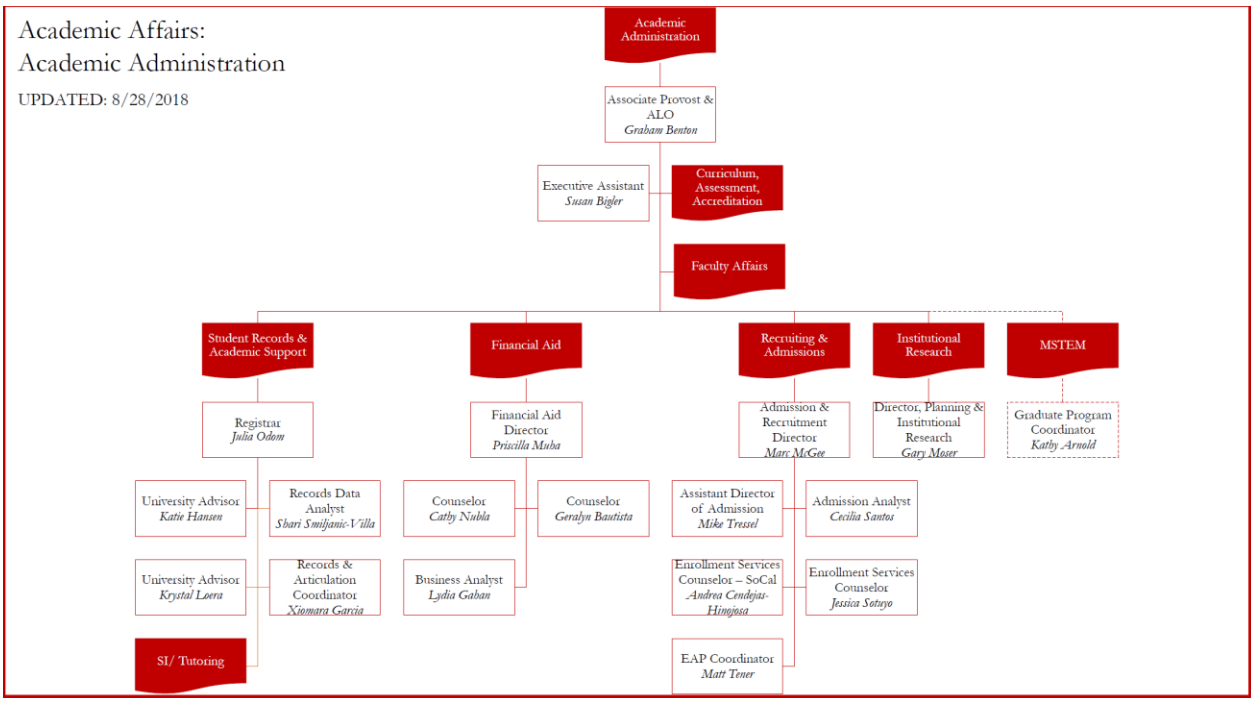
Michele Van Hoeck
Dean, Library

Julianne Tolson
Chief Technology Officer, Information Technology
Julia Odom
Registrar, Student Records & Academic Support

Katie Hansen
University Advisor, Student Records & Academic Support

Wendy Higgins
Director of Career Services, Career Services

Matthew Tener
Interim Tutoring Coordinator, Student Records & Academic Support
EAP Coordinator, Recruiting and Admissions



6. Credit Unit

It is assumed that one semester or quarter credit normally represents one class hour or three laboratory hours per week. One academic year normally represents at least 28 weeks of classes, exclusive of final examinations. If other standards are used for this program, the differences should be indicated.

At Cal Maritime, one semester unit represents one class hour or two laboratory hours. One academic year is 30 weeks of classes, exclusive of final examinations.

7. Tables

Complete the following tables for the program undergoing evaluation.

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering Program

	Academic Year		Enrollment Year 1st	2nd	3rd	4th	5th	Total Undergrad	Total Grad	Degrees Awarded Associates	Bachelors	Masters	Doctorates
Current Year	**2018-19**	FT	**62**	**44**	**34**	**40**	**9**	**189**	**0**	**0**	**36***	**0**	**0**
		PT	**0**	**0**	**1**	**3**	**4**	**8**	**0**				
1 year prior to current year	**2017-18**	FT	**73**	**28**	**36**	**38**	**15**	**190**	**0**	**0**	**36**	**0**	**0**
		PT	**0**	**0**	**0**	**3**	**2**	**5**	**0**				
2 years prior to current year	**2016-17**	FT	**60**	**39**	**32**	**52**	**6**	**189**	**0**	**0**	**34**	**0**	**0**
		PT	**1**	**0**	**1**	**3**	**4**	**9**	**0**				
3 years prior to current year	**2015-16**	FT	**67**	**37**	**39**	**48**	**15**	**206**	**0**	**0**	**48**	**0**	**0**
		PT	**0**	**0**	**0**	**2**	**4**	**6**	**0**				
4 years prior to current year	**2014-15**	FT	**46**	**43**	**39**	**47**	**10**	**185**	**0**	**0**	**32**	**0**	**0**
		PT	**2**	**2**	**2**	**2**	**3**	**11**	**0**				

* As of July 1, 2019. Summer 2019 graduates are not included.

Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the on-site visit.

FT—full-time
PT—part-time

Table D-2. Personnel

Mechanical Engineering Program

Year[1]: Fall 2018

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[2]	1	1	1.4
Faculty (tenure-track)[3]	5	2	6
Other Faculty (excluding student Assistants)	0	2	2.1
Student Teaching Assistants[4]	0	1	0.3
Technicians/Specialists	1	1	1.2
Office/Clerical Employees	1	0	1
Others[5]	0	0	0

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).

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

SUBMISSION ATTESTING TO COMPLIANCE

Only the Dean or Dean's Delegate can electronically submit the Self-study Report.

ABET considers the on-line submission as equivalent to that of an electronic signature of compliance attesting to the fact that the program 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 Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*