ABET
Self-Study Report

for the

Bachelor of Science

in

Mechanical Engineering

at

California State University, Fullerton

800 North State College Boulevard
Fullerton, CA 92834

June 30, 2014

CONFIDENTIAL

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Self-Study Report

Mechanical Engineering Program

Bachelor of Science

BACKGROUND INFORMATION

A. Contact Information

Acting Chair for the Department of Mechanical Engineering (ME) is Dr. Roberta Rikli. She will be the primary contact person for the ABET site visit. Dr. Sang June Oh, who serves as Vice Chair of the ME Department, will be a secondary contact person for the ME Program site visit.

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B. Program History

The Mechanical Engineering Program at Cal State Fullerton began as an 'Option' in 1983, housed under an umbrella BS degree in Engineering. The ME program received its initial ABET accreditation in 1985. Effective in Spring of 1993, the ME program was approved as a separate stand alone B.S. degree in Mechanical Engineering. The date of the last ABET general review was in 2008. A major change since the last review has been the significant reformation in the makeup of the program's full-time faculty. At the time of the last review (2008) the full-time faculty consisted of six tenured full professors (Drs. Bazar, Kreiner, Lancey, Moini, Othmer, and Rizza), with the last successful search for a new faculty hire being in 1987, more than 20 years prior to the last ABET visit in 2008. Since that time, the department has been successful in hiring six new Assistant Professors -- Drs. Oh (2009), Ngo (2011), Robson (2012), Wang (2012), Mayoral (2014), and Piacenza (2014). Currently, due to retirements, only two of the full time

faculty in 2008 still teach in the ME program (Drs. Bazar and Moini). Another program change since the last review has been an 8-unit reduction in required units for the ME degree, from 137 to 129, with the impetus for this change coming from two sources – 1) from the California State University (CSU) Board of Trustees and CSU Chancellor's Office to reduce total units for undergraduate degrees in all programs as a way of reducing program costs and time to degree, and 2) in response to feedback from program constituents, especially from graduating seniors and alumni suggesting that certain courses should be eliminated, reconfigured, or moved from required to elective status (see discussion of curricular changes on page 48). Fortunately, constituent feedback about recommended program changes was closely matched (in terms of units) with the request to reduce total program degree requirements by 8 units, a reduction that brought the ME program in line with the 129 unit requirement of other engineering programs at Cal State Fullerton and more closely in line with other ME programs in the CSU system and elsewhere. Specifically, the areas of unit reduction were:

- Physics 227: Fundamental Physics (1 unit) – Requirement has been eliminated
- EGME 102: Graphical Communications (3 units to 2 units) – Course revised and renamed to Engineering Graphics
- EGEE 303: Electronics (3 units) – Requirement has been eliminated, can be taken as an elective
- EGME 426: Design of Thermal and Fluid Systems (3 units) – Requirement has been changed to technical elective

C. Options

The only option at the present time is a Bachelor of Science in Mechanical Engineering. An approved Emphasis in Manufacturing Engineering is currently inactive and under review. Due to the large turnover of faculty during this period of review it was not always feasible to offer the number of courses needed to support this emphasis. However, with the recent addition of six new faculty, this Emphasis will be under review during the upcoming year for either re-instatement or possibly a reconfiguration to better meet contemporary needs.

D. Program Delivery Modes

The primary delivery mode for the ME program is through traditional on-campus lecture and laboratory classes. Most classes are offered during the daytime, usually on either a Monday/Wednesday schedule or a Tuesday/Thursday schedule. A few lab or combination lecture and lab classes are offered on Fridays. Occasionally, some 400-level technical elective courses are offered in the evening to also accommodate graduate students.

E. Program Locations

All aspects of the ME program are offered on the CSUF campus. The only exception to this would be independent study or internship experiences where part of the work takes place at a local industry or agency location.

F. Summary of Most Recent ABET Final Statement: Concerns from Previous Evaluations and Actions Taken to Address Them

The most recent Final Statement from ABET (August 2013) indicates that two previous weaknesses – one in Criterion 2 and one in Criterion 4 are now concerns, and that a previous concern in Criterion 3 has been resolved.

CRITERION 2 – Concern

The following statement explaining this concern is taken from the August 5, 2013 Final Statement sent to Dean Unnikrishnan:

Due-process response: *The EAC acknowledges receipt of documentation outlining the efforts to obtain constituent feedback on the appropriateness of the current set of program educational objectives. A majority of the current faculty endorsed the objectives at their October, 2012 faculty meeting. A survey was sent out in October of 2012 to 173 alumni and 13 members of the reconstituted advisory board asking them to rank the objectives as to their consistency with both the university and departmental mission statements, as well as to their flexibility and sensitivity to stakeholder needs and interests. At the time of sending the due-process response, they had received seven responses from alumni and six responses from advisory board members, which generally supported the current set of objectives. A new employer survey is slated to be completed during fall of 2012; employers are also represented on the advisory board and thus might be represented in the feedback from the advisory board. There is, therefore, evidence of an effective process to periodically review and revise the program educational objectives, involving program constituents. This process has been initiated, but not yet completed. The due-process response also stated that information concerning student input was provided in the interim report, but the summary of the senior exit interviews that was provided did not include feedback on the objectives.*

This former weakness is now cited as a concern.

ME Response – Actions taken to address Criterion 2 concern

Feedback on the appropriateness of PEOs is now included as part of the Senior Exit Survey document, with the most recent survey of 49 graduating seniors showing very strong support for the current PEOs. A copy of the survey, along with a summary of responses will be available in a *Senior Exit Survey Binder* at the time of the site visit. Also, additional data on the

appropriateness of PEOs has been collected from alumni and by additional Industrial Advisory Board members/employers. See Table 2.1 under CRITERION 2 for additional information about the cycle for reconfirming PEOs and for a description of recent results.

CRITERION 4 – Concern

Per the ABET Final Statement received on August 5, 2013, a previous unresolved weakness about insufficient evidence showing the attainment of the Program's Education Objectives has now become a 'moot' point after the approved change in Criteria for Accrediting Engineering Programs. The following statement is taken directly from the August 5, 2013 Final Statement:

The Engineering Accreditation Commission notes that an approved change to the 2013-14 Criteria for Accrediting Engineering Programs removes the requirement for assessing and evaluating the extent to which the program educational objectives are attained . . . No further action is expected from the program relative to assessment and evaluation of the extent to which program educational objectives are attained.

However, the current Criterion 4 requires that programs regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. Although questions had been previously raised about the limited information provided for evaluating student outcomes (originally listed as a weakness due to having no direct assessment of outcomes), additional evidence provided in the Due Response caused this previous *weakness* to now be listed as a *concern* (August 5, 2013 Final Statement, page 7).

Per the August 5, 2013 Final Statement, *In preparation for the next review . . . It is anticipated that evidence will be provided to show that the assessment data being gathered to evaluate the attainment of student outcomes is appropriate and adequate.*

This former weakness is now a concern.

ME Response – Actions taken to address Criterion 4 concern

The ME program has significantly expanded its procedures for assessing and evaluating student outcomes. Table 4.1 under CRITERION 4 provides an overview of all assessments techniques which include both direct and indirect measures. Direct measures (which had not been part of the former review in 2008) now consist of evaluating each a-k outcomes within in at least two different courses by directly assessing certain targeted aspects of student work (e.g., homework, projects, or exam questions). Indirect methods of assessing a-k outcomes occur through self reports in Senior Exit Surveys, Alumni Surveys, Course Evaluation Surveys, and by Advisory Board Member/Employer surveys where the program's degree of success is evaluated relative to

it helping students achieve the a-k outcomes. Tables 4.2.a – 4.2.k provide additional information about current student outcome assessment procedures, frequency of administration, expected level of attainment, and a summary of results.

CRITERION 1. STUDENTS

A. Student Admissions

Students are admitted as a first-time freshman if they

1. have graduated from high school, have earned a Certificate of General Education Development (GED), or have passed the California High School Proficiency Examination.

2. have a qualifiable eligibility index.

   The eligibility index is the combination of a high school grade-point average and a test score on either the American College Test (ACT) or the Scholastic Achievement Test I (SAT I). Grade point averages (GPA) are based on grades earned in courses taken during the final three years of high school.

   - The California State University (CSU) Eligibility Index (EI) can be calculated by multiplying GPA by 800 and adding the total score on the **mathematics and critical reading scores** of the SAT I.

   - For students who took the ACT, multiply the grade point average by 200 and add ten times the ACT composite score.

   - Persons who are California high school graduates (or residents of California for tuition purposes) need a minimum index of 2900 using the SAT or 694 using the ACT.

   - Persons who neither graduated from a California high school nor are a resident of California for tuition purposes need a minimum index of 3502 (SAT I) or 842 (ACT).

   - Graduates of secondary schools in foreign countries must be judged to have academic preparation and abilities equivalent to applicants eligible under these criteria.

   - An applicant with a grade point average of 3.0 or above (3.61 for nonresidents) is not required to submit test scores. However, all applicants for admission are **urged to take the SAT or ACT and provide the scores of such tests to each CSU to which they seek admission.**

   Campuses use these test results for advising and placement purposes and may require them for admission to impacted majors or programs. Impacted CSU campuses require SAT I or ACT scores of all applicants for **freshman** admission. The CSU Eligibility Index is subject to change on an annual basis. Admission as a first-time freshman may not be available for all semesters. Students who complete college units during high school or through the

summer between high school graduation and fall enrollment in the California State University are considered first-time freshmen and must meet above admission requirements.

3. have completed with grades of C or better the required comprehensive pattern of college-preparatory subjects as approved and listed on the UC/CSU "a-g" list and as follows:

   - Four years of English
   - Three years of math including Algebra I, Geometry and Algebra II
   - Two years of social science, including 1 year of US history, or US history and government
   - Two years of laboratory science (1 biological and 1 physical, both must have laboratory instruction)
   - Two years in the same foreign language (subject to waiver for applicants demonstrating equivalent competence)
   - One year of visual and performing arts: art, dance, drama/theater, or music (in the same discipline)
   - One year of electives: selected from English, advanced mathematics, social science, history, laboratory science, foreign language, visual and performing arts or other courses approved and included on the UC/CSU "a-g" list

4. Subject matter requirements must be met with a "C" or better and may not be completed during the summer term immediately preceding fall admission.

B. Evaluating Student Performance

Student evaluations are done through grading of their homework assignments, midterm exams, and final exams for all courses. In the lab and capstone design courses, class/lab participation, teamwork, and grades for term projects/reports also influence the student's grade. The notebooks prepared for each course, and available at the time of the ABET Program Evaluator (PEV)'s visit, represent how each student is evaluated in the classroom. The following items are included in the course notebooks:

- Course outline covering the course learning objectives or expectations
- Samples of graded homework
- Samples of graded lab reports/project assignments, if any
- Samples of graded exams/quizzes

Moreover, the Department's assigned undergraduate advisor conducts evaluation of student's academic performance at least once a year, when a mandatory individual advising is provided. During this advising session, student's course list for the subsequent semester will be determined, while the advisor carefully reviews that pre- and co-requisites are met. In addition, further evaluation and review of the student's file is performed every time the students seeks advising, files a petition, or initiates any action that requires the Department approval.

Pre- and Co-requisite Requirement Checks:

For ***additional*** monitoring of pre- and co-requisite requirements, the department faculty members inform the students about the pre- and co-requisite requirements in every course on the first day of class. The Department Administrative Support Coordinator (ASC) also checks every Mechanical Engineering student's course enrollment during the first few weeks of the semester. If the student is in violation of any pre-/co-requisite requirement for the courses taken in the current semester, the student is informed about the violation. When the violation is confirmed, and absent any action by the student to withdraw from the course, he/she will be administratively dropped from the course.

C. Transfer Students and Transfer Courses

Students who have completed 59 or fewer transferable semester college units (89 or fewer quarter units) are considered lower-division transfer students. Students who have completed 60 or more transferable semester college units (90 or more quarter units) are considered upper-division transfer students. Transferable courses are those designated for baccalaureate credit by the college or university offering the courses and accepted as such by Cal State Fullerton.

Generally, applicants will qualify for admission as a lower-division transfer student if they have a grade point average of at least 2.0 (C or better) in all transferable units attempted, and the following:

1. meet the freshman admission requirements (grade point average and subject requirements) in effect for the term to which they are applying (see "Freshmen Requirements" section) or

2. were eligible as a freshman at the time of high school graduation except for missing college preparatory subject requirements, have been in continuous attendance in an accredited college since high school graduation, and have made up the missing subject requirements with a 2.0 or better GPA.

Generally, applicants will qualify for admission as an upper-division transfer student if they meet all of the following requirements:

1. have a grade point average of at least 2.0 (C) or higher in all transferable units attempted;

2. they are in good standing at the last college or university attended; and they have completed at least 60 transferable semester (90 quarter) units of college coursework with a grade point average of 2.0 or higher and a grade of C or higher in each course used to meet the CSU general education requirements in written communication, oral communication, critical thinking and quantitative reasoning, e.g. mathematics. The 60 semester (90 quarter) units must include at least 30 semester (45 quarter) units of courses, which meet the CSU general education requirements including all of the general education requirements in communication in the English language (both oral and written) and critical thinking and the requirement in mathematics/quantitative reasoning (usually 3 semester units) **or** the Inter-segmental General Education Transfer Curriculum (IGETC) requirements in English communication and mathematical concepts and quantitative reasoning.

After the admission is granted, the requests for credit for mathematics, sciences, and engineering transfer courses are processed and approved by the Department Advisor. The request accompanies the catalog description of the transferable courses and the transcript showing the grades for the coursework. A transferred course should have at least a coverage equivalent to a required course at CSUF. A transfer student shall complete a minimum of 30 units in residence of which at least 15 units shall be taken in upper-division engineering courses. Courses taken at another college or university with a grade of "D" will not be accepted as substitute for upper-division courses. If a student is from another public California college of university, transferring into Cal State Fullerton, the Department Advisor typically uses online tool found in, www. assist.org to confirm the equivalency of courses. This website is an online student-transfer information system that shows how course credits earned at one public California college or university be applied when a student is transferred to another school. This website is the official repository of articulation of California's public colleges and universities and provides the most accurate and up-to-date information about transferrable course equivalencies.

D. Advising and Career Guidance

The Mechanical Engineering Department student advising plan is as follows:

- A designated, experienced department advisor (Mechanical Engineering faculty member) is assigned to advise all Mechanical Engineering students at least once a year. Students are also encouraged to meet with individual faculty members to learn more about the profession and specific areas within mechanical engineering, and to seek career guidance.

- After the student meets with the Department Advisor, a study plan is developed by the student and the advisor to ensure that all the prerequisites for all courses are met. For each advising session, the advising sheet is signed by the advisor. A copy of the signed form is

placed in the student's file and is used in the future sessions for follow up and continuity of student's plan of study.

- All the students in the ME Program are required to see the Department's Advisor at least once a year by appointment. To enforce this requirement, there is a ***Mandatory Advising Hold*** placed on the registration for the Mechanical Engineering students. After the advising session, the hold is released via the computerized system.

Additional advising sources include the following:

- **Freshman Programs**: Since 1997, this program has provided curriculum and services to support first-year students' successful transition to higher education at Cal State Fullerton. The University is a lot bigger and more diverse than a high school campus. Freshman Programs offers a community of students, professors, advisors, professional staff and peer mentors to help first-year students make new friends and make the most of the college experience. This community will help students find what they need, whether it's a place on campus to chill or tips to improve writing or time management skills. To help new students become a part of the campus community, the program introduces them to student clubs, leadership and service opportunities, recreation programs and athletic events. The Freshman Programs office provides general advising, and a computer lab and study lounge where students can work.

- **CASECS (Center for Academic Support in Engineering and Computer Science**): The Center for Academic Support in Engineering and Computer Science (CASECS) is an academic support program designed to recruit, retain and graduate students. CASECS serves educationally disadvantage students, to the extent possible by law, emphasizes participation by students from groups with low eligibility rates for four-year colleges. Some of the features of the program include:
  - Building a support community among students with similar career goals
  - Constructing the bridges necessary to establish a mentor-protégé relationship between faculty and students
  - Expecting excellent performance by students
  - Effectively communicating support for the students' success at the University and in the selected profession

- **University Academic Advisement Center**: This center is available on a walk-in basis to meet with an academic advisor. Students usually bring a current printed copy of transcript in order to be advised. Students who are undeclared major have the opportunity to schedule an appointment to meet with a Major Exploration Specialist. The overall mission of the center is to work in a collaborative partnership with students, a shared responsibility, where

the advisor and student are equally invested in the educational process and holistic development of the student.

E. Work in Lieu of Courses

When a student is admitted to the undergraduate program, the Office of Admissions and Records will evaluate previous college work, such as Advanced Placement Test results from high school, in relation to the requirements of Cal State Fullerton. All undergraduate degree candidates will be issued a credit summary or a degree audit report during the first semester of attendance that serves as a basis for determining remaining requirements for the student's specific objectives. If the work is through non-standardized tests, the Department of student's degree objective will evaluate the work for appropriate credit followed by University policy and guidelines. The following summarizes the requirements and process for awarding credit for work in lieu of courses.

1. Credit by Advanced Placement: Students who have successfully completed courses in the Advanced Placement Program of the College Board (defined as receiving a score of 3, 4 or 5) shall be granted credit for each advanced placement course toward graduation, advanced placement in the University's sequence of courses and credit for curriculum requirements.

2. Credit by International Baccalaureate Program: Those who have received the International Baccalaureate (IB) Diploma will be given advanced placement and/or University credit for International Baccalaureate subject examinations may be awarded at the discretion of the Department. For example, successful passing of Higher Level IB Mathematics will be granted credit of one semester of Calculus (MATH 150A course).

   Credit for Non-Collegiate Instruction: Cal State Fullerton grants undergraduate degree credit for successful completion of non-collegiate instruction, either military or civilian, appropriate to the baccalaureate, that has recommended by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed is those recommended in the Guide to the Evaluation of Educational Experience in the Armed Services and the National Guide to Educational Credit for Training Programs. Students who have at least one year of active military service may be granted 4-12 units of undergraduate credit. As per CSU policy, every effort should be made to assure that "military" credit is used to advance individuals toward degree completion.

3. Credit for Prior Learning: Cal State Fullerton grants up to 30 units of undergraduate credit for learning, knowledge or skill-based experience that has been documented and evaluated at a community college, according to campus policy. Requests for Credit for Prior Learning will be evaluated individually by the Department.

4. College Level Examination Program: The University shall accept three semester units of credit for approved College Level Examination Program (CLEP) examinations, subject to minimum passing scores, provided the examination was not taken previously within one calendar year and that the equivalent or at a more advanced level than for the examination in question.

F. Graduation Requirements

The undergraduate program requirements for the Bachelor of Science in Mechanical Engineering are comprised of three major segments: foundation courses in Mathematics and Basic Sciences; Engineering courses; and General Education courses in the Arts, Humanities, and Social Sciences. The number of units for each required segment is as follows:

• Mathematics and Basic Science Courses	32 Units*
• Engineering Courses	67 Units
• General Education Courses	30 Units
	129 Units

*Effective Fall 2013, students were approved to substitute CHEM 123: Chemistry for Engineers (3 units) for the previous requirement of CHEM 120A (5 units). Student taking CHEM 123 for 3 units versus CHEM 120A for 5 units will have completed only 30 units in this Math and Basic Science category and, therefore, must complete an additional 2 units to meet the graduation requirement of 129 units. Based on constituent feedback, discussions are underway for converting the extra 2 units to a new 2-unit, 200-level required course that will further develop skills in Geometric Dimensioning and Tolerancing (GDT) and related concepts.

The student's progress towards graduation is orchestrated and monitored through a various activities that are based on collaboration between different departments/divisions on campus. These include:

- The New Student Orientation event organized by the Office of Vice President for Student Affairs in collaboration with Dean's Office in College of Engineering & Computer Science
- Regular and systematic advising conducted by the ME Department Advisor
- Advising by the Academic Advisement Center on the General Education requirements and other general issues
- Titan Degree Audit, an on-line service, offered by the Office of Admissions and Records for tracking the unit credits awarded to students and meeting graduation requirements, including major, minor and the GE courses

- "Grad-Check Process": Each prospective graduate must file for graduation at the Office of Admissions and Records. The form generated by Office of Admissions and Records identifies the units completed and those need to be finished before the degree being awarded. This form is reviewed, and verified by the Department Advisor

At the Department level, undergraduate students are required to meet with the Department Advisor every year throughout the program. Students are strongly encouraged to see their academic advisor frequently. The student's records are accessible through the on-line Student Information System and the TITAN Degree Audit program, which produce reports that inform the advisor and students of the progress status of degree requirements.

All courses taken in fulfillment of the requirements for the Bachelor's degree must be taken for a letter grade. All mathematics and physical science courses required for the degree must be completed with at least a "C" (2.0 GPA) grade to count as prerequisite courses to engineering courses or as credit toward the degree. Graduate courses are not open to undergraduate students without approval of the Department Chairman.

The Upper Division Writing Requirement is satisfied by a passing as sequence of courses from the Mechanical Engineering Program: EGME 306A, 306B, 476A, and 476B. Written work for these courses must meet professional standards and requires completion with a grade of "C" (2.0) or better.

G. Transcripts of Recent Graduates

The Department 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 sent separately upon request from the Team Chair of ABET.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

A. University Mission Statement

Learning is preeminent at California State University, Fullerton. We aspire to combine the best qualities of teaching and research universities where actively engaged students, faculty and staff work in close collaboration to expand knowledge.

Our affordable undergraduate and graduate programs provide students the best of current practice, theory and research and integrate professional studies with preparation in the arts and sciences. Through experiences in and out of the classroom, students develop the habit of intellectual inquiry, prepare for challenging professions, strengthen relationships to their communities and contribute productively to society.

Located in Orange County, a technologically rich and culturally vibrant area of metropolitan Los Angeles, we are a comprehensive, regional university with a global outlook. Our expertise and diversity serve as a distinctive resource and catalyst for partnerships with public and private organizations. We strive to be a center of activity essential to the intellectual, cultural and economic development of our region.

The University Mission Statement is available at: *http://www.fullerton.edu/aboutcsuf/mission.asp*

B. Program Educational Objectives

The Mechanical Engineering program has established the following Program Educational Objectives:

1. **Technical Growth**: Mechanical Engineering graduates will be successful in modern engineering practice, integrate into the local and global workforce, and contribute to the economy of California and the nation.
2. **Professional Skills**: Mechanical Engineering graduates will continue to demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
3. **Professional Attitude and Citizenship**: Mechanical Engineering graduates will become productive citizens with high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

The Mechanical Engineering Department's Program Educational Objectives are available at: http://www.fullerton.edu/ecs/me/missionandobjectives.asp

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

Consistent with the University mission statement, the Mechanical Engineering Program Educational Objectives (PEOs) focus on *preparing graduates for challenging professions* with knowledge of modern engineering practice, ability to integrate into the local and global workforce, and with continued demonstration of professional skills. Also the PEOs direct graduates to assume leadership roles and contribute to the economy of California and the nation, which is consistent with the University's mission of *strengthening relations to communities and contributing productively to society*. Furthermore, the Department's PEOs promote enthusiasm for professional growth and career success as professional citizens, *serving as a distinctive resource and catalyst for our surrounding regions*.

D. Program Constituencies

The Mechanical Engineering Department classifies its primary constituents as:

- Current Students
- Graduates (alumni/alumnae)
- Local Industry Leaders and Employers (represented by the Mechanical Engineering Industrial Advisory Board)
- The Mechanical Engineering Faculty

E. Process for Review of the Program Educational Objectives

All Mechanical Engineering constituents (current students, alumni, advisory board/employers, and the mechanical engineering faculty) periodically review the PEOs and provide feedback on whether the objectives remain consistent the University mission and with meeting the needs of program constituents. The goal is to provide an opportunity for all constituent groups to review the PEOs no less than every three years, with some groups as often as every year. Below in Table 2.1 is a summary of the timelines for PEO reviews, along with methods of review over the most recent years.

Constituents are asked to select among the responses listed below concerning the appropriateness of the PEOs relative to their alignment with the University mission and with constituents needs. Also, responders are encouraged to add additional suggestions or comments. The goal is to receive at least 70% 'very appropriate' ratings on each of the three PEOs. Any ratings falling below this target would be considered cause for reconsideration of our PEOs.

- 5: Very appropriate
- 4: Somewhat appropriate
- 3: Unsure
- 2: Not very appropriate
- 1: Not at all appropriate

Table 2.1 – Review Cycle for Reevaluating PEOs with Summary of Most Recent Results

Program Review Constituents	Frequency of Review	Method of Review	Most Recent Results (Date)
Students (Graduating Seniors)	Every year	As part of Senior Exit Survey	2014 Graduating Seniors >70% Very Appropriate Rating on each PEO; Average = 75.8% (Original surveys available at site visit)
Faculty	Every year	Discussion in faculty meeting about continued appropriateness	Reconfirmation of support for PEOs at Nov 21, 2013 faculty meeting; and previously in October 2012. (Meeting minutes will be available at site visit)
Alumni	Every 2-3 years	Alumni Survey	Spring 2014 Survey data >70% Very Appropriate rating on each PEO. Average = 74.0% July 2012 Survey data collected by Social Science Research Center >75% very appropriate ratings (Original data available during site visit)
Industrial Advisory Board (IAB)/Employers	Every 2-3 years	IAB discussion during meeting, followed by written survey	Dec 6, 2013 IAB Meeting >70% rated PEOs as very appropriate Average = 76.7% (Original data available during site visit)

CRITERION 3. STUDENT OUTCOMES (SOs)

A. Student Outcomes

The Mechanical Engineering program has adopted the following a-k student outcomes:

1. An ability to apply knowledge of mathematics, science, and engineering (**a**)
2. An ability to design and conduct experiments, as well as to analyze data (**b**)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (**c**)
4. An ability to function in multidisciplinary teams (**d**)
5. An ability to identify, formulate and solve engineering problems (**e**)
6. An understanding of professional and ethical responsibility as an engineer (**f**)
7. An ability to communicate effectively (**g**)
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (**h**)
9. A recognition of the need for, and ability to engage in life-long learning (**i**)
10. A knowledge of contemporary issues (**j**)
11. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (**k**)

The Student Outcomes (SO) are documented at:
h*ttp://www.fullerton.edu/ecs/me/studentlearningobjectives.asp*

B. Relationship of Student Outcomes to Program Educational Objectives

As one can see from the Table 3.1, attainment of the SO through various courses is closely knitted with achieving the PEO of the Mechanical Engineering Department. This particular version of the PEO was created in Fall semester of 2010, and has been ***reviewed periodically*** through various constituencies of the program.

Table 3.1 Relationship between CSUF Mechanical Engineering PEOs and SOs

Program Educational Objectives / Student Outcomes	**PEO #1** **Technical Growth** M.E. graduates will be successful in modern engineering practice, integrate into the local and global workforce, and contribute to the economy of California and the nation.	**PEO #2** **Professional Skills** M.E. graduates will continue to demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.	**PEO #3** **Professional Attitude and Citizenship** M.E. graduates will become productive citizens with high ethical & professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.
Student Outcome (a) Math, Science, & Engineering	X		
Student Outcome (b) Design, Conduct, & Analyze Experiment	X		
Student Outcome (c) Design Component with Constraint	X		
Student Outcome (d) Multidisciplinary Team	X	X	
Student Outcome (e) Identify, formulate and solve problems	X		
Student Outcome (f) Professional and Ethical Responsibility	X	X	X
Student Outcome (g) Communicate Effectively	X	X	
Student Outcome (h) Broad Education	X	X	X
Student Outcome (i) Life-Long Learning		X	X
Student Outcome (j) Contemporary Issues	X	X	X
Student Outcome (k) Modern Engineering Tools	X		

CRITERION 4. CONTINUOUS IMPROVEMENT

A. Student Outcomes

1. Listing and Description of Assessment Processes

ABET defines *assessment* as one or more processes that identify, collect, and prepare the data necessary for evaluation. As indicated in Criterion 3, the Mechanical Engineering program at CSUF has identified 11 student outcomes, which are consistent with the ABET EAC recommended a-k outcomes. Student outcome achievement in the Mechanical Engineering program is assessed through a variety of both indirect and direct measures, with the major ones being: 1) senior exit interviews/surveys, 2) alumni surveys, 3) advisory board/employer surveys, 4) course evaluation surveys, and 5) direct assessment of students' work (projects, homework, and exams).

Although direct assessments are often considered to be a more reliable method of assessing student learning than are indirect measures (e.g., surveys), surveys have the advantage of allowing for both 'objective' ratings of outcomes, as well as 'subjective' comments that are useful in interpreting the data and better understanding possible underlying contributors to 'high' or 'low' ratings. Thus, the department considers both types of assessment data (indirect and direct) to be important in making decisions about program planning and improvement actions. See Table 4.1 for a summary of assessment methods used to evaluate student outcomes.

Indirect Assessments

Senior Exit Interviews/Surveys – Each year the department chair meets with graduating seniors to discuss their experiences in the program and to obtain feedback via a confidential survey regarding program strengths, weaknesses, and suggestions for improvement. In the most recent survey of 2014 graduates, students also performed a self-evaluation of their degree of success on attaining the program's student outcomes. Copies of all survey responses and data summaries will be available in a Senior Exit Survey Binder at the time of the ABET site visit. Although the policy is to meet with graduating seniors every year before they graduate to obtain feedback about the program, data are presented for only the last three years of this review period.

Alumni Surveys – The department's policy is to seek input from its alumni every 2 to 3 years, with the survey asking for both 'objective' ratings of how the program prepared them to meet student outcomes, as well as subjective comments about the program strengths, weaknesses, and recommendations for improvement. Surveys in 2012 and again in 2014 were distributed to alumni electronically, allowing them to complete and return the surveys online or return hard copies to the department office. In summer/fall of 2012, survey information was collected by the Social Science Research Center (SSRC) at Cal State Fullerton who was contracted to

distribute the surveys electronically to all alumni. However, because the rate of return was so low (resulting in a return rate of only 4.2% or 7 returns out of 165), survey information was also collected from all B.S. degree alumni who were currently enrolled in the graduate program. This brought the total number of alumni responses for 2012 to 14. Alumni surveys in Spring of 2014 were distributed directly from the department to a list of 107 alumni over the past 5 years (2009-2013), resulting in a return rate of 16.8% (18 completed surveys). Copies of all surveys responses and data summaries will be available in an Alumni Survey Binder at the time of the ABET site visit.

Industrial Advisory Board/Employer Surveys – The department's Industrial Advisory Board (IAB) consists of 13 members, all of whom are recognized leaders in local industries that employee ME program graduates. Every two years, members are asked to evaluate the ME program's success in preparing its graduates to attain the identified student outcomes. IAB members also provide feedback on the appropriateness of the Program Educational Objectives (PEOs) relative to meeting industry needs and relative to their consistency with the University mission. In 2012 Advisory Board Members/Employers were invited to complete the surveys electronically, with a return of 7 completed surveys (53.8%). In 2014 a total of 10 Advisory Board Surveys were returned (76.9%), with the better rate of return attributed to the fact that they were distributed in person at the December 6, 2013 Advisory Board meeting. Copies of all surveys responses and data summaries will be available in an Industrial Advisory Board Survey Binder at the time of the ABET site visit.

Course Evaluation Surveys—Course evaluation surveys are administered in every class every semester, asking students to evaluate the course relative to how well it prepared them to achieve the specific a-k Student Outcomes that were targeted in that specific course. Students provide both objective ratings of amount learned, as well as suggestions for improvement. Copies of all surveys responses and data summaries will be available in a file box labeled Course Evaluation Surveys at the time of the ABET site visit.

Table 4.1 Direct and Indirect Methods of Assessing Student Outcomes

	Indirect Measures				Direct Measures																	
Student Outcomes	Senior Exit Surveys	Alumni Surveys	Advisory Board/Employer Surveys	Course Evaluation Surveys	EGME 102 - Engineering Graphics	EGME 205 – Digital Computation	EGME 304 - Thermodynamics	EGME 306A – Unified Lab	EGME 306B – Fluids & Thermal Lab	EGME 308 – Engineering Analysis	EGME 314 – Engineering Economy	EGME 322 L – Intro to CAD	EGME 331 – Mech Behavior of Materials	EGME 333 – Fluid Mech .& Aerodyn	EGME 335 – Into to Mechanical Design	EGME 407 – Heat Transfer	EGME 414 – Design Project I	EGME 419 – Design Project II	EGME 421 – Mechanical Design	EGME 431 – Mechanical Vibrations	EGME 476A – Dynamics & Control Lab	EGME 476B – Energy & Power Lab	EGME 490 – Seminar in Engineering
a) Math, Science & Engineering	x	x	x	x	x		x			x	x		x	x	x	x			x	x			
b) Design, Conduct, & Analyze Exp.	x	x	x	x				x	x									x			x	x	
c) Design Component with Constraint	x	x	x	x								x					x	x					
d) Multi-disp. Team	x	x	x	x													x	x					
e) Identify, Formulate, & Solve Problems	x	x	x	x		x	x			x			x	x	x	x			x	x			
f) Professional & Ethical Responsibility	x	x	x	x														x					x
g) Communicate Effectively	x	x	x	x	x			x	x			x					x	x			x	x	
h) The Broad Education	x	x	x	x							x												x
i) Life-Long Learning	x	x	x	x														x					x
j) Contemp. Issues	x	x	x	x							x					x							x
k) Modern Engineering Tools	x	x	x	x	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	

Direct Assessments

Direct assessment of student outcomes is accomplished through the direct evaluation of students' work (e.g., projects, homework, and exam questions) that is required within the ME curriculum. Each required ME course is designed to address at least two or more a-k student outcomes. Conversely, each a-k outcome is addressed in at least two different required courses. A mapping of the a-k student outcomes with ME required courses is presented in Table 4.1.

Student outcome (SO) data for each required courses is collected by a course instructor, typically by a faculty member who teaches the respective course most frequently and who has been identified as the 'course coordinator' for that course. Each coordinator identifies the particular assignment, project, or exam question that best reflects achievement of each targeted SO for that class. The table below illustrates an example of mapping student outcomes *a, e, and k* with an appropriate method of assessment in the EGME 431: Mechanical Vibrations course.

Student Outcomes for EGME 431	Source of Evidence
Math, Science, & Engineering (a)	Final Exam Problem #2
Identify, Formulate and Solve Problems (e)	Final Exam Problem #1
Modern Engineering Tools (k)	MATLAB/SIMULINK simulation assignment for multi-degree of freedom vibration system

After completing the above step for each course, coordinators then assess individual student performance based on a scale of 1-5, with 5 being high. ***It is emphasized to faculty members that SO assessment scores must reflect degree of learning on a particular SO and, therefore, these scores are different and separate from the grades that faculty members assign for a particular problem or project; thus, grades are NOT synonymous with SO assessment.***

Assessments are measured using the following scale:

- 5: Excellent
- 4: Above Average
- 3: Average
- 2: Below Average
- 1: Poor

Each *individual student* is assessed on each assessment scores with whole numbers (e.g. 4, 3, or 2). Only one source of evidence is used in a particular course to demonstrate attainment of each assigned SO. However, each SO is evaluated in at least in two courses.

Coordinators report their assessment results for each class using an excel spreadsheet such as an example below for the EGME 431: Mechanical Vibrations course.

- Source of evidence ratings for SO criterion a
- Source of evidence ratings for SO criterion e
- Source of evidence ratings for SO criterion k

Student Names	criterion a	criterion e	criterion k
Student A	4	2	3
Student B	2	3	2
Student C	3	3	3
Student D	4	4	4
Student E	3	4	4
Student F	3	3	3
Student G	4	4	3
Student H	1	3	2
Student I	3	4	3
Student J	4	4	4
Student K	3	2	3
Student L	3	2	3
AVERAGE	3.08	3.17	3.08

The sources of evidence for each course (i.e. the graded homework, projects, exams, etc.) will be available for review at the time of the site visit.

2. Expected Level of Achievement (Expected Targets) for Student Outcomes

For assessment and evaluation purposes, the achieved target (as recommended by the ME faculty and Industrial Advisory Board members) is set at obtaining average scores of 3.5 or better on a 5.0 scale for all direct measures, and achieving 70% ratings in top two assessment scores (i.e. 70% Excellent or Above Average(AA) ratings) on all indirect measures: Senior Exit Surveys, Course Evaluations, and Alumni/IAB (Industry Advisory Board) Surveys. For each outcome a-k, the goal is to reach the target achievement level on the majority of indicators assessed.

3. Frequency of Student Outcome Assessment

The goal is to collect assessment data based on the direct measures of student work and based on survey data from alumni and the Industrial Advisory Board at least ***twice*** in a period of six years, preferably with reassessments being at least two to three years after the previous assessment. Assessment data from graduating seniors (Senior Exit Surverys) and from Course

Evaluation Surveys are collected every year. See Section B for a discussion of changes in student outcome scores from one assessment period to the next.

4. Summary of Assessment Processes and Results for both Indirect and Direct Methods

Tables 4.2a – 4.2k provide a summary the various assessment methods for each a-k outcome, along with the frequency of assessment, expected level of achievement, and summary of the most recently collected results. Following each table is a brief discussion of results and recommendations for action by the Continuous Improvement Committee.

Continuous Improvement (CI) Committee – The CI Committee consists of faculty members (Drs. Chean Chin Ngo, Sang June Oh, and Haowei Wang) from the Mechanical Engineering Department, with the Acting Department Chair serving as an ex officio member. The role of the CI Committee is to review all direct and indirect assessment data as it becomes available (both objective ratings and written comments) and made recommendations to the rest of the faculty and to the dean concerning needed improvement actions. Examples of actual improvement activities linked to a-k outcome results are provided in Table 4.3. ***In tables 4.2.a thru 4.2.k, acronym AA stands for Above Average, letters F and S followed by the year indicate a particular semester (e.g. F2013 = fall 2013 semester and S2014 = spring 2014 semester), and AY stands for Academic Year.***

Table 4.2.a - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'a'.

(a) An ability to apply knowledge of mathematics, science, & engineering			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or AA ratings by graduating seniors	**82.7%** of 2014 seniors rated their achievement as Excellent or Above Avg.
Course Evaluations (Indirect)	Every semester, for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**87.3%** of students rated their SO achievement as Excellent or AA in S2013; **90.6%** provided similar ratings in F2013; and **89.8%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**100%** rated ME graduates' achievement as Excellent or AA
Alumni Survey (Indirect)	Every 2 years	70% Excellent or AA ratings on amount achieved in ME program	**72.2%** rated their achievement as Excellent or AA
Direct assessment of student work in EGME 102, 304, 308, 314, 331, 333, 335, 407, 421, & 431	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.6** with 59.2% receiving Excellent or AA in AY 2012-13; Average rating on student work was **3.8** with 65.4% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: All assessment indicators suggest that student achievement on this outcome meets expected standards. No further action is recommended at this time.

Table 4.2.b - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'b'.

(b) An ability to design & conduct experiments, as well as to analyze and interpret data			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**47.8%** of 2014 seniors rated their achievement as Excellent or Above Ave.
Course Evaluations (Indirect)	Each semester for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**76.8%** of students rated their learning as Excellent or AA in S2013; **98.2%** had the same ratings in F2013; and **88.6%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**70%** rated ME graduate achievement as Excellent or Above Average.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**94.4%** rated their achievement as Excellent or Above Average
Direct assessment of student work in EGME 306A, 306B, 419, 476A, & 476B	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **2.8** with 30.3% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **3.4** with 58.5% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: The assessment results are somewhat mixed on this outcome, with the low ratings from graduating seniors and on the direct assessment of students' work suggesting that students are not reaching the expected level of achievement with respect to their ability to design experiments. Based on students' written comments and on faculty input, the CI Committee recommends that additional emphasis/homework assignments on designing experiments be added to the various lab classes and that an updating of experimental equipment is needed in EGME 306A, 306B, 476A, and 476B.

Table 4.2.c - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'c'.

(c) An ability to design a system component or process to meet desired needs within realistic constraints such as economic environmental, social, political, ethical, health and safety, manufacturability, and sustainability			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**56.5%** of 2014 seniors rated their achievement as Excellent or Above Ave.
Course Evaluations (Indirect)	Each semester for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**89.1**% of students rated their learning as Excellent or AA in S2013; **86%** had the same ratings in F2013; and **95%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**60%** rated ME graduate achievement as Excellent or AA.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**77.8%** rated their achievement as Excellent or AA
Direct assessment of student work in EGME 322L, 414, & 419	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **4.4** with 100% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **4.4** with 88.5% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Although the target achievement level was reached on most indicators, it is of concern that graduating seniors and IAB members/employers rated this outcome as below expectations. Written comments from each of these constituents was very clear in suggesting additional emphasis on GD&T skills. Therefore, the CI Committee has recommended that the department find additional ways to incorporate GD&T skills into the curriculum, such as by expanding the unit on GD&T in EGME 322L: Introduction to CAD, and by considering a new 2-unit course that focuses on GD&T skills along with other related concepts.

Table 4.2.d - Assessment Methods, Frequency, Expected Level of Achievement, and Summary of Most Recent Results for Student Outcome 'd'.

(d) An ability to function in multidisciplinary team			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**54.3%** 0f 2014 seniors rated their achievement as Excellent or Above Ave.
Course Evaluations (Indirect)	Each semester for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**78.3%** of students rated their learning as Excellent or AA in S2013; **94.7%** achieved the same rating in F2013; and **84.6%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**70%** rated ME graduate achievement as Excellent or Above Average.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**88.9%** rated their achievement as Excellent or Above Average
Direct assessment of student work in EGME 414 & 419	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **4.2** with 81.3% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **4.0** with 79.6% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Target levels of achievement were reached on all assessments except for Senior Exit Surveys, and with borderline results from IAB members/employers. Written comments from graduating seniors and IAB members indicated that seniors could benefit from additional opportunities to work together on projects with students from other majors, especially from electrical engineering and from computer engineering, as well as sometimes from other disciplines such as kinesiology and business. Therefore, it has been a recommendation from the CI Committee that school policy be changed to allow for and encourage collaboration in the capstone senior design projects with student from other disciplines.

Table 4.2.e - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'e'.

(e) An ability to identify, formulate, and solve engineering problems			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**71.7%** of 2014 seniors rated their achievement as Excellent or AA
Course Evaluations (Indirect)	Each semester for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**81.1%** of students rated their learning as Excellent or AA in S2013; **85.5%** provided the same ratings in F2013; and **81.9%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**100%** rated ME graduate achievement as Excellent or Above Average
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**83.3%** rated their achievement as Excellent or AA
Direct assessment of student work EGME 205, 304, 308, 331, 333, 335, 407, 421, & 431	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.3** with 44.7% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **3.8** with 63.1% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: All recent assessment indicators suggest that student achievement on this outcome met or exceeded expected standards. No further action is recommended at this time. Reviewing written feedback from various constituents did not reveal any negative comments regarding student attainment of outcome 'e'.

Table 4.2.f- Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'f'.

(f) An understanding of professional and ethical responsibility			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**67.4%** of 2014 seniors rated their achievement as Excellent or AA
Course Evaluations (Indirect)	Each semester for all required courses	70% Excellent or Above Average ratings by students in relevant courses	**91.7%** of students rated their learning as Excellent or AA in S2013; **100%** of students provided the same rating in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**90%** rated ME graduate achievement as Excellent or AA
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**72.2%** rated their achievement as Excellent or AA
Direct assessment of student work in EGME 419 & 490	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **4.1** with 80.4% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **4.9** with 100% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Although most assessment indicators suggest that student achievement on this outcome meets expected standards, it is of some concern that graduating seniors rated this outcome somewhat lower than expectations. The CI Committee has recommended that course content and procedures for EGME 419 and 490 be reviewed, with additional emphasis placed on professional and ethical responsibility. Reviewing written feedback from various constituents did not reveal any negative comments regarding student attainment of outcome (f).

Table 4.2.g - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'g'.

(g) Ability to communicate effectively			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**42.2%** of 2014 seniors rated their achievement as Excellent or AA
Course Evaluations (Indirect)	Each semester for every course taught	70% Excellent or Above Average ratings by students in relevant courses	**85.9%** of students rated their learning as Excellent or AA in S2013; **92.3%** gave the same rating in F2013; and **84.7%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**70%** rated ME graduate achievement as Excellent or Above Average.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**83.3%** rated their achievement as Excellent or Above Average
Direct assessment of student assignments/exams in EGME 102, 306A, 306B, 322L, 414, 419, 476A, & 476B	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.7** with 57.8% receiving Excellent or Above Average ratings in AY 2012-13; Average rating on student work was **3.9** with 74.8% receiving Excellent or Above Average ratings in AY 2013-14

Evaluation of Assessment and Recommendations: All assessment indicators suggest that student achievement on this outcome meets expected standards, except for Senior Exit Survey results which consistently tend to be lower than most other measures. Perhaps the lower ratings by graduating seniors compared to other constituents are due to students' nervousness and feelings of uncertainty at they approach the end of their degree preparation and enter the job market. Because former program graduates (alumni) and other constituents give high ratings to this outcome, no further action is recommended at this time. Also, a review of written feedback from various constituents did not reveal any negative comments regarding student attainment of outcome (g).

Table 4.2.h - Assessment Methods, Frequency, Expected Level of Achievement and Summary of Most Recent Results for Student Outcome 'h'.

(h) A broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**39.1%** of 2014 seniors rated their achievement as Excellent or AA
Course Evaluations (Indirect)	Each semester for every course taught	70% Excellent or Above Average ratings by students in relevant courses	**79.2%** of students rated their learning as Excellent or AA in S2013; **85.2%** gave similar ratings in F2013; and **100%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**60%** rated ME graduate achievement as Excellent or Above Average.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**72.2%** rated their achievement as Excellent or Above Average
Direct assessment of student assignments/exams in EGME 314 & 490	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.7** with 57.9% receiving Excellent or Above Average ratings in AY 2012-13; Average rating on student work was **4.7** with 100% receiving Excellent or Above Average ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Compared to other outcomes, achievement on outcome (h) received relatively lower scores, especially from graduating seniors and from IAB members/employers. The CI Committee has recommended that instructors of EGME 314: Engineering Economy and EGME 490: Engineering Seminar review their course syllabi and revise as needed to place more emphasize on attainment of this outcome.

Table 4.2.i - Assessment Methods, Frequency, Expected Level of Achievement, and Summary of Most Recent Results for Student Outcome 'i'.

(i) A recognition of the need for and ability to engage in lifelong learning			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**60.9%** of 2014 seniors rated their achievement as Excellent or AA.
Course Evaluations (Indirect)	Each semester for every course taught	70% Excellent or Above Ave ratings by students in relevant courses	**83.3%** of students rated their learning as Excellent or AA in S2013; with **95.1%** giving similar ratings in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**60%** rated ME graduate achievement as Excellent or AA
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**72.2%** rated their achievement as Excellent or AA
Direct assessment of student work in EGME 419 & 490	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.6** with 52.6% receiving Excellent or Above Average ratings in AY 2012-13; Average rating on student work was **4.5** with 90.1% receiving Excellent or Above Average ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Again, evidence of students' attainment of this outcome is mixed, with graduating seniors and IAB members/employers providing lower ratings than others. The CI Committee has recommended that instructors of EGME 419: Design Project II and EGME 490: Engineering Seminar review their course procedures and make changes as seem appropriate to help students gain additional experience and ability in independently searching for new knowledge.

Table 4.2.j - Assessment Methods, Frequency, Expected Level of Achievement, and Summary of Most Recent Results for Student Outcome 'j'.

(j) A knowledge of contemporary issues			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**26.1%** of 2014 seniors rated their achievement as Excellent or Above Ave.
Course Evaluations (Indirect)	Each semester for every course taught	70% Excellent or Above Ave ratings by students in relevant courses	**77.8%** of students rated their learning as Excellent or AA in S2013; **81.5%** provided similar ratings in F2013; and **93.3%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**40%** rated ME graduate achievement as Excellent or Above Average.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**55.5%** rated their achievement as Excellent or Above Average
Direct assessment of student work in EGME 314, 407, & 490	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **4.4** with 77.2% receiving Excellent or AA ratings in AY 2012-13; Average rating on student work was **4.4** with 83.7% receiving Excellent or AA ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Overall, this outcome had the lowest ratings of any outcome from three important constituents – graduating seniors, IAB members/employers, and from alumni. Judging from the written feedback of constituents, the main suggestions for improvement were: hiring of additional faculty with focused, contemporary areas of specialization; expanding computer lab opportunities; upgrading equipment in other labs; and adding/improving course offerings on topics such as Solidworks and GD&T. The department chair and CI Committee have discussed these recommendations with the full faculty and the dean, with a number of improvements already initiated. See Section B discussion of Continuous Improvements, including Table 4.3, as well as Criterion 7, Section A on facilities.

Table 4.2.k - Assessment Methods, Frequency, Expected Level of Achievement, and Summary of Most Recent Results for Student Outcome 'k'

(k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice			
Assessment Methods	**Frequency**	**Expected Level of Achievement**	**Summary of Results**
Senior Exit Survey (Indirect)	Every spring semester	70% Excellent or Above Average ratings by graduating seniors	**56.5%** of 2014 seniors rated their achievement as Excellent or Above Aver.
Course Evaluations (Indirect)	Each semester for every course taught	70% Excellent or Above Ave ratings by students in relevant courses	**80.2%** of students rated their learning as Excellent or AA in S2013; **88.6%** gave similar ratings in F2013; and **83.1%** in S2014.
Industrial Advisory Board/Employers (Indirect)	Every 2 years	70% Excellent or Above Ave ratings on ME graduate success	**80%** rated ME graduate achievement as Excellent or AA.
Alumni Survey (Indirect)	Every 2 years	70% Excellent or Above Aver ratings on amount achieved in ME program	**72.2%** rated their achievement as Excellent or AA
Direct assessment of student work in EGME 102, 205, 306A, 306B, 322L, 331, 333, 335,407, 414, 419, 421, 431, 476A, & 476B	Every 1-3 years	Average 3.5 rating of student work on a 5 point scale	Average rating on student work was **3.9** with 64% receiving Excellent or Above Average ratings in AY 2012-13; Average rating on student work was **3.8** with 67.4% receiving Excellent or Above Average ratings in AY 2013-14

Evaluation of Assessment and Recommendations: Again, the target level of achievement was met on all measures except by graduating seniors. Relevant recommendations on the Senior Exit Survey again included upgrading laboratory equipment and hiring more faculty with focused contemporary areas of specialization. These recommendations have been put forward by the CI Committee, with several improvements already made or underway.

B. Continuous Improvement

The process of continuous improvement starts with evaluation, which is defined as one or more processes for interpreting the data acquired through the assessment processes in order to determine how well the student outcomes are being attained. This cycle of continuous improvement is portrayed in Figure 4.1 which indicates that continuous improvement can be reflected in both an ***improvement of the learning environment*** **and** ***improvement of student outcome achievement.***

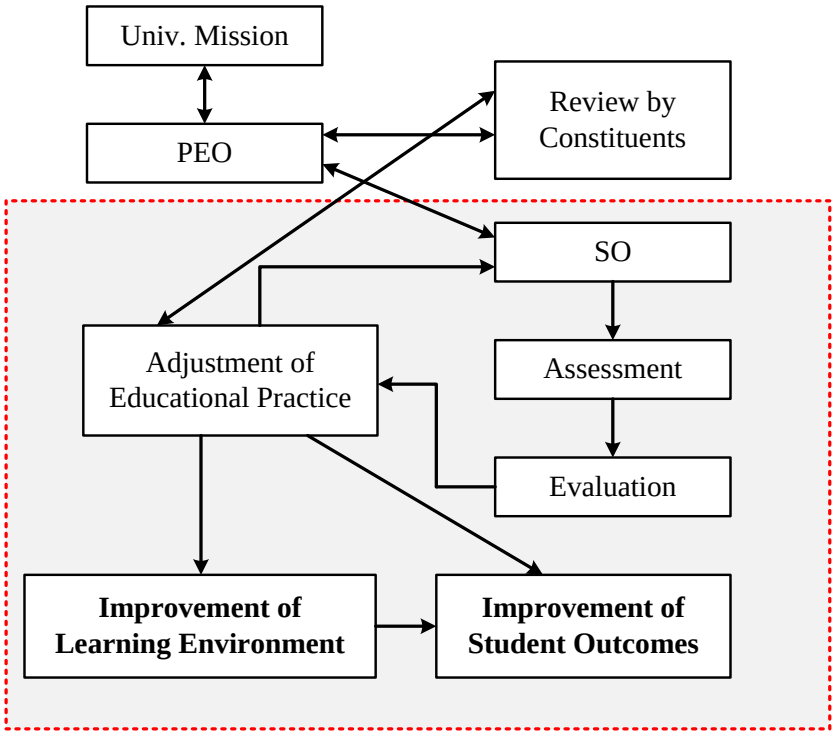


Figure 4.1 Continuous Improvement Process
(Red box indicates the cycle of Continuous Improvement)

1. Improvement of Learning Environment

The results of a-k outcome assessments described in Section 4.A are regularly reviewed as they become available by the Continuous Improvement (CI) Committee, with results and recommendations discussed at faculty meetings and with the dean of the college. Results are then considered when making decisions and establishing priorities for all aspects of the program (e.g., curriculum development; resource allocation; faculty and staff recruitment; lab renovation; and student advising procedures). Table 4.3 provides examples of how assessment results have led to program improvement activities and to *improvement of the learning environment.*

Table 4.3 – Examples of Assessment Results Linked with Program Improvement Activities

Student Outcomes	Summary of Results	Program Improvement Activities (See list following the table for additional details)
Math Science and Engineering **(a)**	All measures indicate that expected level of achievement was met.	- No improvement actions taken
Design, Conduct & Analyze Experiment **(b)**	Target achievement not reached on 2 measures (1 direct, 1 indirect)	- New assignments were implemented in EGME 306A lab requiring students to design their own experimental procedures, then collect and analyze data - New experimental lab equipment was provided in EGME 476A & 476B courses
Design Components with Constraint **(c)**	Target achievement not reached on 2 indirect measures	- EGME 332L course syllabus was revised to include expanded unit on Geometric Dimensioning & Tolerances (GDT); New 200-level course proposal is being developed that will focus on GDT and related concepts.
Multidisciplinary Team **(d)**	Expected level of achievement not reached on Senior Exit Survey (54% of Excellent and Above Average)	- Policy changes were made to allow students from different majors to work together on senior design projects. 5 of 8 senior project teams in 2013-14 included students from multiple engineering majors
Identify, formulate and solve problems **(e)**	Expected targets were met on all recent indicators.	- No improvement actions were taken at this time
Professional and Ethical Responsibility **(f)**	Expected level of achievement not reached on Senior Exit Survey (67% of Excellent and Above Average)	- Course outline for EGME 490 was revised to promote better awareness and understanding of professional and ethical responsibility; also changed textbook to better facilitate achievement of this SO

Communicate Effectively **(g)**	Expected level of achievement was reached on most indicators.	- No improvement actions taken since almost all measures (including high scores in direct measures) reached the expected target.
Broad Education **(h)**	Relatively low ratings given by graduating seniors and IAB members/employers	- Textbook in EGME 490 has been changed to one which better fosters understanding and impact of engineering in a global, economic, environmental and social context.
Life-Long Learning **(i)**	Target achievement not reached on 2 indirect measures	- Course procedures in EGME 419 and EGME 490 have been modified to provide more assignments to students that can lead to more independent search for new knowledge
Contemporary Issues **(j)**	Target achievement not reached on ratings by 3 important constituents – graduating seniors, alumni, and IAB members/employers	- Related actions to date include hiring of 6 new faculty since last review, expanding and upgrading computer classrooms; upgrading lab equipment; adding additional course emphasis on key contemporary topics such as Solidworks and GD&T, and creating an additional Smart classroom that better facilitates media demonstrations of contemporary issues.
Modern Engineering Tools **(k)**	Expected level of achievement met on most indicators, except for Senior Exit Survey (56.5% of Excellent and Above Average)	- Improvement activities include hiring of new faculty with focused areas of specialization; upgrading of lab equipment and computer labs

List of Program Improvement Activities Leading to Improved Learning Environment

The following is a list of continuous improvement activities since Fall 2008 (our last ABET site visit), with all activities resulting from the assessment and evaluation of SOs and/or as a result of additional suggestions for program improvement from constituents -- students, alumni, advisory board/employers, and faculty.

- Faculty Recruitment - Hiring of ***six*** new tenure-track faculty members since Fall 2008

No.	Name	Semester and Year	Specialization
1	Sang June Oh	Fall 2009	Control Systems
2	Chean Chin Ngo	Spring 2011	Heat Transfer
3	Nina Robson	Fall 2012	Robotics
4	Haowei Wang	Fall 2012	Combustion
5	Salvador Mayoral	Fall 2014	Fluid Mechanics; Aerospace
6	Joe Piacenza	Fall 2014	System Design

- Classroom Upgrades **($358,000)** - "Smart" Classroom Upgrades since our last ABET visit incorporate powerful computer hardware and software upgrades in three major mechanical engineering instructional classrooms (Photos are listed in Criterion 7A of this Self Study Report).
  - **E-201** is one of the premium lecture rooms in the University, accommodating 70 students. This lecture room has the state of the art media equipment with two high-end Epson video projectors that can project in two screens in the classroom, and a microphone/loud speaker system. The cost for this lab renovation was **$80,000.**
  - **CS-304** hosts 48 stations featuring High-end Dell Precision T1500 computers with Intel i5 Quad core with 8GB of RAM and 22-inch LCD panels. Includes all the latest software for mechanical engineering such as: ANSYS version 14.5.7, AutoCAD 2014, Autodesk Inventor 2014, LabVIEW 2011, Lego Mind Storms NXT, Mathcad 15, Mathcad Prime 2.0, Mathematica 9.0, MATLAB 2013, Pro/E 5.0, ProE/Creo 2.0, SolidWorks 2013 and Working Model 2D. Also includes a D size (24"X36") HP Plotter and a high speed Network Printer that could print 8 ½ "X11" to 11" x17" Papers. The cost for this lab renovation was **$120,000**
  - **CS-309** is one of the best computer facilities on our campus, hosting 38 stations featuring the new High-end Dell Precision T1700 computers with the 4th generation of Intel i7 Quad core with 8GB of RAM, 250GB Solid State Hard drive and a 27- inch LCD panels, plus all the latest software for mechanical engineering such as: ANSYS version 14.5.7, AutoCAD 2014, Autodesk Inventor 2014, LabVIEW 2013, Lego Mind Storms NXT, Mathcad 15, Mathcad Prime 2.0, Mathematica 9.0, MATLAB 2013, Pro/E 5.0, ProE/Creo 2.0, SolidWorks 2013 and Working Model 2D. The cost for this lab is **$145,000**

Additional Computer Enhancements – Includes a new high end Dell Precision T 5500 computer for the SAE Formula One Team **($5,000)** and 4 Dell Precision T-1700 computers for 4 additional senior project teams **($8,000).**

- Course Improvements (since last ABET visit)

  - EGME 102: Engineering Graphics – Course outline was modified to reflect additional emphasis on SolidWorks; also introduction to GD&T
  - EGME 205: Digital Computation - Integrated MATLAB and Mathcad programs into course.
  - EGME 306A: Unified Laboratory – Added new assignments that required students to design their own experiments, identify necessary parameters and procedures.
  - EGME 306B: Thermofluids Laboratory – Rewrote Lab Manual for the course, incorporating newer data processing methods using modern computer software.
  - EGME 322L: Introduction to Computer Aided Design – Expanded unit on Geometric Dimensioning and Tolerances (GDT); changed textbook to one that included more critical thinking exercises.
  - EGME 414 & 419: Design Project I, II – Have connected with additional industry partners to meet with and support senior design students on a bi-weekly basis (e.g., Disneyland, Boeing, Raytheon); received grant funding from Associated Students to help cover materials costs for senior design projects and travel expenses for students to attend national conferences and competitions; received external funding to install Qualysis motion capture system for use by EGME 414 and 419 senior design students.
  - EGME 424: Data Acquisition and Instrumentation – revised course procedures to use LabVIEW.
  - EGME 431: Mechanical Vibrations – Incorporated MATLAB/SIMULINK into course.
  - EGME 476A: Dynamics and Controls Lab – Upgraded lab procedures by developing three new experiments from Quanser – DC Motor Control, Inverted Pendulum, and Ball on a Beam experiments. Also revised and updated Lab Manual for 476A.
  - EGME 476B: Power and Energy Lab – Updated course outline to include several new experiments involving the *TurboGen*, a newer gas turbine power system, and a *Solar Heat and Solar Photovoltaic Trainer* to support alternative energy experiments.
  - EGME 490: Engineering Seminar – Changed textbook to better foster understanding and impact of engineering in a global, economic, environmental and social context; added several case studies to improve awareness and responsibility for professional and ethical responsibility; added addition research and writing requirements to help students improve writing and critical thinking skills in support of lifelong learning.

- Equipment Upgrade Examples **($501,865)** since last ABET review
  (also described in Criterion 7A of Self Study Report)

  Equipment for Senior Labs (EGME 476A, 476B)
  - Quanser Control Experiment Modules ($60,000)
  - TurboGen Gas Turbine Electrical Generation System ($98,000)
  - H-SHSP-1 Solar Heat and Solar Photovoltaic Trainer ($55,000)

  Equipment for Machine Shop
  - 2 Miller Syncrowave 250 DX Tig welders ($8,000)
  - Foamlinx CNC router ($44,000)
  - Acer EVS-3VK mill ($12,000)
  - Haas ST-10Y CNC Lathe with live tooling ($60,000)
  - Haas VF-2Y CNC Mill ($60,000)

  Equipment to study performance and emissions of alternative fuels
  - TD200, Small Engine Test Set ($17,457)
  - TD212, Four-Stroke Diesel Engine ($6,548)
  - DVF1, Automatic Volumetric Fuel Gauge with Digital Reading ($6,079)
  - ECA100, Engine Cycle Analyzer ($6,463)
  - ECA101, Pressure Transducer ($5,935)
  - Enerac 700AV, Gas Analyzer ($3,145)

  Equipment to support robotics design and instruction
  - Articulated Suspension Exploratory Platforms, ATG Mobile Electric Systems ($3,230)
  - Lego Mindstorms, LEGO Education, 10 packs, ($3,215)
  - Universal Robot - UR5, Numatic Engineering, 1 unit ($28,540)
  - Motion Capture System OQUS500.1mp, Qualisys, 4 cameras ($24,253)

2. Improvement of Student Outcomes Achievement: Reassessment Results

The ultimate goal of the assessment and evaluation process is to fully 'close the loop' by showing that the assessment and evaluation of student outcomes led to the planning and incorporation of improvement activities, which in turn led to an improvement in the student outcomes themselves. During this review cycle, a reassessment of SO data (needed for showing changes in outcomes) has been possible in three categories – 1) through reassessment and evaluation of students' actual work in required classes (direct assessment), 2) through reassessment and evaluation of course survey information, and 3) through reassessment and evaluation of senior exit survey information. Below is a discussion of changes observed in each of these assessment categories.

Reassessment of Student Work (Direct Assessment):

The following two figures (Figures 4.2 and 4.3) provide a comparison of direct assessment of student outcomes from the academic year 2012-13 and year 2013-14.

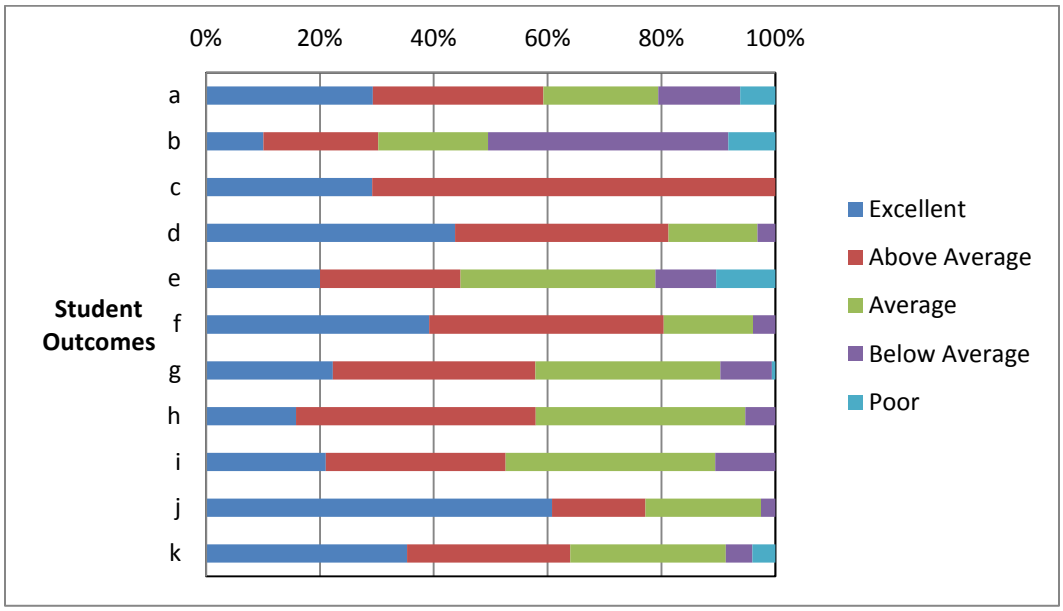


Figure 4.2 ***Direct*** Assessment Data Summary of SO (by Faculty Members) in AY 2012-13

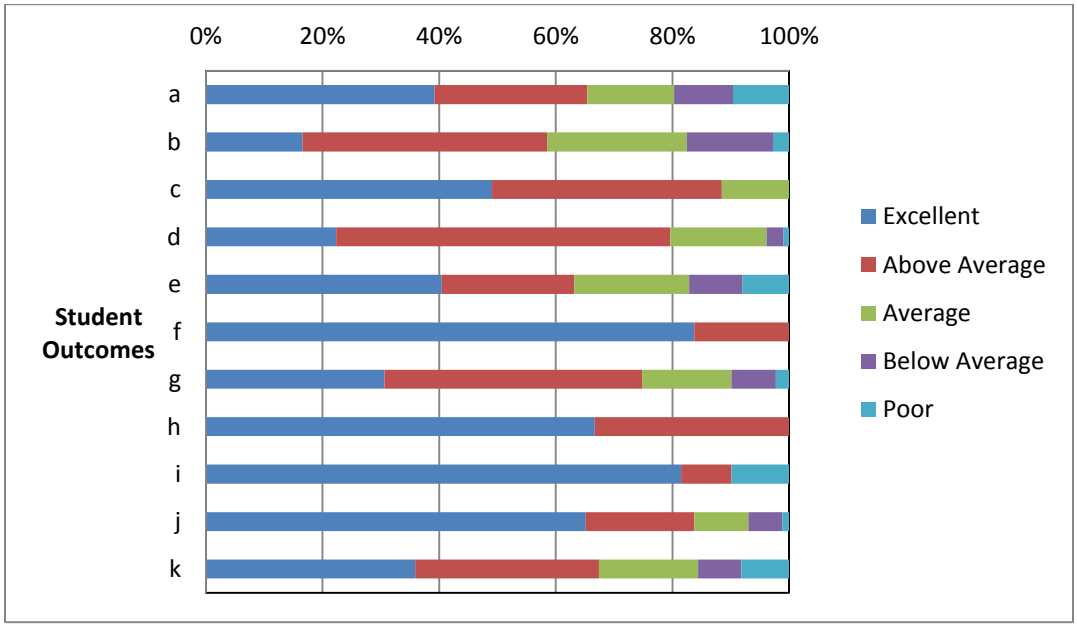


Figure 4.3 ***Direct*** Assessment Data Summary of SO (by Faculty Members) in AY 2013-14

Discussion of Direct Measure Reassessments: For student outcomes such as **(a)**: Math Science and Engineering and **(e)**: Identify, Formulate and Solve Problems, which require heavy problem solving skills, faculty's direct assessment on these outcomes was more stringent than other outcomes. Since the data showed improvement from the first academic year to the next, the continuous improvement (CI) committee did not recommend any changes. For these outcomes, however almost all indirect measure data indicated higher percentages of Excellent or Above Average scores -- a fact that must be paid closer attention in the future. The outcome that had the least favorable result by the faculty's direct assessment occurred in outcome **(b)**: Design, Conduct, and Analyze Experiment. *All* faculty agreed with the need for greater emphasis on the *design* aspect. Because of this, a few experimental equipment was purchased for the senior lab courses to further strengthen students' ability to design their own experimental procedures and attain necessary engineering parameters. Another outcome that had conflicting results occurred in outcome **(j):** contemporary issues. Faculty's assessment scores indicated improvement, with satisfactory scores. However, graduating students disagreed. To explore this disagreement, ME Department took action by increasing the emphasis of this outcome in EGME 490: Engineering Seminar. For other student outcomes, there has been a general trend of improvement from the first assessment year to the next. But, as it is listed in Table 4.3, necessary actions were taken any time the CI Committee or the faculty evaluated the need to close the loop in the continuous improvement process.

<u>Reassessment of Course Survey Information (Indirect Assessment)</u>:

The following two figures (Figures 4.4 and 4.5) provide a comparison of course survey ratings on student outcomes from the academic year 2012-13 and year 2013-14.

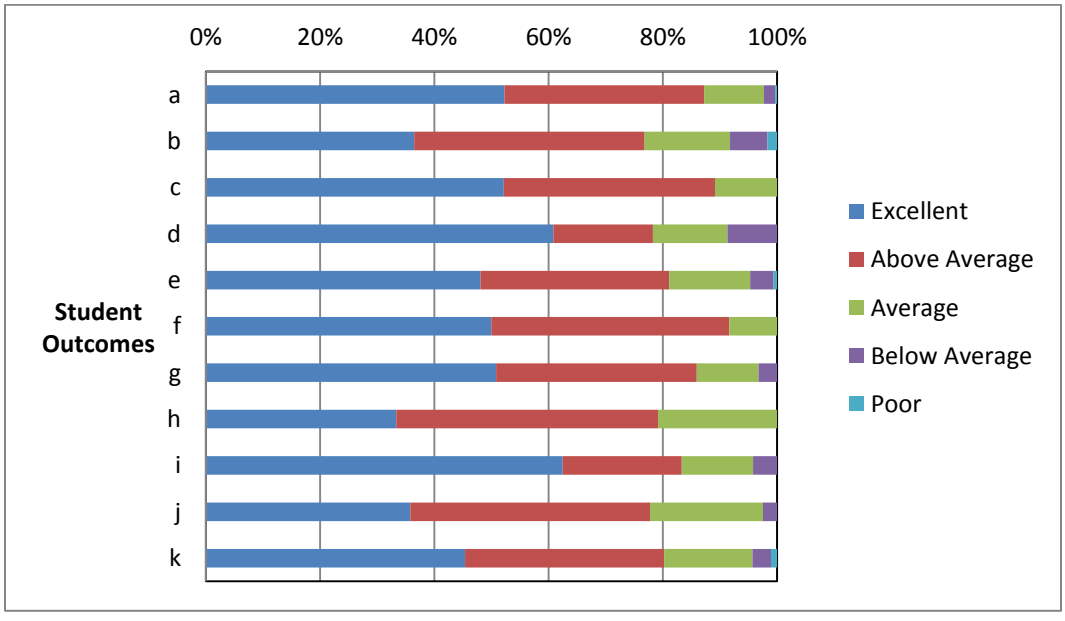


Figure 4.4 Course Evaluation Assessment Summary of SO Achievements in Spring 2013

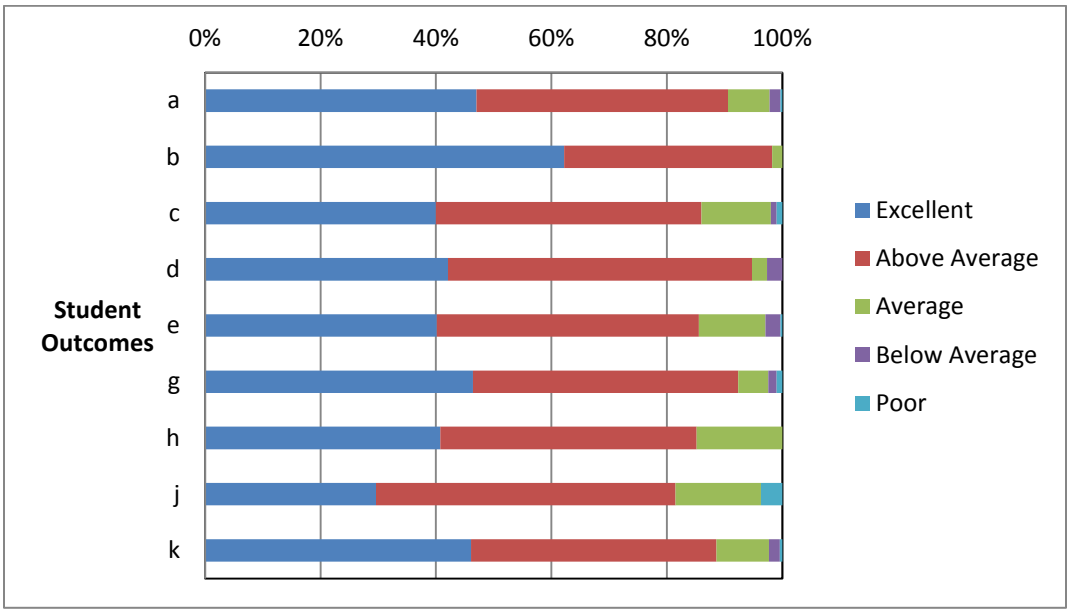


Figure 4.5 Course Evaluation Assessment Summary of SO Achievements in Fall 2013 (Note 'f' is not assessed in Fall semester)

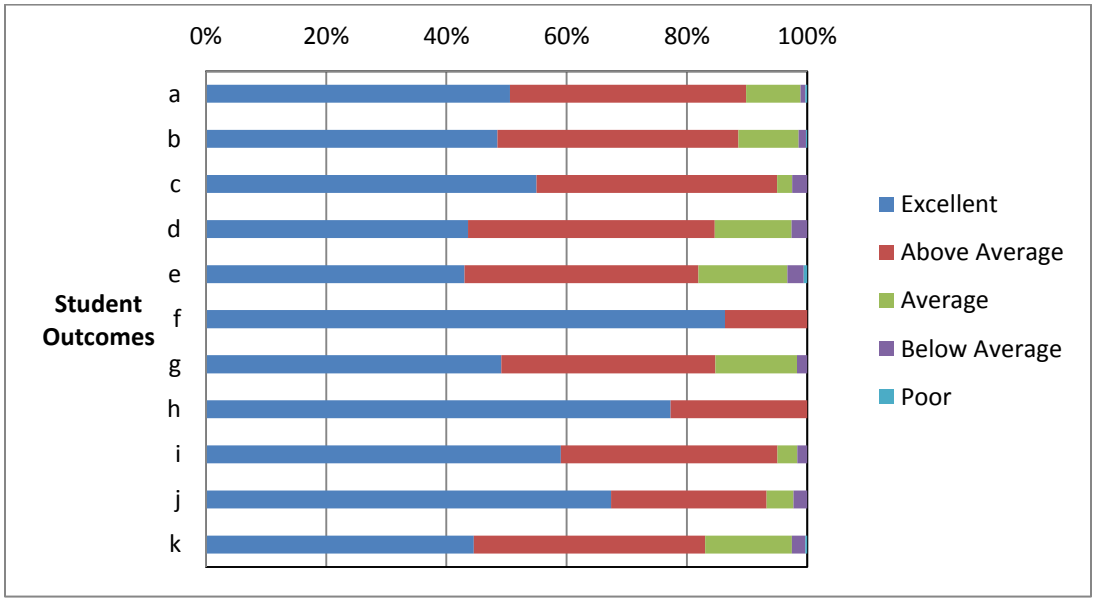


Figure 4.6 Course Evaluation Assessment Summary of SO Achievements in Spring 2014

Discussion of Course Evaluation Reassessments: For indirect measure data such as the course surveys, the Continuous Improvement Committee tried to use these numerical scores as the *supporting* data, confirming whether these are in agreement with the direct measure data. However, CI Committee came to realize that valuable written comments from the indirect measure data provided very useful information that was hidden behind these numerical assessment scores. Written comments from indirect measure data clearly showed the direction to which continuous improvement should be headed. Closing the loop in the continuous improvement process can be implemented in many different ways. But, much time can be efficiently saved if the initial direction for improvement can be guided correctly.

Reassessment of Senior Exit Survey and Alumni Survey Data:

Although numerical ratings by graduating seniors and alumni of their attainment of a-k student outcomes were available only in the most recent survey (2014), written comments about program strengths and weaknesses over the past three years (2012, 2013, and 2014) provide valuable insight concerning program issues and program improvement over the years. Original copies of all survey comments will be available for review at the time of the site visit in a Senior Exit Survey Binder and in an Alumni Binder.

Faculty Improvements: Graduating seniors and alumni in 2012, for example, were very clear in their dissatisfaction with the instruction they received in many ME courses and urged the hiring of additional faculty with focused contemporary specializations. By 2014, graduating seniors were much more complimentary of the instruction they had received in many courses (by full-time and by new part-time hires), although they continued to express some concerns and continued to recommend even more new hires to cover particular specializations.

Equipment Upgrades: The second most common concern of graduating seniors and alumni in 2012 was the poor shape of equipment in laboratory classes and the need for additional computer lab space. By 2014, graduating seniors were complimentary of the upgrades in equipment in certain areas (476A and in the machine shop, for example) and the addition and planned addition of new classrooms and computer labs (E 201, CS 304, and CS 309).

Curriculum Changes: Other common concerns of graduating seniors and alumni in 2012 were courses that they saw as being of little or no value, such as a 1-unit Physics 227 course and the EGEE 303 Electronics course. Both of these courses, following additional review, have since been dropped from the requirements and are now electives. Students and alumni in 2012 also voiced concern that the EGME 102 Graphics Design course contained too much information too early for first-year freshmen, with little opportunity to follow up and use much of what was learned. They also were concerned that the 322L Intro to Computer Aided Design course was not covering material related to what would be needed in industry. Since 2012, the 102 course was revised slightly and reduced to 2-units, with plans underway to add another 200-level

follow up course that would focus on additional skills such GD&T, SolidWorks, and related concepts. Also, a new adjunct instructor with industry experience was hired to teach the 322L (SolidWorks) course. Graduating seniors in 2014 were complimentary of the newly formatted 322L course and of the plans to offer a 200-level follow up course to 102.

3. Future Improvement Plans

Based on the assessment results of 'a–k' student outcomes and on the numerous comments and suggestions made by individuals on the various constituent surveys (students, alumni, advisory board/employers – all available to reviewers during the site visit), the following thematic concerns have surfaced as areas needing special attention, areas which are being considered priorities for making program improvements.

Areas of Concern/Needs

- Additional emphasis on assuring a contemporary knowledge base for program graduates.
- A need for additional skill development in geometric dimensioning and tolerancing (GD&T), based on the frequent comments/recommendations coming from all constituents on written surveys.
- Hiring of additional faculty with up-to-date knowledge who teach in their areas of specialization. Considerable concern has been expressed that some faculty teach courses not in their areas of expertise.
- Expanded lab opportunities and updated equipment that enhances students' ability to design and conduct experiments.
- Expanded curriculum opportunities in areas of biomedical engineering, materials engineering, aerospace, and manufacturing engineering with special attention to skill development in geometric dimensioning and tolerancing (GD&T)
- Increased opportunities to work in multidisciplinary teams.

Future Plans

Based on the above areas of concern, the following program improvements plans are already underway:

- Hiring of New Faculty. A proposal (just approved, May 2014) has been submitted for a 2-year faculty recruitment plan that involves hiring two new tenure track faculty in 2014-15 (one in Materials Engineering and one in Biomedical Engineering) and two additional tenure track faculty in 2015-16 (one in Manufacturing Engineering and one in Aerospace Engineering). Note that one new tenure track faculty member in Aerospace Engineering,

Dr. Salvador Mayoral, was hired this year and will begin in Fall 2014. This additional hire in Aerospace Engineering will further strength this area of specialization.

- Curriculum Development. An experienced adjunct faculty member with extensive industry experience, Professor Hai Phan, has volunteered to develop a draft proposal for a new course to address the need for further skill development in GD&T and related concepts. The course proposal draft will be considered by the faculty in early Fall 2014, then submitted through the channels for final approval before the end of the term.

- Lab Remodel/Expansion. A proposal has been submitted (via the Dean to the Provost) to remodel and expand laboratory opportunities for Mechanical Engineering. Specially, the remodeling/expansion (if approved) will create new spaces for a Combustion/Propulsion Lab, a Heat Transfer research/instruction lab, an improved Wind Tunnel lab with an Anechoic Chamber, and a new Automotive Lab. In response to the proposal, campus leaders from Design and Facilities and from the Provost's Office have already conducted a 'walk through' on May 28, 2014 of the proposed space modifications, resulting in tentative support to complete Phase I of the project during AY 2014-15.

- Expanded Opportunity for Multidisciplinary Teamwork. Discussions across all ECS departments are underway for creating a more generic (college-based) senior design course, which would allow students to enroll in project-themed courses that are in their areas of interest, regardless of their major. As is, all ECS majors must enroll in senior design courses within their own majors. If a college-based course is developed and approved, then students from any ECS major who are interested in automotive design, robot design, UAV design, etc. could work together in inter-disciplinary teams on such projects.

- Other future plans for 2014-15 (as summarized in the Annual Report Goals) include:
  - Work with the Industrial Advisory Board to expand internship opportunities for students, setting up formal agreements with local companies and industries
  - Establish an improved internal process (database) for tracking ME graduates after they leave the University. Working with the University Alumni Affairs Office to locate and solicit input from former students has been less successful than one would expect. We believe we can do a better job of this internally, that is, maintaining a more up-to-date database and staying in closer contact with our graduates.
  - Develop a more reliable multi-year rotation schedule for technical electives, which will better facilitate student planning and specialized focus opportunities.

C. Additional Information

The following is a summary of assessment items discussed in Sections 4.A and 4.B that will be available for review at the time of the ABET site visit in September, 2014.

Binder #1: Senior Exit Surveys and Data Summaries
Binder #2: Alumni Surveys and Data Summaries
Binder #3: Industrial Advisory Board/Employer Surveys and Data Summaries
File Box #1: Course Evaluation Surveys and Data Summaries
File Boxes #2 - #21: Sources of Evidence (projects, homework, exam questions, etc.) used to evaluate SOs in each ME required course, along with data summaries

CRITERION 5. CURRICULUM

A. Program Curriculum

The courses that make up the ME Program included in Table 5.1. The ME Program prepares students for professional careers and further study based on the following components:

- College-level mathematics and basic sciences coverage includes a total of thirty (32) semester units.*
- Engineering topics that consist of engineering science and engineering design is for a total of sixty-six (67) semester units.
- The General Education component complements the technical content of the program and includes thirty (30) semester units of instructions.

*If CHEM 123: Chemistry for Engineers (3 units) is taken in lieu of CHEM 120A: General Chemistry, then an additional 2 units of free electives is required. See previous discussion in Criterion 1.F (Graduation Requirements).

The following sections discuss further the courses identified in Table 5.1 and how they are classified at CSUF.

1. Mathematics and Basic Science Courses (32 units)

Mathematics and Sciences course requirements provide a firm foundation in mathematics and the natural sciences, a necessary prerequisite for our rigorous Mechanical Engineering curriculum. The required Mathematics and Science courses, including the associated units are as follows:

Mathematics 150A	Analytical Geometry and Calculus I (4)
Mathematics 150B	Analytical Geometry and Calculus II (4)
Mathematics 250A	Multivariate Calculus (4)
Mathematics 250B	Introduction to Linear Algebra & Differential Equations (4)
Physics 225	Fundamental Physics: Mechanics (3)
Physics 225L	Fundamental Physics Lab: Mechanics (1)
Physics 226	Fundamental Physics: Electricity & Magnetism (3)
Physics 226L	Fundamental Physics Lab: Electricity & Magnetism (1)
Chemistry 120A	General Chemistry (5), or Chemistry 123 (3) Chemistry for Engineers
Biology 101	Elements of Biology (3)

2. Engineering Courses (67 units)

Engineering Topics are covered through three sets of courses:

- Engineering Core Courses (24 units)
- Required Mechanical Engineering Courses (32 units)
- Technical Elective Mechanical Engineering Courses (11 units)

Engineering Core Courses

The engineering core provides a strong, and broad, foundation for the Mechanical Engineering Program. It exposes students to fundamental engineering concepts in civil, electrical and mechanical engineering. It further provides comprehensive coverage of principle multidisciplinary concepts that students will be using in design-oriented courses. In this core, engineering applications of mathematics and basic science are discussed, basic engineering design concepts are presented, engineering laboratory measurement techniques are taught, and advanced analytical methods in engineering are covered. In addition, methods of computer utilization are presented. These courses also provide students with basic oral, written, and graphical and communication skills. The core courses, including the associated units are as follows:

EGME 102	Engineering Graphics (2)
EGCE 201	Statics (3)
EGEE 203	Electric Circuits (3)
EGEE 203L	Circuits Laboratory (1)
EGME 205	Digital Computation (3)
EGCE 302	Dynamics (3)
EGME 304	Thermodynamics (3)
EGME 306A	Unified Laboratory (1)
EGME 308	Engineering Analysis (3)
EGME 314	Engineering Economy (2)

Required Core Courses in Mechanical Engineering

These required courses provide the necessary depth in mechanical engineering. The laboratory component, involving both the engineering and design laboratories, provides a particularly varied set of educational experiences; the lecture sequence equips students with the knowledge and tools required to synthesize mathematics, natural science, engineering science and laboratory experiences. The progressive coverage of engineering sciences and design principles, together with hands-on laboratory experiences, prepare the students for their major and final preparation to become competent engineers as they start their two-semester multi-disciplinary capstone design course sequence EGME 414 and EGME 419.

EGME 306B	Fluids & Thermal Laboratory (1)
EGME 322L	Introduction to Computer-Aided Design (3)
EGME 331	Mechanical Behavior of Materials (3)
EGME 333	Fluid Mechanics & Aerodynamics (3)
EGME 335	Kinematics of Mechanisms (3), formerly Intro to Mechanical Design

EGME 407	Heat Transfer (3)
EGME 414	Design Project I (3)
EGME 419	Design Project II (2)
EGME 421	Mechanical Design (3)
EGME 431	Mechanical Vibrations (3)
EGME 476A	Dynamic Systems and Controls Laboratory (2)
EGME 476B	Energy and Power Laboratory (2)
EGME 490	Seminar in Engineering (1)

Technical Elective Courses in Mechanical Engineering

The Mechanical Engineering Program offers four areas of specialization:

- Robotics, Controls and Automated Manufacturing Engineering
- Design and Materials for Manufacturing
- Thermal and Fluids Engineering
- Power and Energy

ME students select technical elective courses that focus on one of the four areas of specialization. The elective courses associated with these four tracks are shown below.

Robotics, Controls and Automated Manufacturing Engineering

EGME 315	Basic Fabrication Techniques & Manufacturing Practices (3)
EGME 410	Introduction to the Finite Element Method and Applications (3)
EGME 411	Mechanical and Control Systems (3)
EGME 418	Space and Rocket Engineering (3)
EGME 422	Mechanical Design using Pro/ENGINEER (3)
EGME 424	Data Acquisition and Instrumentation Using LabVIEW (3)
EGME 438	Analytical Methods in Engineering (3)
EGME 454	Optimization of Engineering Design (3)
EGME 456	Introduction to Mechatronics for Engineers (3)
EGME 457L	Intelligent Systems Laboratory (2)
EGME 461	Fabrication Methods (3)
EGME 463	Introduction to Robotics and Automated Manufacturing (3)
EGME 475	Acoustics and Noise Control (3)
EGME 480	Human Factors in Engineering (3)
EGME 483	Computer-Integrated Manufacturing (3)
EGME 486	Introduction to Electronics Packaging (3)

Design and Materials for Manufacturing

EGME 315	Basic Fabrication Techniques & Manufacturing Practices (3)
EGME 410	Introduction to the Finite Element Method and Applications (3)
EGME 411	Mechanical Control Systems (3)

EGME 422 Mechanical Design using Pro/ENGINEER (3)
EGME 424 Data Acquisition & Instrumentation Using LabVIEW (3)
EGME 438 Analytical Methods in Engineering (3)
EGME 447 Piping Selection and Piping Network Design (3)
EGME 454 Optimization of Engineering Design (3)
EGME 456 Introduction to Mechatronics for Engineers (3)
EGME 459 Plastics and Other Non-Metallics (3)
EGME 460 Failure of Engineering Materials (3)
EGME 461 Fabrication Methods (3)
EGME 462 Composite Materials (3)
EGME 463 Introduction to Robotics and Automated Manufacturing (3)
EGME 475 Acoustics and Noise Control (3)
EGME 480 Human Factors in Engineering (3)
EGME 483 Computer-Integrated Manufacturing (3)
EGME 486 Introduction to Electronics Packaging (3)

Thermal and Fluids Engineering

EGME 315 Basic Fabrication Techniques & Manufacturing Practices (3)
EGME 410 Introduction to the Finite Element Method and Applications (3)
EGME 417 Computational Heat Transfer (3)
EGME 418 Space and Rockets Engineering (3)
EGME 424 Data Acquisition and Instrumentation Using LabVIEW (3)
EGME 426 Design of Thermal and Fluid Systems
EGME 438 Analytical Methods in Engineering (3)
EGME 447 Piping Selection and Piping Network Design (3)
EGME 451 Thermal Environmental Conditioning and Control (3)
EGME 452 Fluid Machinery (3)
EGME 454 Optimization of Engineering Design (3)
EGME 486 Introduction to Electronics Packaging (3)
EGME 487 Thermal Control of Electronic Packaging (3)

Power and Energy

EGME 315 Basic Fabrication Techniques & Manufacturing Practices (3)
EGME 410 Introduction to the Finite Element Method and Applications (3)
EGME 417 Computational Heat Transfer (3)
EGME 418 Space and Rocket Engineering (3)
EGME 424 Data Acquisition and Instrumentation Using LabVIEW
EGME 426 Design of Thermal and Fluid Systems
EGME 438 Analytical Methods in Engineering (3)
EGME 447 Piping Selection and Piping Network Design (3)
EGME 451 Thermal Environmental Conditioning and Control (3)
EGME 452 Fluid Machinery (3)

EGME 454	Optimization of Engineering Design (3)
EGME 486	Introduction to Electronics Packaging (3)
EGME 487	Thermal Control of Electronic Packaging (3)

3. General Education Courses (30 Units)

The goal of General Education at CSU-Fullerton is to prepare students for thinking and acting as informed and ethically mature human beings, and preparing them to become productive citizens in a culturally diverse society. The complete Mechanical Engineering General Education requirements are itemized below.

***General Education Area A: Core Competencies* (*9 units*)**

1. Course in Oral Communication
2. Course in Written Communication
3. Course in Critical Thinking

***General Education Area C: Arts and Humanities* (*12 units*)**

1. Course in Introduction to Arts
2. Course in Introduction to the Humanities
3. Course in Explorations in the Arts and Humanities
4. Course in Origins of the World Civilizations

***General Education Area D: Social Sciences* (*9 units*)**

1. Course in American History, Institutions and Values
2. Course in American Government
3. Course in Explorations in Social Sciences

4. Free Electives (2 Units)

Students who take CHEM 123 for 3 units instead of CHEM 120A for 5 units must take two additional units of electives from technical or non-technical courses. However, tentative plans are to reassign these units beginning next year to a new 2-unit, 200-level required course that will address a need for additional skill development in GD&T and related concepts (per constituent feedback).

- **Curriculum with, PEO, SO, and ABET EAC Criterion 5**

  Table 5.3 shows how the required courses within the curriculum meet the ABET EAC Student Outcomes. Table 5.4 shows how the technical elective courses within the curriculum meet the Student Outcomes. Furthermore, Table 3.1 maps the Student Outcomes to the Program Educational Objectives. The course syllabi provided in Appendix A further elaborate on how each course within the program meets different requirements of Criterion 5.

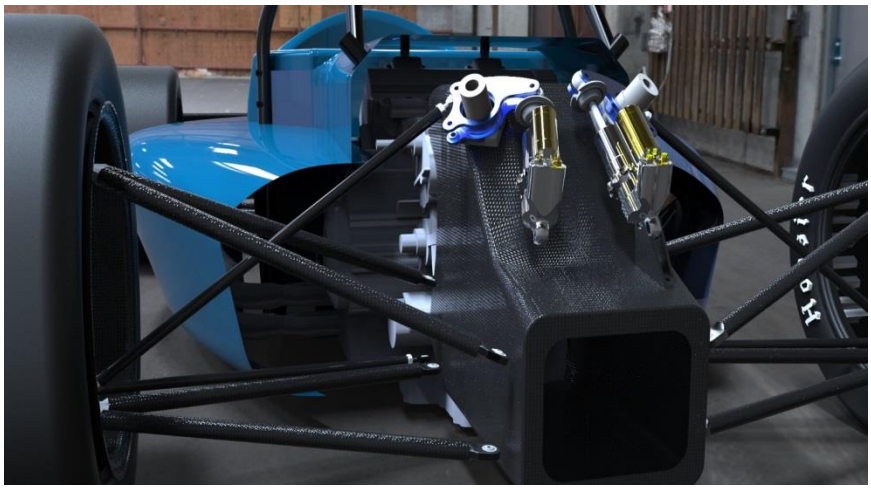
- **Students' Laboratory and Hands-On Experience**

  ME students are required to take seven (7) units of engineering upper-division equipment laboratory courses (Electrical Engineering 303L, EGME 306A, 306B, 476A, and 476B). This is in addition to the two (2) units of lower-division laboratory coursework in the supporting disciplines (Physics 225L and Physics 226L). The students obtain experience with computer-aided testing and data acquisitions in the upper-division laboratories. In addition, they are exposed to computer simulations as an adjunct to testing in the Mechanical Engineering Department laboratories. They gain experience in the use of computer-aided design in the Engineering Graphics and the Computer-Aided Design courses. The progressive coverage of engineering sciences and design principles, together with hands-on laboratory experiences, prepare the students for their major and final preparation to become competent engineers as they start their two-semester capstone design course sequence EGME 414 and EGME 419.

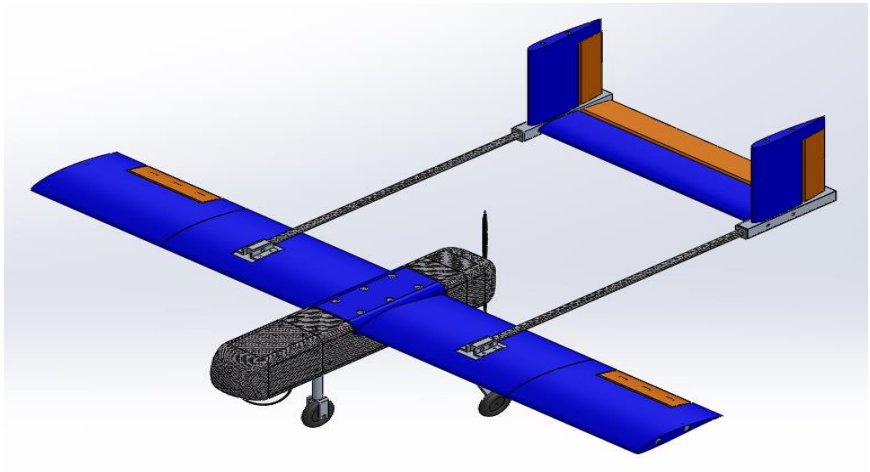
➢ **Major Design Experience (Year-Long Capstone Senior Design Courses)**

An important element of the Mechanical Engineering Program is the sequel of capstone design courses EGME 414 (Design Project I) and 419 (Design Project II), which are required courses for all seniors. The successful completion of these courses demonstrates the students' competencies prior to their graduation. The multi-disciplinary projects, covered by EGME 414/419, provide opportunity to students to learn about the design process, develop a conceptual design for a system, analyze that concept through mathematical modeling and computer simulations, fabricate it using advanced tools available to them, and test the final product. All these projects involve an iterative process that is based on a strong foundation of earlier courses. Such broad-base strong foundation is developed by courses in mathematics and basic sciences, and engineering core course that cover the fields of civil, electrical and mechanical engineering. Overall, the required and elective courses within the ME Program provide the progressive knowledge and skills that are required for conducting a major design experience that incorporate realistic constrains and professional engineering standards. The following is a list of projects that have been completed by ME students in EGME 414/419, during the most recent academic year.

- **Titan VII Formula Race Car**: Titan VII is Titan Motorsports 2014 entry in the F-SAE Collegiate Design Competition (SAE International, June 2014, Lincoln, NE). Titan VII is our most ambitious and advanced design to date. Notable improvements include widespread use of structural composites, a new, more advanced suspension, and an engine and drivetrain combination that achieves great power with sustained reliability.



- **Titan Unmanned Air Vehicle - UAV**: Titan UAV implements an Unmanned Air Vehicle that can takeoff, fly its corresponding route, track and locate targets, and land autonomously. This year's team UAV design will be based off of the *Malat Heron* TP (targeting pod). The design is meant for a low speed reconnaissance air vehicle that can locate targets using a high definition camera and relay the information back to ground control. We plan to represent CSUF/ECS at the AUVSI collegiate design competition June 18-22, 2014 at the Air Base in St. Inigoes MD.



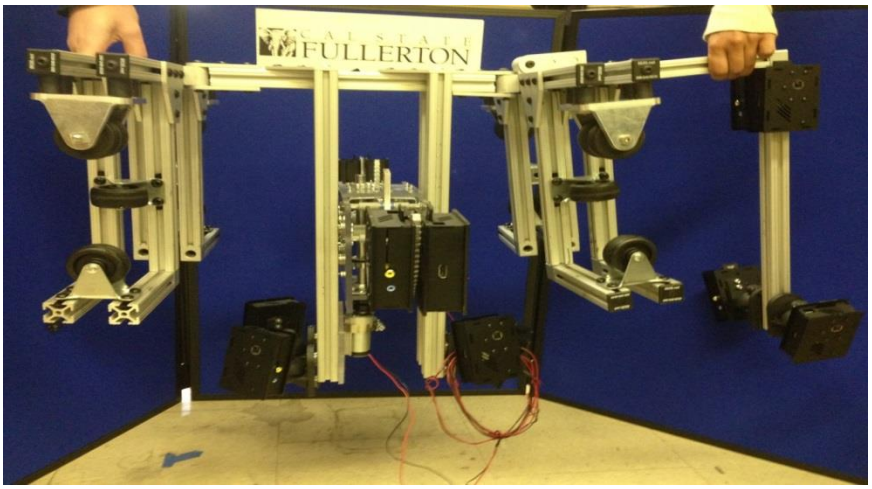
- **Eagle Eye Archery Target & Stand**: Team Eagle Eye Engineering design and fabricate a completely unique archery target and stand. The dynamic stand will be able

to simulate outdoor archery competition distances in an indoor environment. Allowing professional archers to amateur enthusiast the ability to practice at desired distances, while promoting the development of muscle memory needed for competitions. The technology will foster innovation in mechanical designs and composite materials.

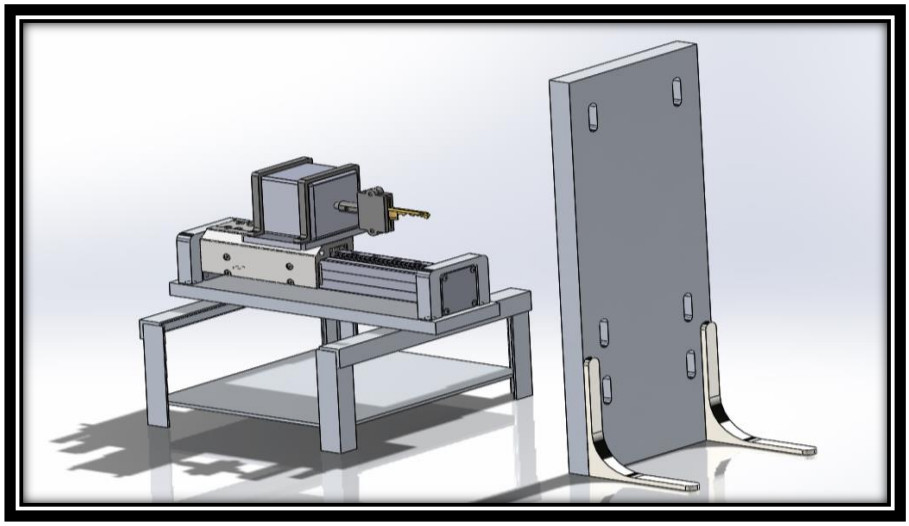
- **Development of a Passive Exo-Limb for People with Lower Leg Injuries**: The goal of the project is to design a hands-free crutch for persons with below-knee injuries. Some of the functional requirements for the crutch are to be comfortable for the user and able to mimic the natural human walking gait. The goal is to design a system that is cost-effective and easier to use than standard crutches. The device will be a purely mechanical passive system that requires no batteries or sources of power other than the natural movement of the user's body. By utilizing this technology, we intend to design a hands-free crutch for people with below-knee injuries.

- **Load Wheel Design (Disney)**: The purpose of the design project is to improve on the design and maintenance of the load wheel for the Pirates of the Caribbean boat at the Disneyland Resort. The process will start with the design of four load wheels, attached to the hull of each boat. Our main interest is to develop a design that will resist corrosion more effectively than the current design, while lowering maintenance costs and time. One of the project challenges is to achieve an improved design without major redesign of current load wheel dimensions.

- **Inspector Willie (Disney)**: A Weld Inspection System for the Indiana Jones Attraction at Disneyland. Inspector Willie Project is a visual aid inspection system that will take images of the welds underneath the track system of the Indiana Jones Attraction at Disneyland Resort. Currently, at the Indiana Jones Attraction, the inspection process includes: manual removal of large metal plates, manual cleaning underneath the track system, and waiting for a weld inspector to inspect the welds in person. Inspector Willie will be able to have a cleaning aspect, inspect underneath the track (underneath the covered metal plates) without having to remove the metal plates, and take a visual image of the welds.



- **PDI Mechanical and Electro-Mechanical Locks Projects (PDI)**: PDI is a small manufacturing company in Southern California that specializes in detention furniture and building accessories for the corrections industry. PDI is preparing to introduce a series of locks (simple mechanical types as well as advanced electronic ones) to its product line up. The two projects, related to the development of purely mechanical and electro-mechanical locks include: reverse engineering of existing lock systems not protected by patents, new design proposals, prototype development, and testing to ensure the design meets required American Society for testing and Materials ASTM standards.



The final reports for the design projects that were completed in AY 2013-2014 will be available as part of the EGME 414/419 Course Notebook.

- **Additional Materials Available for Review**

  Table 5.1 depicts the credit hours dedicated to each curricular component along with additional information on the course structures and their class sizes when the last time they were offered. Available Course Notebooks at the time of the visit in Fall 2014 will include materials that demonstrate how each course contributes to different curricular components and Student Outcomes.

  The course descriptions for all courses are given in the University Catalog, which is also forwarded in an electronic form together with this report. ***Please note that the University Catalog is updated every two years. As a result, the information in the Catalog may lag behind the changes due to curriculum/course revisions and other matters that are brought about due to the Department's continuous improvement. Most changes are more frequently publicized through the Department Brochure/Advising Package and the ECS Web site.***

- **Prerequisite Flowchart**

  The flowchart in Table 5.5 shows the prerequisite structure of program's courses required toward the graduation.

B. Course Syllabi

In Appendix A, a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements by required by Criterion 5 are provided.

Table 5.1 Curriculum

Bachelor of Science in Mechanical Engineering

Course	Required (R), Elective (E) or Selected Elective (SE)	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and Semester	Maximum Section Enrollment for the Last Two Terms the Course was Offered
		Math & Basic Science	Engineering Topics Check if Contains Significant Design (✓)	General Education	Other		
MATH 150A Calculus I	R	4				F13, Sp14	39, 34
CHEM 120A General Chem or CHEM 123 Chem for Engineers	R	5/3				F13, Sp14	
EGME 102 Engineering Graphics	R		2			F13, Sp14	48, 48
General Education (A1:Oral Communication)	SE			3		F13, Sp14	
General Education (A2:Written Communication)	SE			3		F13, Sp14	
MATH 150B Calculus II	R	4				F13, Sp14	
PHYS 225 Fundamental Physics: Mechanics	R	3				F13, Sp14	122, 116
PHYS 225L Fundamental Physics: Laboratory	R	1				F13, Sp14	25, 26
EGME 205 Digital Computation	R				3	F13, Sp14	46, 46
General Education (A3:Critical Thinking)	SE			3		F13, Sp14	
General Education (C1:Introduction to Arts)	SE			3		F13, Sp14	
MATH 250A Calculus III	R	4				F13, Sp14	
EGCE 201 Statics	R		3			F13, Sp14	
PHYS 226 Fundamental Physics: Electricity and Magnetism	R	3				F13, Sp14	
PHYS 226L Fundamental Physics: Laboratory	R	1				F13, Sp14	
EGME 304 Thermodynamics	R		3			F13, Sp14	48, 65
General Education (B2:Life Science): BIOL 101	SE	3				F13, Sp14	
MATH 250B Intro. to Linear Algebra and Differential Equations	R	4				F13, Sp14	
EGCE 302 Dynamics	R		3			F13, Sp14	
EGME 331 Mechanical Behavior of Materials	R		3			F13, Sp14	22, 45
EGEE 203 Electric Circuits	R		3			F13, Sp14	
EGEE 203L Electric Circuits Laboratory	R		1			F13, Sp14	
General Education (C2:Introduction to Humanities)	SE			3		F13, Sp14	
EGME 308 Engineering Analysis and Statistics	R	3				F13, Sp14	37, N/A
EGME 335 Kinematics of Mechanisms	R		3			F12, F13	70, 69

EGME 333 Fluid Mechanics and Aerodynamics	R		3			F12, F13	70, 30
EGME 306A Unified Laboratory	R		1			F13, Sp14	20, 35
EGME 322L Introduction to Computer-Aided Design	R		3 (✓)			F13, Sp14	48, 48
General Education (C4:Origins of the World Civilizations)	SE			3		F13, Sp14	
EGME 431 Mechanical Vibrations	R		3			Sp13, Sp14	56, 40
EGME 421 Mechanical Design	R		3			Sp13, Sp14	48, 39
EGME 407 Heat Transfer	R		3			Sp13, Sp14	56, 60
EGME 306B Fluids and Thermal Laboratory	R		1			Sp13, Sp14	8, 17
EGME Technical Elective[1]	SE		3			F13, Sp14	
General Education (D3:American History, Institutions and Values)	SE			3		F13, Sp14	
EGME 476A Dynamic Systems and Controls Laboratory	R		2			F12, F13	16, 24
EGME 414 Design Project I	R		3 (✓)			F12, F13	47, 48
EGME 314 Engineering Economy	R		2			F12, F13	52, 50
EGME Technical Elective[1]	SE		3			F13, Sp14	
General Education (D4:American Government)	SE			3		F13, Sp14	
General Education (D5:Explorations in Social Sciences)	SE			3		F13, Sp14	
EGME 476B Energy and Power Laboratory	R		2			Sp13, Sp14	16, 23
EGME 419 Design Project II	R		2 (✓)			Sp13, Sp14	32, 48
EGME 490 Seminar in Engineering	R		1			F13, Sp14	20, 24
EGME Technical Elective[1]	SE		3			F13, Sp14	
EGME Technical Elective[1]	SE		2-3			F13, Sp14	
General Education (C3:Explorations in the Arts and Humanities)	SE			3		F13, Sp14	
Free Electives	SE				2	F13, Sp 14	
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		33	61-62	30	5		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	129						
PERCENT OF TOTAL		25.6%	47.3%-48.1%	23.3%	3.9%		
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours	32 Hours	48 Hours				
	Minimum Percentage	25%	37.5%				

[1]EGME technical electives selected from an approved list (Table 5.2).

Table 5.2 EGME Technical Electives

Course	Required (R), Elective (E) or Selected Elective (SE)	Subject Area (Credit Hours)	Last Two Terms the Course was Offered: Year and Semester	Maximum Section Enrollment for the Last Two Terms the Course was Offered
		Engineering Topics Check if Contains Significant Design (✓)		
EGME 315 Basic Fabrication Techniques and Manufacturing Practices	SE	3 (✓)	F13, S14	20, 20
EGME 350 Living and Working in Space	SE	3	S04, S05	Offered prior to F08
EGME 410 Introduction to the Finite Element Method and Applications	SE	3	F04, S14	,17
EGME 411 Mechanical Control Systems	SE	3	F07, S14	,49
EGME 417 Computational Heat Transfer	SE	3	F11, F13	19, 19
EGME 418 Space and Rocket Engineering	SE	3	F01, F04	12, 20
EGME 422 Mechanical Design Using Pro/ENGINEER	SE	3 (✓)	S11, S12	41, 41
EGME 424 Data Acquisition and Instrumentation Using LabVIEW	SE	3	F11, F13	19, 16
EGME 426 Design of Thermal and Fluid Systems	SE	3	F11, F13	29, 28
EGME 438 Analytical Methods in Engineering	SE	3	F11, F13	20, 18
EGME 447 Piping Selection and Piping Network Design	SE	3	S02, S03	Offered prior to F08
EGME 451 Heating, Ventilating and Air Conditioning Systems	SE	3	F09, S14	23 , 28
EGME 452 Fluid Machinery	SE	3	F05, F07	Offered prior to F08
EGME 454 Optimization of Engineering Design	SE	3 (✓)	S11, F13	24, 28
EGME 456 Introduction to Mechatronics for Engineers	SE	3	S07, S13	10, 37
EGME 457L Intelligent Systems Laboratory	SE	2	S02, F06	7,
EGME 459 Plastics and Other Non-Metallics	SE	3	S12, s14	19, 20
EGME 460 Failure of Engineering Materials	SE	3	F11, S14	27, 20
EGME 461 Fabrication Methods	SE	3	S11, F13	36, 31
EGME 462 Composite Materials	SE	3	S09, F10	36, 36
EGME 463 Introduction to Robotics	SE	3	S10, S13	26, 28
EGME 475 Acoustics and Noise Control	SE	3	S01, F03	15, 15
EGME 480 Human Factors in Engineering	SE	3	S07, S12	20,
EGME 483 Computer-Aided Manufacturing	SE	3	S07, S11	8, 19
EGME 486 Introduction to Electronics Packaging	SE	3	S01, F06	7, 6
EGME 487 Thermal Control of Electronics Packaging	SE	3	S03, F01	10

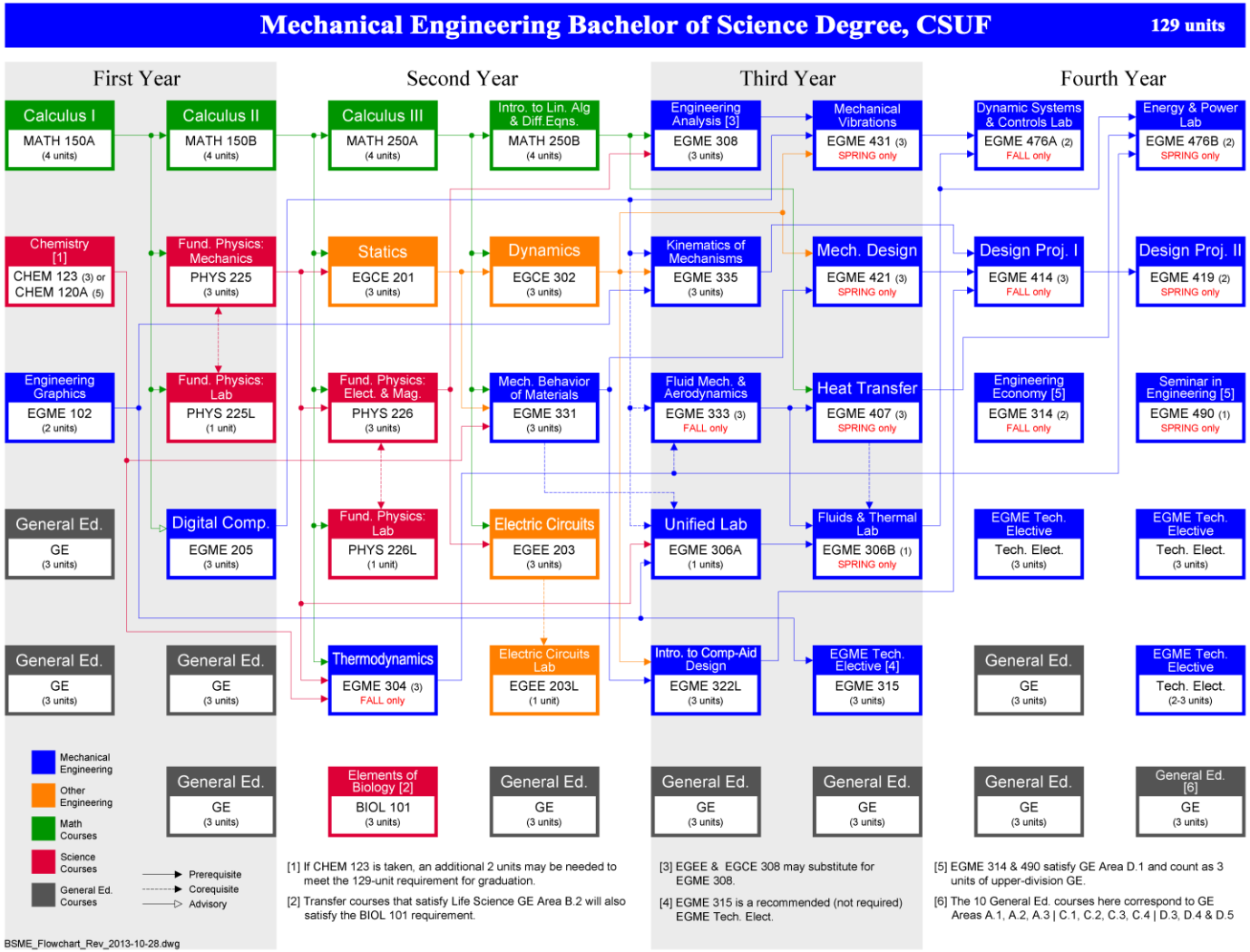
Table 5.3 SOs Addressed in Required Undergraduate Courses

Criteria		*Required*																		
		ME 102	ME 205	ME 304	ME 306A	ME 306B	ME 308	ME 314	ME 322L	ME 331	ME 333	ME 335	ME 407	ME 414	ME 419	ME 421	ME 431	ME 476A	ME 476B	ME 490
1	Math, Science and Engineering (a)	X		X			X	X		X	X	X	X			X	X			
2	Design, Conduct, & Analyze Experiment (b)				X	X									X			X	X	
3	Design Component with Constraint (c)								X					X	X					
4	Multidisciplinary Team (d)													X	X					
5	Identify, Formulate, and Solve problems (e)		X	X			X			X	X	X	X			X	X			
6	Professional and Ethical Responsibility (f)														X					X
7	Communicate Effectively (g)	X			X	X			X					X	X			X	X	
8	The Broad Education (h)							X												X
9	Life-Long Learning (i)														X					X
10	Contemporary Issues (j)							X					X							X
11	Modern Engineering Tools (k)	X	X		X	X			X	X	X	X	X	X	X	X	X	X	X	

Table 5.4 SOs Addressed in Technical Elective Courses

	Criteria	*Electives*																								
		ME 315	ME 410	ME 411	ME 417	ME 422	ME 424	ME 426	ME 438	ME 447	ME 450	ME 451	ME 452	ME 454	ME 456	ME 457 L	ME 459	ME 460	ME 461	ME 462	ME 463	ME 475	ME 480	ME 483	ME 486	ME 487
1	Math, Science and Engineering (a)		X	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X			X	X
2	Design, Conduct, & Analyze Experiment (b)	X					X									X								X		
3	Design Component with Constraint (c)	X				X		X		X				X		X	X	X	X	X		X			X	X
4	Multidisciplinary Team (d)	X										X				X										
5	Identify, Formulate, and Solve problems (e)	X	X	X	X			X	X		X		X	X	X	X	X	X	X	X	X	X	X	X		X
6	Professional and Ethical Responsibility (f)																						X			
7	Communicate Effectively (g)						X			X						X	X	X	X				X			
8	The Broad Education (h)															X				X			X		X	X
9	Life-Long Learning (i)									X			X			X				X			X		X	
10	Contemporary Issues (j)				X										X	X				X		X	X			X
11	Modern Engineering Tools (k)	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X		X

Table 5.5 Flowchart Illustrating the Prerequisite Structure of the Program's Required courses



CRITERION 6. FACULTY

A. Faculty Qualifications

The current full-time Mechanical Engineering faculty members all have earned doctoral degrees in Mechanical Engineering with a wide range of disciplinary specializations. They have extensive teaching and research experiences at CSUF and other institutions and are qualified to cover all the curricular areas of the program. The following is the list of the current ME faculty members serving in the Department. Table 6.1 summarizes faculty qualifications and faculty vita are included in Appendix B.

Andy Bazar, PE, Professor

Dr. Bazar earned his Ph.D. from North Carolina State University in 1974. His teaching interests include rocket and space engineering, manufacturing engineering, ergonomics, biomechanics, and failure analysis. Prof. Bazar's research has focused on space colonies, nuclear thermal rockets, Mars mission, and ergonomics of space vehicles. Dr. Bazar is currently working on a book manuscript on rocket design. Dr. Bazar has had extensive industry consulting.

***Salvador Mayoral, Assistant Professor* (beginning Fall 2014)**

Dr. Salvador Mayoral received his Ph.D. in Mechanical and Aerospace Engineering from the University of California, Irvine in 2013. As a graduate student, Dr. Mayoral's research focused on the shielding of jet noise by a hybrid wing body aircraft. Currently, his research interests are jet noise, aeroacoustics, experimental fluid mechanics, and unmanned aerial vehicles. His teaching interests are fluid mechanics, applied mathematics, thermal sciences, experimental and numerical methods. Ultimately, Dr. Mayoral aims to rebuild the aerospace program within the Mechanical Engineering Department. Before joining Cal State Fullerton, Dr. Mayoral worked as a Research and Development Engineer at Sonendo where he worked on the design and development of medical devices for endodontics.

Hossein Moini, Professor

Dr. Moini received his Ph.D. in mechanical engineering from University of California, Santa Barbara in 1986. His teaching interests are in the areas of mechatronics, intelligent systems, controls, and vibrations. Dr. Moini's current research has been focused on adaptive structures, active vibration damping, and intelligent mechatronics systems. He has received grants from the National Science Foundation (NSF) and Lockheed Martin Corporation for support of his projects on intelligent systems and active vibration damping of flexible structures.

Chean Chin Ngo, Assistant Professor

Dr. Chean Chin Ngo received his Ph.D. degree in Mechanical Engineering from the University of Oklahoma in 2006. His teaching interests are in the areas of thermal-fluid sciences, alternative energy and numerical modeling. Dr. Ngo's current research interest focuses on transport phenomena in porous media, heat and mass transfer enhancement using electric field, and multimedia technology in engineering education & K-12 STEM education. Prior to joining Cal State Fullerton, Dr. Ngo was a visiting assistant professor at the University of North Dakota from 2008-2010 and a postdoctoral research associate at the University of Oklahoma in 2007.

Sang June Oh, Assistant Professor

Dr. Sang June Oh received his B.S., M.S., and Ph.D. degrees in Mechanical Engineering from Columbia University (New York) in 2004. His teaching interests are in the areas of control systems, optimization, mechatronics, vibrations and applied mathematics. Dr. Oh's current research focuses on control applications in biomedical engineering, assistive technology, and iterative learning and repetitive control design for aerospace applications. His previous academic experience includes postdoctoral research at Johns Hopkins University and Yale University. He was a recipient of the Outstanding Educator of the Year by the Associated Students, Inc. (ASI) of CSUF in 2009

Joe Piacenza, Assistant Professor **(beginning Fall 2014)**

Dr. Joseph Piacenza earned his B.S. in mechanical engineering from the University of South Florida (USF), and completed his MBA at USF in 2008 with a focus on entrepreneurship and management. While working toward the MBA, he founded an automotive-based small business, specializing in the restoration and service of European vehicles. This business was sold in early 2010, and he completed his M.S and Ph.D. in mechanical engineering at Oregon State University (2012 and 2014 respectively). Dr. Piacenza's dissertation explored the robust design of complex infrastructure systems. However, his research interests extend to design theory and methodology, automotive engineering, and design sustainability.

Roberta Rikli, Professor

Dr. Roberta Rikli received her Ph.D. in Higher Education from the University of Colorado, Boulder in 1972 with specializations in research design and measurement. During her long career at Cal State Fullerton, she has held a number of teaching and administrative positions including Professor of Kinesiology, Chair of the Division of Kinesiology and Health Promotion, and Dean of the College of Health and Human Development. Over the years, Dr. Rikli has overseen the development of several nationally accredited programs including the Master of

Public Health, Master of Social Work, Doctorate of Education (EdD), Doctorate of Nursing Practice (DNP) and several other Nursing specializations including the RN pre-licensure program. She also was influential in the development of several centers and institutes on campus, including the Center for Successful Aging, the Employee Wellness Program, the Center for Promotion of Healthy Lifestyles and Prevention of Obesity, the Sport and Movement Institute, the Gerontology Research Institute, and the Health Promotion Research Institute. Dr. Rikli has been active in proposal-writing, having served as PI or Co-PI on more than $3 million in externally funded projects. She currently serves as Acting Chair of Mechanical Engineering.

Nina Robson, Assistant Professor

Dr. Nina Robson has obtained MS degrees in Electronics and Automation Engineering (1994) and in Robotics and Flexible Manufacturing Systems (1996) from the Technical University of Sofia. She also completed a 3rd MS in Mechanical and Aeronautical Engineering from the University of California, Davis (2001) and a Ph.D. degree in Mechanical Engineering from the University of California, Irvine in 2008. During 2009-2011 she was an Assistant Professor in the Department of Engineering Technology and Industrial Distribution at Texas A&M University. She has worked extensively in the areas of Robotics, Geometric Design of Mechanical Linkages and Kinematics of Motion. Dr. Robson's current research interest is on human motion planning with reduced mobility with the goal of developing novel technologies to facilitate the recovery of patients with neurological disorders. She has more than thirty papers published in peer reviewed national and international journals and conferences. Dr. Robson is a recipient of the 2012 NSF NRI collaborative grant "A Design Methodology for Multi-Fingered Robotic Hands with Second Order Kinematic Constraints."

Haowei Wang, Assistant Professor

Dr. Haowei Wang received his B.Eng degree in Thermal Energy and Power Engineering from Southeast University in Nanjing China in 2008. He received his MS and PhD degrees in Mechanical Engineering in 2009 and 2012 from Rensselaer Polytechnic Institute in Troy, New York in 2009 and 2012. His doctoral research involved issues on combustion and in particular the autoignition of traditional and alternative jet fuels and jet fuel surrogates. He has also interned at the Combustion Laboratory of General Electric Global Research Center in Niskayuna, New York where he prepared and conducted tests for gasifier design projects as well as design, test and improve gasifier nozzles. He also set up optics and beam light for image capture, and worked with high-speed camera images of gasifier flows to optimize image quality for data extraction. He is the author of several publications and presentations in the field of combustion. Currently his research is focused on the combustion of traditional and alternative fuels. He teaches primarily thermal-fluids related courses.

B. Faculty Workload

Table 6.2 Summarizes Faculty workload devoted to the Mechanical Engineering Program.

C. Faculty Size

Since the last ABET program review in September 2008, four new tenure track faculty members have been hired at the assistant professor level, with two additional tenure track faculty beginning in Fall 2014. During this time four full professors have retired. Approval has been received to search for and hire two more full-time faculty in 2014-15 and another two in 2015-16. The additional faculty hires are needed as the number of total undergraduates ***has more than doubled over the past five years (from 272 in Fall 2008 to 615 in Fall 2013),*** with this number projected to increase further in the subsequent academic year. When the full time faculty have been assigned to administrative, curriculum development, or research activities, some of the course openings are staffed with competent part time faculty members. In the last five years, fourteen part time faculty have supported the endeavors of the Mechanical Engineering program, with one long-term adjunct faculty member (Eryk Stacy) serving .6 time as academic advisor.

D. Professional Development

Andy Bazar, PE, Professor

- Reviewer for engineering book manuscripts for McGraw Hill, Prentice Hall, John Wiley & Sons, and the Oxford University Press
- Book manuscript, *Space Pioneers* in process
- Regular attendance at National expositions and seminars in the Southern California
- Chair of Department Faculty Search Committee and Department Personnel Committee in AY 2013-2014
- Visitation to several major universities, industrial plants and national expos during sabbatical leave in 2010

Salvador Mayoral, Assistant Professor **(beginning Fall 2014)**

- Upgrading of the CSUF Wind Tunnel Laboratory
- Attended AIAA Aerospace Sciences Meeting, Orlando, FL, 2010 & 2011
- Attended AIAA Aeroacoustics Conference, Miami, FL, 2009

Hossein Moini, Professor

- "Clean Tech Business Plan Competition", Anaheim Center for New Energy Technologies, CSUF, April 2009.
- "Funding Opportunities at NSF and Complex Systems Optimization", by Dr. Robert L. Smith, NSF Program Director for Operations Research, April 2009.
- Workshop on Federal Contract Procurement Training for Minority Serving Institutions, Feb 2009.
- "Harvesting Energy - Entrepreneurial Opportunities in Clean Tech", Caltech/MIT Enterprise Forum. January 2010.
- SAE Seminar Series: "Energy Innovation Performance", and "Design of Hybrid for Everyone", UCI, October 2009.
- "Delivering Quality Education in Times of Financial Crisis", Academic Affairs/Academic Senate Retreat, August 2009.
- "2008 Midyear Economic Forecast, Sponsored by Mihaylo College of Business and Economics", April 2008.
- "Preparing and Submitting Government Contract Proposals", CSUF, January, 2009.
- National Instruments' LabVIEW Hands-On Campus Workshop, UCI, March 2009.
- Workshop on the Application of Camtesia Software, June 2010.
- Live Webinar on Green Energy Simulations, October 2009.
- Live Webinar on Accelerating the Design of Embedded Controls Systems for Vehicle Applications, November 2009. Sponsored by MapleSoft and SAE International.
- Live Webinar on Advanced Physical Modeling Techniques Accelerate the Design of Complex Systems, June 2010. Sponsored by MapleSoft.

Chean Chin Ngo, Assistant Professor

- ABET Program Assessment Workshop, Portland, Oregon, April 14, 2013
- 2013 ABET Symposium, Portland, Oregon, April 12-13, 2013
- NSF Day, University of Southern California, Los Angeles, California, April 12, 2012
- Carbon Capture and Storage: Science, Technology, and Policy, Massachusetts Institute of Technology Professional Education – Short Programs, Cambridge, MA, July 26-28, 2010
- Advanced Renewable Energy for Educators: More Hands On Experience, Solar Energy International, Carbondale, CO, June 28-30, 2010
- Renewable Energy for Educators: How to Implement Renewable Energy Education into Your Classroom, Solar Energy International, Carbondale, CO, June 22-25, 2010
- Grant Writing Workshop, Grant Writing USA, Fargo Regional Training Center, Fargo, ND, September 24-25, 2009

- Computational Engineering for Engineering Educators (COMSOL Multiphysics and OpenFOAM), SC09 Educational Summer Workshop, Ohio Supercomputer Center, Ohio State University, Columbus, OH, July 13-18, 2009

Sang June Oh, Assistant Professor

- Workshop on *Frontiers of Additive Manufacturing Research and Education* (NSF Sponsored), Arlington, VA, June 2013
- ANSYS Seminar on *Design Optimization of Robust and Quiet Electric Machines*, Irvine, CA, November, 2013
- ABET Accreditation Symposium and Assessment Workshop, Portland, OR, April 2013
- NSF Day, University of Southern California, Los Angeles, California, April 2012 and University of San Diego, San Diego, CA, January 2011
- ENGAGE Workshop (NSF Funded) -- Engage Students in Engineering, Denver, CO, May-June 2011
- CSUF Faculty Representative for visitation of National Funding Agencies, Washington, DC, April, 2010
- NSF Grant Proposal Review Panel Member, April and October 2009

Joe Piacenza, Assistant Professor **(beginning Fall 2014)**

- Proposal Key Personnel: "Design of Robust Cyber-Physical Energy Infrastructure Systems" (co-PIs: C. Hoyle, E. Cotilla-Sanchez, I. Y. Tumer, OSU), National Science Foundation, submitted 06/2014
- Proposal Primary Author: "Robust Optimization of Complex Cyber-Physical Systems" (co-PIs: I. Y. Tumer, and C. Hoyle, OSU), NASA Marshall (sub-award to University of Alabama in Huntsville), 03/2013-09/ 2013
- Proposal Primary Author: "Reliability and Functional Failure Analysis of Complex Cyber-Physical Systems" (co-PIs: I. Y. Tumer, and C. Hoyle, OSU), NASA Marshall (sub-award to University of Alabama in Huntsville), 03/2012-09/2012

Nina Robson, Assistant Professor

- CSUF ECS faculty member to discuss research at NSF headquarter, Washington, DC, April 2014
- NSF CAREER and ABET Workshop, ASEE Conference, June, 2013
- Advanced Accident Reconstruction Certification, Texas A&M University, TEEX, Bryan/College Station, TX, April 2012

Haowei Wang, Assistant Professor

- New Faculty Training Program at CSUF, 8/2012-5/2013
- Set up the Combustion Laboratory on Campus, 8/2012-Present
- Submitted NSF Research Proposal, 10/2013
- Attended Combustion Institute conference, Pasadena, CA, 2014

E. Authority and Responsibility of Faculty

The ME Department faculty, as a collaborative team, has the responsibility for ensuring consistency and quality of the courses taught. It is the responsibility of the Department faculty to initiate new courses and modify of existing ones as needed. Each proposed new course or course modifications is evaluated and approved by the entire ME Department faculty before submission to the College Curriculum Committee. Upon approvals by both the College Curriculum Committee, which is composed of representatives of all the departments within the College of Engineering and Computer Science and the Dean, the proposals are submitted to the Provost/Associate Vice President for Academic Programs (AVPAP). The Provost/AVPAP then decides whether further evaluation is required by the University Curriculum Committee. Final approval is granted by the Vice President for Academic Affairs.

TABLE 6.1 FACULTY QUALIFICATIONS

MECHANICAL ENGINEERING PROGRAM

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
Azzazy, Medhat T	Ph.D., Mech. E, 1982	A	NTT	PT	11	40	24	CA	M	L	H
Bailey, Jacob	B.S., Mech. E, 2013	A	NTT	PT	7	1	1	CA	M	M	L
Bazar, Andy	Ph.D., Industrial E, 1974	P	T	FT	5	40	24	CA	M	M	H
DiGilio, Gregory	A.S., Manuf. Tec., 2012	A	NTT	PT	0	6	4	-	L	L	L
Kim, Gyung Hwan	M.S., Mech. E, 2012	A	NTT	PT	2	1	1	-	L	M	L
Mignosa, Peter	M.S., Mech. E., 2009	A	NTT	PT	0	4	4	CA	M	M	H
Moini, Hossein	Ph.D., Mech. E, 1986	P	T	FT	0	34	27	-	L	M	M
Ngo, Chean Chin	Ph.D., Mech. E, 2006	AST	TT	FT	0	6	3	-	M	M	L
Oh, Sang June	Ph.D., Mech. E, 2004	AST	TT	FT	2	6	6	-	M	M	L
Phan, Hai	M.S., Mech. E., 1981	A	NTT	PT	38	28	28	CA	M	M	H
Rikli, Roberta	Ph.D., Higher Ed., 1972	P	T	FT	0	25	41	-	H	M	M
Robson, Nina	Ph.D., Mech. E, 2008	AST	TT	FT	4	5	2	-	H	H	M
Sharma, Pradeep	M.S., Mech. E., 1977	A	NTT	PT	32	20	1	CA; ONT	M	M	L
Stacy, Eryk	B.S., Mech. E, 1994	A	NTT	PT	18	17	17	CA	L	M	L
Wang, Haowei	Ph.D., Mech. E, 2012	AST	TT	FT	0.3	6	2	-	M	H	M

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. Code: FT = Full-time PT = Part-time Appointment at the institution.
4. The level of activity (high, medium or low) should reflect an average over the year prior to the visit plus the two previous years.

TABLE 6.2 FACULTY WORKLOAD SUMMARY

Mechanical Engineering Program

Faculty Member Name	PT or FT[1]	Term and Year[2] Classes Taught (Course No./Credit Hrs.) Note: Course No. Designation - ME as EGME for short	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Azzazy, Medhat T	PT	Fall 2013: ME 417 (3), ME 526 (3) Spring 2014: ME 520 (3)	90%	10%	-	100%
Bailey, Jacob	PT	Fall 2013: ME 322L (3) Spring 2014: ME 322L (3)	100%	-	-	100%
Bazar, Andy	FT	Fall 2013: ME 314 (2), ME 331 (3), ME 454 (3), ME 461 (3) Spring 2014: ME 421 (3), ME 459 (3), ME 460 (3), ME 530 (3)	90%	10%	-	100%
DiGilio, Gregory	PT	Fall 2013: Two Sections of ME 315 (3) Spring 2014: Three Sections of ME 315 (3)	100%	-	-	100%
Kim, Gyung Hwan	PT	Fall 2013: Two Sections of ME 306A (1) Spring 2014: Four Sections of ME 306A (1)	100%	-	-	100%
Mignosa, Peter	PT	Fall 2013: ME 304 (3), ME 426 (3) Spring 2014: ME 407 (3)	100%	-	-	100%
Moini, Hossein	FT	Fall 2013: ME 205 (3), ME 308 (3), ME 424 (3), ME 438 (3) Spring 2014: Two Sections of ME 205 (3), ME 410 (3), ME 576 (3)	100%	-	-	100%
Ngo, Chean Chin	FT	Fall 2013: ME 304 (3), ME 571 (3) Spring 2014: Two Sections of ME 476B (2)	60%	20%	20%	100%
Oh, Sang June	FT	Fall 2013: Two Sections of ME 476A (2) Spring 2014: ME 411 (3), Two Sections of ME 431 (3)	50%	30%	20%	100%

Phan, Hai	PT	Fall 2013: ME 102 (2), ME 322L (3), ME 333 (3) Spring 2014: ME 102 (2), Two Sections of ME 306B (1), ME 490	100%	-	-	100%
Rice, Milo	PT	Fall 2013: ME 335 (3) Spring 2014: ME 421 (3)	100%	-	-	100%
Rikli, Roberta	FT	Fall 2013: Acting Department Chair Spring 2014: Acting Department Chair	-	-	100%	100%
Robson, Nina	FT	Fall 2013: ME 335 (3), ME 414 (3) Spring 2014: ME 419 (2), ME 554 (3)	50%	30%	20%	100%
Sharma, Pradeep	PT	Fall 2013: N/A Spring 2014: ME 451 (3)	100%	-	-	100%
Stacy, Eryk	PT	Fall 2013: Two Sections of ME 102 (2) Spring 2014: ME 102 (2)	100%	-	-	100%
Wang, Haowei	FT	Fall 2013: ME 205 (3), ME 333 (3), ME 540 (3) Spring 2014: ME 304 (3), ME 306B (1), ME 407 (3)	60%	20%	20%	100%

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

CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

Each full-time faculty member has a private office that is approximately 10 ft x 11 ft. Offices contain the usual equipment – desk, chairs, a book case, and file cabinet. Faculty also have a desktop computer, laptop, and access to a printer. The ME Department classrooms/laboratory facilities occupy 10 rooms, with a total of approximately 17,500 square feet of total space. Plus there are three smaller rooms equipped with computers and access to the Internet that are assigned as student project rooms for students' work on their capstone design projects. Most classrooms used by the ME students have a capacity 30 to 70 students. Overhead projectors and screens are standard equipment in each classroom. There have been several classroom upgrades since last ABET program review in Fall 2008 that include "Smart Classroom" features. This type of classroom features high tech multimedia equipment and instructional computer that include DVD player, multiple projectors, speakers and the Internet access. Instructors can communicate interactively with students through computers in near real time. Recent classroom renovations such as Room CS-304 (Smart Classroom with 48 Dell computer stations), Room E-201 (Figure 7.1, Smart Classroom with dual projectors and 70 student capacity), and Room CS-309 (Figure 7.2 Smart Classroom with 40 Dell computer stations) are where many of mechanical engineering courses are held.

Figure 7.1 Upgrade of Classroom E-201

Figure 7.2 Upgrade of Classroom CS-309

The following is a description of major equipment that a available in the Department laboratories to support the attainment of the student outcomes and to provide an atmosphere conducive to learning. A list of major instructional and laboratory equipment is also provided in Appendix C.

Computer-Aided Design Laboratories

The Computer-Aided Design Labs (Rooms CS-304, CS-309) are used in several courses (e.g., EGME 102, 322L, 410, 411, 414, 419, and 422). It supports students' studies on modeling, analysis, simulations, and design of systems/components. In addition to being available for regular courses, the lab is accessible for work on student design projects. The labs are continuously updated with top-of-the-line workstations and latest versions of industry-standard software. See Criterion 4, Section B for a complete description of the CS 304 and 309 Computer Labs.

***Unified Engineering Laboratory* (*EGME 306A*)**

The purpose of this introductory measurement laboratory is to support student education in the areas of materials, mechanics, and dynamics. The lab has four computer workstations with National Instruments data acquisition boards and LabVIEW software, providing capabilities for computer-aided testing, measurements and signal processing. Additional computers, running Microsoft Office, are also available for students' use to perform data manipulation/reduction and analysis for the experiments, and to prepare reports. Students have access to the following equipment in this lab:

- MTS Insight 50 Testing Machines – to conduct tensile and compression, and deflection/bending tests (Figure 7.3).

- Charpy Impact Test Machine – to perform impact testing, and investigate the ductile to brittle transition temperature for various materials at different temperatures.
- Column Testing Machines – to study the crushing and buckling behavior of columns under axial compressive loading, and determine the critical loads of columns.

Figure 7.3 MTS Testing Machines

***Fluids and Thermal Laboratory* (*EGME 306B*)**

This laboratory houses equipment for validating theoretical concepts in fluid mechanics and heat transfer. Computer-aided data acquisition workstations running the LabVIEW software are used for velocity measurements using the hot-wire anemometer and temperature measurements. Students have access to the following equipment in this lab:

- Air Duct – to investigate the flow of air through a duct and examine pressure drop along the duct, as well as the velocity profile through the duct cross-section.
- Water Venturi Meter Experiment – to investigate the fluid mechanics principles, which govern the flow of an incompressible fluid through a venturi meter.
- Water Pipe Circuit Experiment – to study fluid mechanics principles that govern the flow of an incompressible fluid through pipe fixtures and straight and bent pipe sections; friction factors and loss coefficients based on pipe dimensions and configurations; and Reynolds Numbers for the different flow rates.
- Subsonic Wind Tunnel – to evaluate the principles that govern the flow of an incompressible fluid over various types of bluff and streamlined bodies as well as airfoil models consisting of different flap/slat configurations (Figure 7.4).
- Hampden shell-and-tube heat transfer system with LabVIEW logging capability (Figure 7.5).

Figure 7.4 Subsonic Wind Tunnel

Figure 7.5 Hampden Shell-and-Tube Heat Transfer System

***Dynamic Systems and Controls Laboratory* (*EGME 476A*)**

This lab supports student education in the areas of modeling of dynamic systems, vibrations, and controls. Computer-aided data acquisition workstations and LabVIEW data acquisition software are available for modal analysis. Furthermore, students are exposed to computer simulations for system analysis and control purposes, using the MATLAB/SIMULINK software. Students have access to the following equipment in this lab:

- ECP Model 750 Control Moment Gyroscopes – to determine the relationship between the spin and precession angular velocities, and the applied moment of a gyroscope (Figure 7.6).
- Multi-Degree of Freedom Spring-Mass Vibrating System Integrated with a High-Speed DSP-Based Control System – to measure and control several variables in real-time. This module enables students to perform a variety of experiments, e.g., subjecting the dynamic system to different loading conditions, evaluating its harmonic and transient responses, and implementing different control strategies (Figure 7.7).
- Spectra Quest Machinery Fault Simulator – to check experimentally the methods of calculating the positions of counter balancing weights in rotating mass systems (Figure 7.8).
- Quanser Control Experiment Modules – to conduct various control experiments that include DC Motor, Velocity Control Experiments, 2D Helicopter, and Ball and a Beam Control Experiment (Figure 7.9)
- Beam Vibration – to investigate the resonance phenomena and measure the natural frequency of a beam.
- B & K Shaker Table – to investigate the response of vibrating system that is subjected to different loading conditions with different frequencies.
- Torsional Pendulum – to determine the damping coefficient of a rotary oscillating system as a function of submergence depth for the torsional oscillator in a liquid.

Figure 7.6 ECP Control Moment Gyroscope

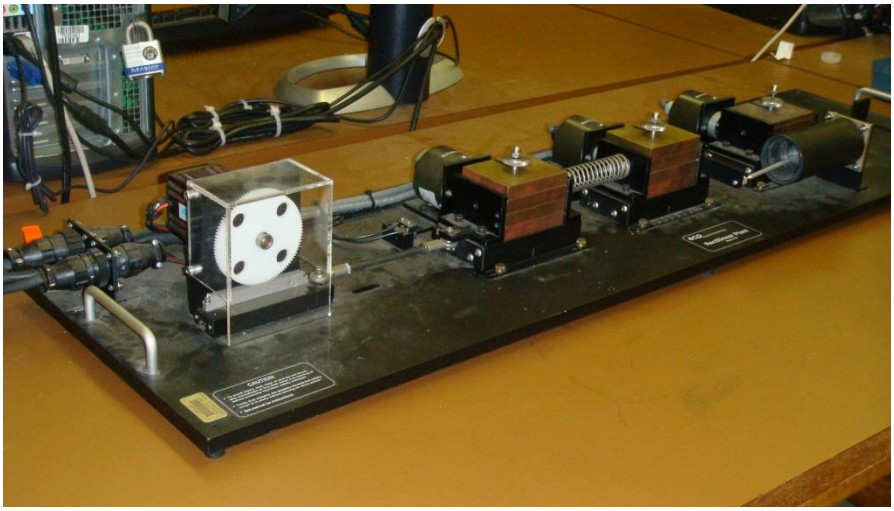


Figure 7.7 Multi-Degree of Freedom Vibration and Control System

Figure 7.8 Spectra Quest Machinery Fault Simulator

Figure 7.9 *Quanser* Control Experiment Modules

***Energy and Power Laboratory* (*EGME 476B*)**

The Power and Energy laboratory is equipped with heat pipes, a cooling tower, refrigeration units, a heat conduction unit, a ramjet, a turbulent flow water heat transfer unit, and internal combustion and diesel engines. Computer workstations with integrated National Instruments data acquisition boards and LabVIEW are used for computer-aided testing of the ramjet, oil flow experiments, and conduction experiments. The ANSYS Flowtran computer software, which is industry-standard software for computational fluid dynamics study, is available for simulation of fluid systems. Students have access to the following equipment in this lab:

- Double Pipe Heat Exchanger – to study the heat transfer characteristics of a double pipe heat exchanger using hot and cold water as the working fluid (Figure 7.10).
- Flotek 306 Subsonic Wind Tunnel – to examine lift and drag characteristics of an NACA airfoil and velocity pressure profile around the airfoil (Figure 7.11).

- Hampden Refrigeration Unit – to investigate refrigeration theory, and determine the coefficient of performance for different operating conditions.
- Oil Pipe Flow – to examine the flow of oil in a pipe. Laminar, transition, turbulent flow conditions are explored and the use of a hot film anemometer to measure velocity profiles is introduced.

Figure 7.10 Double Pipe Heat Exchanger

Figure 7.11 Flotek Subsonic Wind Tunnel

Newest additions to EGME 476B

- **TurboGen Gas Turbine Electrical Generation System:** TurboGen, one of the newest units offered by Turbine Technologies, LTD, has been added to our EGME 476B Energy and Power Laboratory. TurboGen consists of an engine/generator combination: (a) SR-30 engine with a radial flow centrifugal compressor, a reverse flow annular combustor and an axial flow turbine, and (b) a trust driven free power turbine directly coupled to TG-2000 electrical generator. TurboGen comes with a laptop computer equipped with National Instruments DAQ system with LabVIEW display. This TurboGen unit provides a platform for the study of gas turbine power systems and gas turbine electrical generation systems. Students are able to apply the theories and concepts introduced in thermodynamics, fluid mechanics and heat transfer courses to the operation of an actual engine using Brayton cycle analysis. (Figure 7.12)

Figure 7.12 ***Turbogen Gas Turbine Electrical Generation System***

- **H-SHSP-1 Solar Heat and Solar Photovoltaic Trainer:** H-SHSP-1 Solar Heat and Solar Photovoltaic Trainer, offered by Hampden Engineering Corporation through Ranesco Technical Training, is the latest equipment addition to our EGME 476B Energy and Power Laboratory (Figure 7.13). H-SHSP-1 consists of both solar voltaic and solar hot water: (a) two solar photovoltaic modules, a charge controller controls the charging of a 12V DC battery and a 375W inverter to convert the 12V DC to 120V AC, and (b) a flat panel solar cell collector, a water tube solar collector along with circulation pumps. H-SHSP-1 comes with a computer data logging option. This solar heat and solar photovoltaic trainer provides a platform for incorporating solar energy study into our mechanical engineering undergraduate curriculum. It allows students to examine the hot

water and electrical layouts and operational features associated with a solar heating system and photovoltaic power source. Our students will be beneficial through the integration of modern and cutting-edge knowledge in alternative energy through the addition of this solar heat and solar photovoltaic trainer.

Figure 7.13 Solar Heat and Solar Photovoltaic Trainer

Engineering Machine Shop (EGME 315 & 419)

The Engineering Machine Shop serves all the departments in the College of ECS. It is well equipped with conventional metalworking machines and woodworking capabilities. Staffed by a full-time machinist experienced in prototype as well as production processes, the Machine Shop provides fabrication tools and hands-on experience to ME students through design and team projects. New additions to the machine shop include six CNC machines by Haas that worth more than $290,000. These machines include two TL-1 models (conventional/CNC lathes - Figure 7.14), two TM-2 models (conventional/ CNC mills), one SL-20 (turning Center: lathe with auto tool changer) and one VF-3 model (vertical machining center: 5-axis milling machine). Figure 7.15 shows the TL1, TM2, and VF-3 CNC machines. These machines introduce students to production manufacturing technology and prepare them to consider many facets of machining that could not be taught using conventional machines. The modified EGME 315 course material will include modern cutter geometry, tool offsets, calculable feed rates, and G-code programming. In addition, undergraduate students create prototypes using the existing 3D printer to realize a model before heading to actual manufacturing of the project (Figure 7.16).

Figure 7.14 Hass TL-1 Conventional/CNC Lathe

Figure 7.15 Hass TL1, TM2, and VF-3 CNC Machines

Figure 7.16 3D Systems Rapid Prototyping Machine

B. Computing Resources

Beyond the facilities and services available in the department and the college, the university has outstanding computing facilities services. These are under the jurisdiction of the Division of Information Technology.

Information Technology at California State University, Fullerton

Information Technology at the university level at Cal State Fullerton are abundant, ubiquitous and cutting-edge. The College of Engineering and Computer Science has an exceptionally close relationship with Campus IT, as this operation is affectionately called. Engineering and Computer Science students benefit from such close working relationship. First, IT helps the college obtain special volume purchase "deals" from computer and other IT vendors by making college purchases part of larger orders. Second, IT understands the special needs of this college and works with faculty and technicians in planning and operating our laboratories.

Facilities and services provided by IT

1. Information and Learning Commons (ILC) & Computing Labs

The Information & Learning Commons (ILC) is a collaboration with Information Technology and the Pollak Library. The ILC integrates technology to provide full service student support for research, writing assistance, and computer work space for papers and projects in a single space. There are some 20 ILCs operated university wide by the Division of Information Technology. A sample of six such labs that is most appropriate for engineering and computer science students are listed below.

ILC Titan Lab (*Pollack Library North Basement*):

- 213 PCs and 5 Macs
- USB port access
- DVD/CD RW drive
- Media card reader
- 6 Scanner stations
- 12 workstations equipped with headphones
- Disabled student workstations
- CSVT machine for loading funds on the Titan Card
- CD-R, DVD-R, USB flash drives, and headphones are available for purchase

ILC Oasis North:

- 133 PCs and 10 Macs

- USB port access
- DVD/CD RW
- Media card reader
- 5 workstations equipped with headphones
- 20 laptops for checkout
- 50 iPads for checkout
- 7 equipped with group study rooms
- Graduate Student Study Center
- Workspace for personal laptops and collaborative activities

ILC Oasis South:
- 36 PCs
- Workspace for personal laptops and collaborative activities

ILC 2nd Floor:
- 39 PCs
- Workspace for personal laptops and collaborative activities

ILC 4th Floor:
- 51 Macs (located in Audio Visual Rooms)
- Workspace for personal laptops and collaborative activities

Open Labs CS-200 and CS-202:
- 57 PCs
- 2 Black and White Printers
- 1 Scanner
- Labs & Software information

2. IT Training and Support

IT Training & Support provides documentation, training, and support to campus constituents on a wide variety of programs.
The team primarily supports PeopleSoft applications and Desktop Applications such as Microsoft Office. Additional IT applications are also supported. A sample is given below
- lynda.com Training
- Absence Management Training
- Data Warehouse Training
- Outlook Anywhere
- Common Financial System (CFS) Training
- IT Training News & Updates

3. Academic Technology Center

The Academic Technology Office (ATO) provides strategic leadership and direction for all campus academic technology applications, initiatives, and support services. The ATO provides leadership in partnership with Academic Affairs for operational and strategic planning and policy related to academic computing such as e-learning, instructional technology, and research and assessment. These efforts ensure that academic technology issues and requirements are incorporated into the university's overall technology plan.

4. Installation and Break-fix support

IT supports all the software on our PC and Mac "images". What is a computer image? IT defines a computer image as a set of software packages that it has customized for a certain hardware platform. IT currently has numerous images for most of the standard campus hardware IT supports. Here is a list of supported software on CSUF campus images: Windows 7 Enterprise, Microsoft Office 2013, Internet Explorer, Firefox, Safari, Adobe Acrobat X Pro, Adobe Flash player, Adobe Reader, Adobe Air, Adobe Shockwave Player, iTunes, QuickTime, iLife, Java, and FileNet. IT also supports the following software packages that are not included on the standard campus image: Adobe Creative products, SPSS, SAS, and iWork.

5. Home Use Software

The following software titles are available to full-time and part-time faculty and staff for home use only. Windows 7 Ultimate (Upgrade Only), Window 8 Professional 64-bit (Upgrade Only),Vista Ultimate, Office 2007, Office 2010, Office 2013, Mac Office 2008, Mac Office 2011, Adobe Acrobat X Pro, IBM SPSS Statistics 21, SAS Version 6, SAS Version 9.3, and VPN. These applications are available through the CSU Microsoft Campus Enterprise Agreement and licensing with SPSS. To obtain copies of the available at home use software packages an online form needs to be completed and submitted. When the software is ready, the faculty member (or staff person) will receive an email confirmation asking him or her for their software pick up.

C. Guidance

The instructional laboratories are taught by the *faculty* who are well prepared on the equipment and safety procedures that are used in the classroom. In general, the instructor of the lab course directly trains/teaches students on the use of the instructional equipment. During this process, safety topics are carefully addressed. These include eye protection, appropriate attire, and emergency preparedness. The department lab technician is certified for laboratory safety procedures. The technician makes sure that all equipment and tools are maintained in safe, good

operating mode. Most equipment comes with electronic manuals or instructions from websites. The use of the computer and software programs are described in labs where they are required. Many of the software programs are available to students, with site licensing arrangements through the university. The department also has an IT technician who maintains computer facilities and update software on a regular basis.

D. Maintenance and Upgrading of Facilities

Since the last ABET review, the ME Department and the College of ECS budgets have provided over $1 million in funding to maintain and upgrade laboratory equipment and classroom/computing facilities. More specifically, as indicated in Criterion 4, Section B Continuous Improvement, $358,000 has been spent since 2008 in upgrading classrooms and computing facilities and $501,865 on other equipment upgrades. Also an additional $150,000 has been spent on minor equipment repairs and maintenance and software upgrades. Minor equipment repair work is done by the laboratory technicians with the support of the Engineering and Computer Science Machine Shop, equipped with a multi-million dollar, state of the art CNC machining center. In addition, the Department IT Technician receives support from the University IT Office to maintain, upgrade and operate computing facilities. If the need arises for upgrade or replacement of tools, equipment, or computing resources by the faculty of staffs of the department, it is brought to immediate attention to the department chair. The department chair then discusses the direction of upgrades or replacement in a faculty meeting. After the department decision is made, the proposal for upgrade or replacement is sent to the College of ECS Dean for the final approval.

E. Library Services

Designed to facilitate the delivery of recorded knowledge and information in support of instruction and faculty research, the Library serves as the hub of the University's information and instruction network. The Library also participates in the University's instruction programs and shares its commitment to lifelong learning.

The Paulina June and George Pollak Library and a small satellite library located at the Irvine campus provide a full range of services to faculty, students, and community users. The Library's staff includes 29 librarians and 40 paraprofessionals plus approximately 110 student assistants. The Library's Web site (http://www.library.fullerton.edu) serves as a gateway to information about library resources and services and is a vital component of the Library's extensive instruction program.

1. Equipment and Technology

Pollak Library holds just over 1,350,000 volumes and provides access to a wide variety of electronic content, including over 200 databases and nearly 200,000 ebooks.

Databases of particular interest to Computer Sciences and Engineering include:

- ACM Digital Library
- Engineering Village
- IEEE Xplore
- Web of Science
- ScienceDirect
- SpringerLink Journals
- OmniFile Full Text Mega
- Academic Search Premier
- Access Science
- Compendex
- Wiley Online Library

The Library also utilizes the Summon discovery service which can be accessed through our Basic Search. Summon provides users with access to thousands of journals including many in the fields of Computer Science and Engineering.

Library Facilities

The Pollak Library has over 500 computers available located throughout the North and South buildings. The library is also home to the Information & Learning Commons (ILC), a main hub for research activities. A service desk staffed by the Reference Team (librarians and library staff) and Information Technology staff is located on the first floor to assist users with research needs and to provide technical support. Wireless access and docking stations are available throughout Library North and Library South. Electronic resources for the visually disabled are also available.

2. Reference and Instruction Services

The Pollak Library's reference and instruction services are designed to teach students to be information literate, to be critical thinkers, and intelligent researchers. The mission of the Library's Instruction program is to prepare CSUF students to be successful information seekers in a rapidly changing technological environment.

Reference

The Library provides several types of reference services to students, faculty, and community. At the Reference Desk, located in the ILC, the Reference Team provides immediate, point-of-need information and research assistance during the Library's scheduled hours of service. The Library's Reference team provides services using a variety of methods, including:

- Telephone Reference—Phone service during Library hours.
- Chat Reference—Online assistance available 24/7.
- Library Answers—Questions answered through email.

- IM Reference—Questions answered through instant messaging during Library hours.

The Library also offers a research consultation service that provides in-depth, one-on-one research assistance on a specific assignment, topic, or thesis. The sessions, available by appointment, are conducted by librarian subject specialists. Virtual consultations are also available for out distance students.

Instruction

Librarians at the Pollak Library teach between 250 and 350 instruction sessions per semester. The Library bases its instruction philosophy and practice on Association of College & Research Libraries' (ACRL) Information Literacy Competency Standards for Higher Education (http://www.ala.org/acrl/standards/informationliteracycompetency). The Library utilizes a team approach to deliver instruction to all departments and programs of the University. Librarians on the Engineering and Computer Sciences/Natural Sciences and Mathematics (ECS/NSM) Instruction Team provide library instruction to students in the program upon the request of the course instructor. This approach ensures students in need of research support are served through instruction sessions targeted to their specific course and delivered to meet the needs of specific research assignments or requirements.

Instruction librarians also often create web portals that are tailored to each individual class that is brought into the library. These library guides provide information to students that is relevant to their assignments. A complete list of guides is available here:
http://libraryguides.fullerton.edu/browse.php

To assess and evaluate instruction efforts, surveys are sent to faculty following library instruction sessions in an effort to gather constructive feedback. Results of the surveys are confidential, and they provide library faculty with useful input pertaining to student learning, student engagement, and instructional resources. The Program also utilizes peer evaluation of selected instruction sessions to provide feedback to instruction librarians.

3. Other Services

Circulation

Students and faculty check out materials using their Titan cards. Most library materials circulate for 60 days. However, checked out materials are subject to recall after 10 days if requested by another borrower. Students and faculty can check out up to 150 items. Renewal of library materials can be done in person, via the telephone or online at the Library's Website. For additional details, see http://www.library.fullerton.edu/about/guidelines/privileges.php

Course Reserves

The Library maintains a course reserves collection of supplementary course materials provided by faculty in support of course curriculum. The Library accommodates reserves in several formats. Digitized copies of print or audiovisual materials are accessed using course management software available to students and faculty via the campus portal site. Digitized reserves can be accessed at any time. Support for using Titanium, our campus course management software, is provided by The Faculty Development Center (assistance to faculty) and IT Help Desk (assistance to students). Reserves in any format (books, textbooks, sample projects, etc.) can be borrowed from the course reserves desk during the hours the Library is open. Complete information regarding course reserves can be found on the Library's Website at http://www.library.fullerton.edu/services/course-reserves.php

Interlibrary Loan

ILLiad, a web-based interlibrary loan system, allows students and faculty to request articles, books, and other materials online. ILLiad is used when the requested materials are not in the library. Interlibrary loan staff may obtain requested items from libraries worldwide. Most materials can be borrowed free of charge. Detailed information regarding the Library's Interlibrary Loan services is maintained at the Library's Website at https://www.library.fullerton.edu/services/interlibrary-loan.php

The Library also maintains reciprocal borrowing arrangements that allow CSUF students, faculty, and staff to go directly to other libraries and borrow the resources they need in person. Reciprocal arrangements exist among the 22 sister institutions in the California State University system and with several institutions in the local area, including Biola, Cerritos College, Hope International University, Marymount College, Santiago Canyon College, and the Southern California University of Health Sciences.

4. Library Collections

As mentioned in Section I above, the Library has a significant collection of materials that support the study and research required by the **College of Engineering and Computer Science**. The Library welcomes input from faculty on the selection and purchasing of resources and materials that support the curriculum and, as funds permit, the research needs of the faculty. Through collaboration with the California State University system as a whole, as well as local subscriptions, the Library provides access to resources essential to the study of Engineering and Computer Science, such as the ACM Digital Library, Engineering Village, IEEE Xplore, Web of Science, and others listed above.

Through an established approval plan, selections by the Engineering librarian, and faculty requests, books in both print and electronic formats are added regularly. Current book holdings are as follows:

Pollak Library print and electronic book collections for College of Engineering and Computer Science	
	Current collection holdings
Engineering: Call numbers T - TP	24,099
Chemistry: Call number QD	5,383
Math & Computer Science: Call number QA	22,809
Physics: Call number QC	10,494
Technology: Call number TS	1,591
TOTAL	**64,376**

The Library also maintains a number of journal subscriptions relevant to Engineering and Computer Science as follows:

Pollak Library journal collections for College of Engineering and Computer Science	
	Current collection holdings
Engineering and Computer Science (including all subcategories, some of which are included below)	7124
Civil Engineering	1004
Information Technology and Computer Science	1797
Electrical Engineering	875
Mechanical Engineering	**451**

F. Overall Comments on Facilities

The College of Engineering and Computer Science has qualified professional staff who manage and maintain laboratory equipment and computing facilities. The Lab Technician checks instructional laboratory equipment for safety concerns before students run an experiment or machine. The IT Technician is always up to date with management of computing facilities. Overall, the facilities and management system available in the Mechanical Engineering Department are adequate to support successful attainment of the PEOs and SOs of the Mechanical Engineering Program.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

The Chair of the Mechanical Engineering Department has the leadership responsibility of the program. Since January, 2012, Dr. Roberta Rikli has been the Acting Chair of the Mechanical Engineering Department. The Chair has the following leadership responsibilities to ensure the quality and continuity of the program:

- To develop a harmonious and collegial environment within the department
- To ensure that the department is aware of, and operates within the framework of the University, College, and Department mission and objectives
- To facilitate collaboration and cooperation between the Department, other departments or units within the College and with the Dean's Office.
- To serve as a representative of the Department to the College, University, and external community outside of the University
- To supervise and coordinate all routine Departmental functions such as budget management, curriculum, course schedules, personnel actions, and faculty and staff recruitment.

The program is also supported by an elected Continuous Improvement Committee which reviews program assessment results and makes recommendations for improvement. All recommendations are then considered by and voted on by the faculty as whole. Recommendations involving budget, personnel, policy, and curriculum changes are submitted to the Dean of the College of Engineering and Computer Science, Dr. Raman Unnikrishnan, for his review before being forwarded to the Chief Academic Officer for the University, Dr. Jose Cruz, Provost/Vice President for Academic Affairs.

B. Program Budget and Financial Support

As part of the California State University (CSU) system, the main source of financial support comes from the State of California. The budgeting systems in the Cal State system differs from how budgeting is done in several universities in the east coast, most private universities and all private businesses. In these institutions, budget process involves the proposal by operating units for funding based on projected needs for the upcoming year followed by administrative scrutiny of the proposal and funding decision by central administration.

In the CSU system the funding process may be better described as "allocation" as opposed to "budgeting." The Governor and the Legislature in Sacramento allocates a certain sum to operate the Cal State System. Then the Chancellor allocates a certain number to CSUF, one of the 21 campuses within the system. The allocation is loosely based on the number of FTES (Full Time Equivalent Students) per campus. The formula for these allocations is complicated and is not

uniform. Therefore, there is some uncertainty about how much funding will be available during each year. The allocations within CSUF start with historical data and precedence. This means that in a given fiscal year, the College of Engineering and Computer Science will receive at least what it received the previous year. There have been, however, variations to such allocation during the recent recession.

The allocation for each college is negotiated by the respective deans with the Provost/Vice President and is based on FTES generated. The enrollment number (FTES) divided by the SFR leads to the number of faculty positions available for a given program. Colleges with large service courses such as Humanities and Social Sciences and Natural Sciences and Mathematics manage their operations based on the SFR (Student Faculty Ratio) model. ECS operation tends to be slightly different.

There are two parts to the budget- baseline budget, a fraction that has recurring obligations to the college, university and the state and one-time money, funds that are allocated on an as available basis without any firm legal obligations for payment every year. Salaries for tenured and tenure track faculty members as well as fulltime staff are in the baseline category where as the operational expenses will be categorized as one-time funds. Of the baseline funds, the most important is the number of faculty positions available in each college.

The Dean of the College makes allocations to each department based on projected number of FTES, full-time equivalent faculty, and on various other needs and parameters. Fortunately, it has been recognized by the university administration that education of engineering students carries a higher than average cost which has permitted the ME Department to operate at a lower student/faculty ratio (SFR) than many other university programs. ME Department has, therefore, the freedom to offer lower level classes with slightly higher enrollment and offer more elective classes with lower enrollment.

Whereas, the university is funded at an SFR of 20.4, the College of ECS is funded at an SFR of approximately 17.1. Within the college, the distribution of faculty positions is not formulaic since the needs are vastly different. Regardless of the size of the program, a critical size of faculty is needed in order to deliver the curriculum, advise students, manage laboratories, interface with external constituencies, engage students in research and provide overall technical leadership in the professional arena in the region. The needs of the program to recruit faculty representing sub-disciplinary areas such as thermal systems, controls, manufacturing and engineering design are also taken into consideration during the allocation of funds. The dean negotiates with the central administration for positions based on these factors and distributes faculty positions to different programs. Such an approach has worked as far as faculty positions are concerned.

Operational expense and equipment budget does not follow the same pattern. It is also recognized that engineering disciplines require resources beyond the standard FTES model, especially to support maintenance and upgrading of laboratories. In addition, a portion of student fees go to each department each year to help to support routine, ongoing instructional costs such as equipment repairs and replacement, supplies, and special enrichment opportunities (e.g., outside speakers, workshops, and seminars). Funds from miscellaneous course fee can be used to purchase laboratory supplies, instructional equipment and classroom materials. Operationally, the department spends down the miscellaneous course fee first and preserves the general operating funds (with fewer restrictions on spending) for other purposes such as faculty travel. The Department's OE&E budget allocation from the college each year has been sufficient to provide for student graders or student assistants as needed for large lecture classes (>40 students) or large lab classes (>20 students) where there is heavy grading.

However, with the declining proportion of funding that comes from the State of California, it has become necessary to seek supplemental funding in other areas. The Director of Development for ECS, Hart Roussel, has been successful in acquiring external funding and in-kind equipment donations to help support various student projects, especially senior design projects. The Dean's discretionary funds have helped major capital projects such as the renovation of E-201 classroom and CS-309 and CS-304 ME Computer Laboratories. The significant improvements in the College Machine Shop also have come from the dean's funds. The department was also successful in receiving over $50,000 over the past two years for Instructionally Related Activity (IRA) from Associated Students to support expenses for senior design projects and for travel to enter national competitions.

Although finding sufficient funding to support costly engineering programs is always a challenge, the combination of State and various sources of non-state outside support has been adequate to provide a quality education for ME students as evidenced by the success rate on meeting student outcomes. *Suffice to say, not a single ME classroom or laboratory need has not been met for lack of funds.*

C. Staffing

Program Staff: The ME program is serviced by 2.5 full time staff at the current time—a full-time Administrative Support Coordinator (Charlotte Morgutia), a full-time Equipment Technician (Donald Ray), and a half-time Information Technology Consultant (Thao Nguyen) who also is half time with the Department of Civil and Environmental Engineering. Major responsibilities for these staff are:

***ASC* (*Administrative Support Coordinator*)** – provides full range of general office and administrative support to the ME department chair, faculty, and students. Tasks include processing and handling of course schedules, room assignments, travel, textbook requests, part-

time contracts, student assistant contracts, advising appointments, phone calls, OE&E budgets, supply orders, and managing faculty recruitment and files.

Equipment Technician – Maintains and repairs laboratory equipment, sets up and prepares equipment for laboratory instruction and experiments, fabricates equipment, test runs equipment, maintains equipment manuals and documentation, assists students with lab experiments and projects, interfaces computer software with machines, etc.

IT Consultant – Maintains and services four computer labs with over 150 workstations, all of which have state-of-the-art technology; also services and maintains more than a dozen other computers housed throughout the various labs for student and faculty use on specialized projects; coordinates licensure agreements for more than a dozen software programs such as SolidWorks, Autodesk, Pro/E, Mathcad, MATLAB, LabVIEW, Multisim, 2D design, Rocscience, Bentley rail Track Design, Microstation, SAP and Staad Pro; installs software and software updates on all machines; serves as system administrator for four departmental servers.

Institutional Support: Additional support to the ME program is provided by a number of university offices such as the Instructional Technology Center which provides a 24-hour Help Desk for assistance with computer-related problems and other units that provide assistance with space planning, facilities management, alumni relations, and philanthropic and external grant support.

Adequacy of Staff Support: Although staff support was adequate until the recent surge in enrollment growth (with a more than doubling in the size of the ME Department over the past five years, from 272 majors in Fall 2009 to 615 in Fall 201), the current staff is not adequate to meet the needs of the program. Fortunately, recruitment is currently underway for an additional Administrative Support Coordinator which will serve both the ME and CEE Departments, resulting in an additional .5 in office staff support for ME. Also, if enrollment growth continues as predicted, within the next year the program will need its own full-time IT staff consultant, rather than sharing with CEE.

D. Faculty Hiring and Retention

Faculty Hiring Process: University procedures for hiring new faculty are well-defined and described in a University Policy Statement (UPS 210.001). Below are key elements of the process.

Authorization of Positions -- Each year, on a date designated in advance by the Vice President for Academic Affairs, and following consultation with an appropriate departmental committee, which shall include at least one member of the departmental personnel committee (DPC), each

Department Chair and the chair of the appropriate departmental committee shall submit to the dean of the college a request for additional faculty for the following year. College deans will submit their college's request to the Vice President for Academic Affairs. After the budget for faculty positions has been determined, the Vice President for Academic Affairs will consult with the academic deans and determine the number of positions and probable ranks to be included in the faculty allocation for the following year.

Position Description and Recruitment Plan -- Implementation of the search for a new faculty member shall be primarily the responsibility of the department chair concerned. Chairs are responsible for ensuring compliance with the Diversity and Equity Program's procedures for faculty recruitment. This includes identifying advertising sources, preparation and submission of a position description, announcement and recruitment plan. The college dean and the Diversity and Equity Program Director will review, consult and approve these documents.

Selection of Department Recruitment Committee -- Each department or equivalent unit shall elect a Recruitment/Search Committee for the purpose of reviewing and recommending individuals for probationary appointments. The Recruitment/Search Committee shall elect a chair from its membership. All tenured and tenure-track faculty are invited to participate in the selection of their future colleagues. These faculty may review letters of application, vitae, transcripts (exclusive of candidate's social security number and restricted or personal information) and written statements. In addition, the members of the Recruitment/Search Committee will review the following restricted documents: letters of recommendation, reference checks/notes. Prior to inviting candidates to the campus, the search committee members will solicit feedback from the entire tenured and tenure-track faculty.

Screening of Applicants -- The Department Recruitment/Search Committee will screen all application materials to determine whether the candidates meet minimum qualifications and recommend a list of finalists for on-campus interviews. Under the direction of the Department and Committee chairs, committee members may also conduct reference checks with individuals who are able to comment on the applicant's qualifications and suitability.

On Campus Interviews -- The Department Chair and the Chair of the Recruitment/Search Committee will review the applicant pool and recommendations of finalists with the College Dean. Final candidates should be interviewed by the Department Recruitment/Search Committee and appropriate departmental faculty, and should be invited to spend a day or so on campus when they will also meet with the College Dean and, where possible, with students.

Recommendations -- The Department Recruitment/Search Committee meets, accepts, rejects, and/or ranks candidates, then makes recommendation to the department. After approval by a majority of the department and by the Department Chair, the Department Chair and the Chair

of the Recruitment/Search Committee shall consult with the College Dean regarding the Committee's recommendation and terms of the offer. In voting on the recommendations of the Department/Recruitment/Search Committees, only tenured and tenure-track faculty members in the department shall vote.

Final Actions -- The Department Chair forwards required documents, including an Affirmative Action Process Summary form, to the Vice President for Academic Affairs via the Dean and Faculty Affairs and Records so that a formal written offer can be prepared. An appointment offer of a new full-time faculty member is made by the dean after concurrence of the Vice President.

Retention of Faculty: Retention of highly qualified faculty is a major pillar of the University's Strategic Plan, as well as a major goal of the Department. As such, a number of strategies have been implemented to facilitate retention which include offering competitive salaries when faculty are first hired, providing attractive start-up packages to support faculty research (typically in the $60,000 range for recent hires), offering reduced teaching loads during the first three semesters (a 3-unit course reduction), and providing student assistant and student grader help for faculty.

In addition, Cal State Fullerton is recognized among the 23 CSU campuses as having one of the best and most comprehensive Faculty Development Centers in the system and perhaps the nation. Also, as further described below, the University provides extensive research development, pedagogical, and faculty enrichment opportunities for its faculty.

E. Support of Faculty Professional Development

The University provides an extensive array of professional development opportunities for faculty that support both their pedagogical development and disciplinary advancement. In fact, there are far more opportunities than most faculty could ever take advantage of. The Faculty Development Center (FDC), recognized as one of the best among the CSU's, offers a broad spectrum of professional development activities that include:

- providing individualized and group support and training to faculty in instructional technology and use of assessment;
- providing support to faculty regarding special issues (e.g., community-based service learning, peer support of teaching, diversity issues, statistics and research design consultation);
- assisting new and tenure-track faculty with an on-going orientation and retention/tenure/promotion workshop series;
- sponsoring an annual program of support for Chairs;
- organizing campus-wide conferences, seminars, workshops, and colloquia across a large variety of professional development topics

- coordinating several intramural funding programs directly supporting teaching and scholarly/creative activities.

Additional types of faculty support offered by the ME Department and other units include:

- Attractive start-up funding for newly hired faculty, as well as a reduced teaching load
- An Incentive Intramural Grant Proposal Program to support proposal writing for external grants
- Junior/Senior Intramural Grant Program to support and enhance faculty research resulting in the following specific outcomes: 1) publications; 2) peer-reviewed conference presentations; 3) performance/exhibits; 4) pilot project implementation; and 5) professional development.
- International Travel Awards for reimbursement of international travel expenses to present peer-reviewed research papers (sponsored by Office of Academic Affairs)
- Domestic Travel Awards to professional conferences and meetings for faculty who have papers accepted for presentation.
- Faculty Sabbatical and Difference in Pay Leaves – available to faculty after having served full time for six years at the campus in the preceding seven-year period prior to the leave and at least six years after any previous sabbatical leave or difference-in-pay leave. A sabbatical leave shall be for the purpose of individual professional development that provides a benefit to the CSU, such as research, scholarly or creative activity, instructional improvement, or faculty retraining.
- Office of Grants and Contracts assistance with preparation of external grants and contracts
- Office of Sponsored Programs assistance with post award administration

PROGRAM CRITERIA

A. Curriculum

- **Well balanced depth and breadth of *Mechanical Systems* and *Thermal Systems* within the discipline of Mechanical Engineering.**

The Mechanical Engineering Department provides students well balanced required courses in Mechanical Engineering that represent both of the traditional stems of *Mechanical Systems* and *Thermal Systems*. The objective of this Program Criterion is to prepare students to well attain the Student Outcomes before graduation, then ultimately, fulfill the Program Educational Objectives, as described in Criterion 2 after they graduate.

The *Mechanical Systems* stem is composed of the following required courses:

EGME 322L	Introduction to Computer Aided Design (3)
EGME 331	Mechanical Behavior of Materials (3)
EGME 335	Kinematics of Mechanisms (3)
EGME 421	Mechanical Design (3)
EGME 414	Design Project I (3)
EGME 419	Design Project II (2)
EGME 431	Mechanical Vibrations (3)
EGME 476A	Dynamic Systems and Control Laboratory (2)

The *Thermal Systems* stem is composed of the following required courses:

EGME 304	Thermodynamics
EGME 306B	Fluid and Thermal Laboratory (1)
EGME 322L	Introduction to Computer Aided Design (3)
EGME 333	Fluid Mechanics and Aerodynamics (3)
EGME 407	Heat Transfer (3)
EGME 414	Design Project I (3)
EGME 419	Design Project II (2)
EGME 476B	Energy and Power Laboratory (2)

In addition, students are required to take 11 units of technical elective courses that cover both *Mechanical Systems* and *Thermal Systems*. Furthermore, the capstone senior design courses provide an opportunity to the ME students to gain enhanced hands-on experience in both stems. **Criterion 5: Curriculum** of this Self Study Report has included the activities and projects conducted in the most recent capstone senior design courses. The course

syllabi in the **Appendix A** further describe the course components that contribute to these requirements.

B. Faculty

- **Diverse faculty composition to successfully teach and mentor students in wide ranges of Mechanical Engineering fields.**

The ME Department faculty members, due to their diverse background and experience, are well-versed with the above topics described in section *A. Curriculum* and regularly supply the necessary instructions and mentorship to students. **Criterion 6**: **Faculty** of this Self Study Report explains the diverse composition of the faculty member, but is summarized here again.

- Andy Bazar, Ph.D. (Materials and Manufacturing)
- Salvador Mayoral, Ph.D. (Fluid Mechanics and Aerospace Applications)
- Hossein Moini, Ph.D. (Mechatronics)
- Chean Chin Ngo, Ph.D. (Heat Transfer)
- Sang June Oh, Ph.D. (Control Systems)
- Joe Piacenza, Ph.D. (System Design)
- Nina Robson, Ph.D. (Robotics)
- Haowei Wang, Ph.D. (Combustion)

The curriculum vita of the Department faculty members are presented in the **Appendix B**, and elaborate on how each has maintained currency in his specialty areas.

APPENDIX A:

COURSE SYLLABI

CALIFORIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 102: ENGINEERING GRAPHICS

- **Credits and Contact Hours**
  - 3 units, 6.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Eryk Stacy (Lecturer)

- **Text book, title, author, and year**
  - *Fundamentals of Graphics Communication*, 6th Edition (2011), by Gary R. Bertoline, McGraw-Hill

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
  - Graphics as a fundamental means of communication in design. Development of spatial visualization. Freehand sketching and use of instruments, orthographic projection pictorials. Dimensioning, tolerances, descriptive geometry, CAD principles and applications, AutoCAD, design procedure, coast analysis and freshman design project.
  - **Prerequisites or co-requisites**
    None
  - **Required, elective, or selected elective**
    Required freshman level course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will develop and improve computer literacy.
    - ✓ Develop the skill to learn new software features, functionality, commands and capabilities in AutoCAD and SolidWorks by utilizing industry-standard professional training resources (such as Lynda.com).
    - ✓ Acquire fundamental skills in operating AutoCAD and SolidWorks.
    - ✓ Be able to identify, visualize and draw: lettering, sketching orthographic projections, section views, auxiliary views and isometric pictorials.
    - ✓ Understand fundamentals of dimensioning and tolerance, drawing scale and sheet size.

- ✓ Be able to create 2D multiview drawings from an isometric pictorial, and be able to create simple 3D solid models from either isometric pictorials or 2D multiview drawings.

- **ABET EAC SO addressed in the course**
  - ✓ Ability to apply knowledge of mathematics, science & engineering (outcome **a**)
  - ✓ Ability to communicate effectively (outcome **g**)
  - ✓ An a ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

➢ **Brief list topics to be covered in the course**

- Sketching
- Engineering Geometry
- Modeling Fundamentals
- Multiviews and Visualization
- Auxiliary Views
- Isometric Pictorials
- Section Views
- Dimensioning and Tolerancing
- Geometric Dimensioning & Tolerancing (DG&T)
- Working Drawings and Assemblies

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 205: DIGITAL COMPUTATION

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Haowei Wang (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to MATLAB for Engineers,* 3rd edition by William Palm, McGraw-Hill, 2010

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Computers and their numerical applications. Programming languages, MathCAD spread-sheet, digital computation methods in statistics and solving algebraic equations. Applications of general purpose software for engineering analysis.
  - **Prerequisites or co-requisites**
    College algebra or three years of high school math, including a second course in algebra.
  - **Required, elective, or selected elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will have the fundamental knowledge and ability of programming after this course.
    - ✓ Students will be able to use the programming skills to solve engineering, science and mathematics problems in their study and work.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to programming.
  - Numeric arrays and operations.
  - Built-in and user defined functions.
  - Relational operators and logical operators.
  - Conditional statements. 'for' loop and 'while' loop.
  - 2-D and 3-D plotting.
  - Function discovery and regression.

- Statistics, interpolation.
- Linear algebraic equations.
- Integration and differentiation.

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 304: THERMODYNAMICS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Fundamentals of Engineering Thermodynamics,* M. J. Moran, H. N. Shapiro, D. D. Boettner and M. B. Bailey, 7th ed., John Wiley & Sons, 2011

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Energy and its transformation; heat and work; conservation of mass and energy; system properties; irreversibility and availability; ideal gases; heat engines and refrigeration (both ideal and actual); equipment selection and sizing
  - **Prerequisites or co-requisites**
    CHEM 120A: General Chemistry; MATH 150B: Calculus II; PHYS 225: Fundamental Physics: Mechanics
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to apply the principle of conservation of energy using the first law of thermodynamics
    - ✓ The student will be able to understand the implications and limitations of the second law in energy conversion and to power and refrigeration cycles

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)

- **Brief list of topics to be covered in the course**
  - Properties – ρ, v, P, T
  - Energy, Work and Heat
  - First Law – Closed Systems and Cycles
  - Evaluating Properties, P-v-T Surface, Property Tables – T, P, v, u, h, c_p, c_v, Properties of Gases, Ideal Gas Model and Properties
  - Conservation of Mass, First Law – Conservation of Energy, First Law – Steady State Processes and Transient Processes

- Second Law – Introduction, Heat Engines, Refrigerators and Heat Pumps, Irreversibility, Carnot Cycle, Clausius Inequality
- Entropy, Entropy Change of an Ideal Gas, Second Law – Closed Systems, Second Law – Steady State Processes, Isentropic Processes, Isentropic Efficiency
- Selected Topics of Vapor Power Systems and/or Gas Power Systems

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 306A: UNIFIED LABORATORY

- **Credits and Contact Hours**
  - 1 unit, 3 hours laboratory, 15 instructional weeks per semester.

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Experimental methods for Engineers,* Latest Edition *by* Holman, J.P., McGraw-Hill, Boston. (Recommended Textbook)
  - Department of Mechanical Engineering, *EGME 306A Laboratory Manual*.
  - Reference: The current or a previous textbook in EGME 331: Mechanical Behavior of Materials.

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Observations and measurements as an introduction to the experimental method. Static and dynamic measurements on engineering systems (beams, columns, pendulums, gyroscopes) Using mechanical and electrical transducers, Principles of probability and statistics and their applications to experimental measurements, Report writing.
  - **Prerequisites or co-requisites**
    Prerequisites: EGME 102: Engineering Graphics; Physics 225: Fundamental Physics (Mechanics)
    Co- requisite: EGME 205: Digital Computation
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The objective of this course is to provide the student with experience in basic experimental techniques in mechanics of materials, data recording, manual and automated data acquisition, and technical report writing. In this course various mechanical systems are tested.

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Tensile Test: Study the mechanical properties of standardized alloys under tension.
  - Bending Of Beams Test: Study stress, deflection and strain of a simply supported beam under load.
  - Column Buckling Test: Study the crushing and buckling behavior of columns under axial compressive loading.
  - Impact Test: Study the ductile to brittle transition temperature for annealed low carbon steel.
  - Fatigue Test: Study the fatigue properties of different materials under standard conditions.
  - Fracture Mechanics Test: Determine if an alloy is in a plane stress, plain strain or a mixed state as well as analyzing the plastic zone.
  - Hardness Test/Pressure Vessels Test: Study thin-walled cylinder under pressure loading that will introduce hoop and longitudinal stress on the surface under open end and closed end conditions.

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 306B: FLUIDS & THERMAL LABORATORY

- **Credits and Contact Hours**
  - 1 unit, 3 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Haowei Wang (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - Engineering 306B – Lab Manual, Haowei Wang, CSUF, 2014

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Flow temperature and pressure measurement. Experimental studies of fluid friction and heat exchanger performance. Experimental studies of fluid friction and heat exchanger performance. Use of computers in data acquisition, reduction and analysis. Each student must write a complete set of technical reports and pass with a "C" or better.
  - **Prerequisites or co-requisites**
    Prerequisite: EGME 306A: Unified Laboratory; EGME 333: Fluid Mechanics and Aerodynamics
    Co-requisite: EGME 407: Heat Transfers
  - **Required, elective, or selected elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will be able to conduct complex experiments and design a simple experiment.
    - ✓ Students will be able to write formal technical reports following guidelines.
    - ✓ Students will be able to process data and plot with Excel and MATLAB.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to design & conduct experiments, as well as to analyze and interpret data. (outcome **b**)
    - ✓ An ability to communicate effectively. (outcome **g**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice. (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Experiment 1 – Water Flow through a Venturi.
  - Experiment 2 – Air Flow through a Duct.
  - Experiment 3 – Water Flow through a Friction Table
  - Experiment 4 – Subsonic Wind Tunnel Air Flow.
  - Experiment 5 – Cross Flow Heat Exchanger.
  - Experiment 6 – Double Pipe Heat Exchanger.

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 308 - ENGINEERING ANALYSIS & STATISTICS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  Advanced Engineering Mathematics, by E. Kreyszig, 10th Edition, Wiley, 2011.

  Other Supplemental Materials:
  WileyPLUS: https://www.wileyplus.com

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Fundamentals and engineering applications of Fourier series, Fourier transforms, Laplace transforms, complex analysis, vector analysis; engineering and computer applications; introduction to probability and statistics.
  - **Prerequisites or co-requisites**
    Prerequisites: Physics 226: Fundamental Physics (Electricity and Magnetism); Math 250B: Calculus II or equivalent
    Required junior level course
  - **Required, Elective, Or Selected Elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will learn basic mathematical concepts that are required for modeling, analysis, design, and testing.
    - ✓ The student will have the fundamental background needed to identify and learn more about the mathematical concepts introduced in the course.
    - ✓ The student will develop skills needed for formulating multidisciplinary problems, and for effective communication across several engineering disciplines using the common language of mathematics.
    - ✓ The student will have a strong foundation for learning more advanced topics and preparing for long-life learning.

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ Ability to identify, formulate and solve engineering problems (outcome **e**)

- **Brief list of topics to be covered in the course**
  - Introduction (Chapters 1-2)
  - Laplace Transforms (Chapter 6)
  - Vector Differential Calculus (Chapter 9)
  - Fourier Series (Chapter 11)
  - Fourier Transforms (Chapter 11)
  - Complex Numbers (Chapter 13)
  - Complex Analytic Functions (Chapter 13)
  - Conformal Mapping (Chapter 17)
  - Probability Theory & Statistics (Chapters 24-25)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 314: ENGINEERING ECONOMY

- **Credits and Contact Hours**
  - 2 units, 2 hours per week, 15 instructional weeks per semester.

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Economic Analysis*, 11th Edition (2012), by Newnan, Donald G., Eschenbach, Ted G, and Lavelle, Jerome P., Oxford University press, New York

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Development, evaluation and presentation of alternatives for engineering systems and projects using principles of engineering economy and cost benefit analysis.
  - **Prerequisites or co-requisites**
    Upper-division standing in engineering.
  - **Required, elective, or selected elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ After completion of this course the student should be able to use engineering economic tools in engineering projects when evaluating design or manufacturing alternatives.
    - ✓ This course should also help the student in preparing for the fundamentals of engineering (FE) exam.

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering(outcome **a**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context (outcome **h**)
    - ✓ Knowledge of contemporary issues(outcome **j**)

- **Brief list of topics to be covered in the course**
  - Time value of money and interest formulas
  - Present-Worth Analysis
  - Annual-Cash-Flow Analysis
  - Rate-Of-Return Analysis
  - Breakeven Analysis
  - Study of Depreciation and Taxes
  - Inflation and Deflation Analysis
  - Use of spread sheets in Engineering Economy

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 315: BASIC FABRICATION AND MANUFACTURING PRACTICES

- **Credits and Contact Hours**
  - 3 units, 4 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Greg DiGilio (Lecturer)

- **Text book, title, author, and year**
  - *Machine Tool Practices,* 9th Edition (2009), by Richard R. Kibbe, John E. Neely, Warren T. White and Roland O. Meyer, Prentice Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Conventional fabrication techniques, measuring, referencing and tolerances applied to manufacturing such as tooling, computer numerical control machining and process indices; Safety instruction for use of campus machine shop equipment
  - **Prerequisites or co-requisites**
    EGME 102: Engineering Graphics
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to understand the manufacturing process and its application in the modern workforce
    - ✓ The student will be able to relate functionality to developing proficient engineers
    - ✓ The student will learn how ease of manufacture is crucial to developing proficient engineers

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to function in multidisciplinary teams (outcome **d**)
    - ✓ Ability to identify, formulate and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Basic manufacturing process
  - Order of operations
  - Application of Geometric Dimension and Tolerance per ANSI 2009
  - Blue print Reading
  - Inspection of finished goods
  - Programming of Computer Numeric Control (CNC) Lathes and Mills using G-Code language
  - Welding using Tungsten Inert Gas (TIG) AKA Gas Tungsten Arc Welding (GTAW)
  - Basic shop math
  - Problem solving
  - Critical thinking
  - Time management

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 322L: INTRODUCTION TO COMPUTER AIDED DESIGN

- **Credits and Contact Hours**
  - 3 units, 1 hour discussion and 6 hours laboratory per week , 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Design with SolidWorks 2012*, by Planchard, David C. and Planchard, Marie P., Schroff Development Corporation, *2012*.
  - *Introduction to Solid Modeling - Using SolidWorks 2012*, by Howard, William E. and Musto, Joseph C., McGraw-Hill, 2012.

  Other Supplemental Materials:
  - DVD Engineering Design with SolidWorks 2012, video instructions and SolidWorks tutorials accompanying the textbook by Planchard and Planchard, 2012.

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Introduction to modeling, assembly, design documentation and analysis using typical commercial CAD/CAE software. Use of online resources in the collaborative design process. Design file transfer protocols. Design project using a technology based team environment. CAD/CAE system selection criteria.
  - **Prerequisites or co-requisites**
    EGME 331: Mechanical Behavior of Materials
  - **Required, Elective, Or Selected Elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will have a basic knowledge of computer aided design (CAD).
    - ✓ The student will be able to do introductory engineering tasks requiring modeling, design, and representation which depend on CAD software.
    - ✓ The student will be able to use general-purpose solid modeling software.
    - ✓ The student will have skills needed for thinking creatively, synthesizing complicated systems and their models, and effective communication using the common language of engineering graphics.

- **ABET EAC SO addressed in the course**
  - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (outcome **c**)
  - ✓ Ability to communicate effectively (outcome **g**)
  - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

➢ **Brief list of topics to be covered in the course***

- Design & Manufacturing Considerations, A: Project 1; B: 1, 3
- Fundamentals of Part Modeling, A: Project 1; B: 1, 3
- Fundamentals of Assembly Modeling, A: Project 2; B: 6
- Introduction to Finite Element Analysis & Optimization, A: Project 7; B: 13
- 2-D Part Drawings & Dimensioning, A: Project 3; B: 2, 8
- Advanced Part Modeling, A: Project 4; B: 4, 5
- Injection Plastic Molding & Design Considerations, B: 12; On-line Resources
- Advanced Assembly Modeling, A: Project 5; B: 7
- Introduction to Rapid Prototyping, B: 13

*The numbers shown above refer to the corresponding chapters in the course textbooks, as follows:

A. *Engineering Design with SolidWorks 2012,* by Planchard and Planchard.

B. *Introduction to Solid Modeling - Using SolidWorks 2012,* by Howard and Musto.

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 331: MECHANICAL BEHAVIOUR OF MATERIALS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester.

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Mechanics of materials: An Integrated Learning System*, 3rd Edition (2013), by Philpot, Timothy A., John Wiley & Sons

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Engineering properties of materials, Toughness and fatigue, Creep phenomena, Corrosion, energy concepts, Beams and columns, Torsion, Combined stresses, Pressure vessels, Fatigue theories, Design of machine elements.
  - **Prerequisites or co-requisites**
    Chem 120A: General Chemistry; EGCE 201: Statistics; Co-requisite: EGME 306A: Unified Laboratory
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to apply concepts and tools to derive the strength of materials
    - ✓ The student will be able to apply engineering properties of materials in selecting the materials and in designing engineering components and systems

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science, and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Stress and Strain Analysis
  - Analyzing Mechanical Properties of Materials
  - Formulating Design Concepts
  - Axial Deformation
  - Torsion and Bending Analysis
  - Shear Stress in Beams

- Beam Equilibrium and Deflection Analysis
- Study of Statically Indeterminate Beams
- Stress and Strain Transformations
- Thin-Walled Pressure Vessels
- Combined Loading on Materials
- Column Design
- Study of Energy Methods
- Material Selection for Design

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 333: FLUID MECHANICS AND AERODYNAMICS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Haowei Wang (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Fluid Mechanics*, 8th edition by R. Fox, P. Pritchard and A. McDonald, John Willey & Sons, 2011

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Principles of fluid mechanics and their applications; fluid properties; fluid statics; one-dimensional incompressible flow; concepts of multi-dimensional flows including conservation principles; similitude and dimensional analysis; internal and external viscous flow; elements of compressible flow; design considerations in fluid mechanics.
  - **Prerequisites or co-requisites**
    EGME 205: Digital Computation; EGME 304: Thermodynamics
  - **Required, elective, or selected elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will understand the fundamentals of fluid mechanics and aerodynamics.
    - ✓ Students will be able to solve problems with kinematics such as streamlines and pathlines, and dynamics such as Navier-Stokes equations and continuity equations.
    - ✓ Students will be able to identify applications of fluid mechanics and solve the problems with theories taught from this class.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science and engineering. (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to fundamental concepts and fluid properties.
  - Fluid statics and hydro static forces.
  - Conservation of mass and momentum in integral forms.
  - Conservation of mass and momentum in differential forms.

- Naiver-Stokes equations and Bernoulli Equations.
- Laminar flow and boundary layers.
- 1-D compressible flow and isentropic flow.
- Normal shock waves and flow in open channels.

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 335: KINEMATICS OF MECHANISMS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Nina P. Robson (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Theory of Machines and Mechanisms*, 4th Edition (2011), by J. J. Uicker, G. R. Pennock, J. E. Shigley, Oxford University Press

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Kinematics and dynamics of mechanisms; Design and analysis of linkages, gears, and cams through the use of analytical, graphical and computer-aided techniques
  - **Prerequisites or co-requisites**
    EGME 102 Engineering Graphics; EGME 205: Digital Computation; EGCE 302: Dynamics
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to analyze, evaluate machine components
    - ✓ The student will be able to use the tools and techniques learned in the course for optimal design in real world applications
    - ✓ The student will be able to apply engineering properties of materials in selecting the materials and in designing engineering components and systems

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to linkages (selected sections from Chapter 1, 2)
  - Machines and mechanical advantage (selected sections from Chapter 1, 2)
  - Linkage Synthesis: Slider Crank and the Four Bar Linkage
    (selected sections from Chapter 10)
  - Planar Robotics. Mobility (selected sections from Chapter 12)

- Cam Design. Displacement Diagrams (selected sections from Chapter 6)
- Gears and Gear Trains (selected sections from Chapter 7, 8, 9)
- Velocity and Acceleration (selected sections from Chapter 3, 4)
- Static and Dynamic Force Analysis (selected sections from Chapter 13, 14)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 350: LIVING AND WORKING IN SPACE

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Space: The Science of Spaceflight*, 3rd edition (2001), by Damon, Thomas D, Krieger Publishing Company

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    History of space flight. Space travel in literature and films. Space pioneers. The Moon Race. Space tourism and space hotels. Colonization of Moon and Mars. Space art. Economic, social, psychological, technological and global issues in space habitats.
  - **Prerequisites or co-requisites**
    Junior level standing
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to analyze and evaluate issues related to human space flight
    - ✓ The student will be able to use or apply the tools and techniques covered in the course for real world applications

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Space travel in literature and films
  - Space pioneers the physical scientists and astronomers
  - Rocket scientists and space engineers

- Space art
- Space law
- Physiological, psychological and medical effects of spaceflight
- Space colonies
- Manned mission to mars

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 407: HEAT TRANSFER

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Haowei Wang (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Heat Transfer*, 6th edition by T.L. Bergman, A.S. Lavine, F.P. Incropera and D.P. Dewitt, John Willey & Sons, 2011

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Principles of heat transfer and their applications: introduction to conductive, convective and radiation heat transfer; one-dimensional heat conduction; concepts of multi-dimensional conduction; convective heat transfer for internal and external viscous flows; cross-flow and shell and tube heat exchangers; thermal system design.
  - **Prerequisites or co-requisites**
    MATH 250B: Introduction to Linear Algebra and Deferential Equations; EGME 333: Fluid Mechanics and Aerodynamics
  - **Required, elective, or selected elective**
    Required course.

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will understand the fundamentals of the three categories of heat transfer: conduction, convection and radiation.
    - ✓ Students will be able to explain and solve classic and contemporary heat transfer problems analytically with theories and techniques introduced in the class.
    - ✓ Students will have the knowledge of finite difference method and the application of computer programs such as MATLAB to solve heat transfer equations numerically.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science and engineering. (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ A knowledge of contemporary issues (outcome **j**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to concepts and definitions in heat transfer.
  - Introduction to conduction. Fourier's law.
  - 1-D steady state conduction within a plane wall, a cylindrical system and a sphere without heat generation.
  - Conduction in Fins.
  - 2-D steady state conduction without heat generation analytical and numeric solutions.
  - Transient conduction for lumped systems and 1-D objects.
  - Introduction to convection.
  - External flow, internal flow, free convection, and heat exchangers.
  - Radiation process and properties. Radiation between surfaces.

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EGME 410: INTRODUCTION TO THE FINITE ELEMENT METHOD AND APPLICATION

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  Finite Element Analysis: Theory & Application with ANSYS, 3rd Edition (2008), by S. Moaveni, Prentice hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Basic concepts of integral and matrix formulation of boundary value problems; One dimensional finite element formulation of heat transfer, truss beam and vibration problems; Applications of commercial finite element programs; Selection criteria for code, element and hardware; CAD system interfaces
    Prerequisites or co-requisites
    Approved study plan
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be introduced to the subject of finite element analysis and its applications
    - ✓ The student will be able to derive mathematical formulations that constitute the foundation of finite element method
    - ✓ The student will be able to recognize that for analysis of complex systems a reliable numerical tool in necessary
    - ✓ The student will be able to conduct an accurate analysis of structural systems and mechanical devices

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Review of matrix algebra (selected sections from Chapter 2)
  - Introduction, finite element formulations (selected sections from Chapter 1)
  - Truss analysis (selected sections from Chapter 3)
  - Overview of ANSYS (selected sections from Chapter 3)
  - Local and global coordinates; transformations (selected sections from Chapter 4)
  - Alternative formulations for bar and beam element (selected sections from Chapter 4)
  - Quadratic and cubic elements; natural coordinates (selected sections from Chapter 5)
  - Thermal and heat transfer problems (selected sections from Chapter 6)
  - Two dimensional elements, isoparametric elements (selected sections from Chapter 7, 10)
  - Advanced ANSYS applications (selected sections from Chapter 8)
  - Applications to two dimensional heat transfer (selected sections from Chapter 9)
  - Applications to vibration problems (selected sections from Chapter 11)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 411: MECHANICAL CONTROL SYSTEMS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Sang June Oh (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Modern Control Systems*, 12th Edition (2010), by Richard C. Dorf and Robert H. Bishop, Prentice Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Mechanical control system design and analysis; Pneumatic, hydraulic, electromechanical actuators and devices; Stability criteria; Root locus plots; Transfer functions; Introduction to feedback control and microprocessor applications
  - **Prerequisites or co-requisites**
    EGME 205: Digital Computation; EGCE 302: Dynamics; EGME 308: Engineering Analysis
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    The student will be able to:
    - ✓ relate differential equations with dynamical systems
    - ✓ understand the role of block diagrams and their role in analyzing control systems
    - ✓ understand the importance of state variable modeling in control system design
    - ✓ understand the differences between controlling the transient response and the steady state response of a control system
    - ✓ be familiar with the design formulas that relate the second-order pole locations to transient properties
    - ✓ understand the importance of stability in control systems
    - ✓ recognize the importance of root locus and its role in control system design
    - ✓ know how to sketch Bode plot and understand concepts of frequency response in control system analysis/design
  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An a ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to Control Systems
  - Mathematical Models of Systems- Block Diagram & Transfer Function
  - Mathematical Models Using State Variable Techniques
  - Feedback Control System Characteristics
  - Performance of Feedback Control Systems
  - Stability of Linear Feedback Systems – Routh Criterion
  - Root Locus Design and Analysis
  - Frequency Response Methods and Bode Analysis and Design
  - Stability in Frequency Domain
  - Design Applications

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 414: DESIGN PROJECT I

- **Credits and Contact Hours**
  - 3 units, 14 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Nina P. Robson (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Design: A Project Based Introduction,* 3rd Edition (2008), by C.L.Dym, P. Little, Wiley & Sons
  - *Design Concepts for Engineers,* 4th Edition (2009), by Horenstein, Pearson

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Design methodology, CAD/CAE philosophy, optimization, product liability, probability/statistical principles, ASME codes, safety, human factors, material selection, legal aspects of design, professional ethics; Design project to be completed in EGME 419, feasibility study, preliminary design, assembly drawings, interim project report; Oral presentation
    Prerequisites or co-requisites
    EGME 322L: Introduction to Computed-Aided Design; 421: Mechanical Design; EGME 426: Design of Thermal and Fluid Systems
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Ability to identify specify goal of the product and develop system/performance requirements
    - ✓ Ability to refine, evaluate and select a final design concept
    - ✓ Ability to describe and present detailed design of complete system and subsystems
    - ✓ Ability to identify features that distinguish the product from the competition

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability (outcome **c**)
    - ✓ Ability to function in multidisciplinary teams (outcome **d**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to use the techniques, skills and modern engineering tools necessary for modern engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Project definition and planning
  - Specific goal of the product, literature survey, developed system/ performance requirements
  - Project proposal and work plan submission and presentation
  - Conceptual design
  - Detailed design of complete system
  - Detailed design of subsystems
  - Bill of materials for assemblies, machined and purchased parts
  - Schedule for manufacturing and testing
  - Innovation and identifying features which distinguish the product from the competition

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 417: COMPUTATIONAL HEAT TRANSFER

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor)

- **Text book, title, author, and year**
  - *Computational Fluid Mechanics and Heat Transfer*, 2nd Edition (1997), by Anderson, Dale; Tannehill, John, McGraw-Hill

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Computer visualization of 2-D/3-D temperature fields; Steady and unsteady conduction heat transfer; Incompressible free and forced convective boundary layer flows; Multiple surface radiation analysis; Boiling and condensation; Emphasis on design aspects of computational heat transfer and use of CFD codes
    Prerequisites or co-requisites
    EGGN 205: Digital Computation; 308: Engineering Analysis and Statistics; EGME 407: Heat Transfer
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be introduced to various partial differential equations used in conduction and convection heat transfer
    - ✓ The student will learn Finite Differencing Technique to solve partial differential equations
    - ✓ The student will utilize Commercial Computational Fluid Mechanics for modeling and solving convention heat transfer flow problems
    - ✓ The student will utilize Commercial Finite Element Code for modeling and solving conduction heat transfer problems in physical configurations

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Knowledge of contemporary issues (outcome **j**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Review of basic fluid mechanics an heat transfer concepts (selected sections from Chapter 1)
  - Partial differential equations of interest in heat transfer (selected sections from Chapter 2)
  - Finite differencing methodology (selected sections from Chapter 3)
  - Application of finite difference method to heat equation (selected sections from Chapter 4-2)
  - Application of finite difference method to Laplace Equation (selected sections from Chapter 4-3)
  - Application of finite difference method to Burgers Equation (selected sections from Chapter 4-5)
  - Introduction to commercial finite element code (software manual)
  - Design/analysis project using finite element code (software manual)
  - Introduction to commercial CFD software (software manual)
  - Design/analysis project using commercial CFD software (software manual)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 418: SPACE AND ROCKET ENGINEERING

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Haowei Wang (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Elements of Propulsion:* Gas Turbine and Rockets, by J. Mattingly and H. von Ohain, American Institute of Aeronautics and Astronautics, 2006.

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Principles of rocket propulsion systems. Single and multi-stage rockets. Theory and application of orbital mechanics. Space flight maneuvers. Boosting a satellite into orbit. Spacecraft guidance and control. Trajectories to Moon and Mars..
  - **Prerequisites or co-requisites**
    EGCE 201: Statistics; EGME 304: Thermodynamics; EGME 331: Mechanical Behavior of Materials; EGME 333: Fluid Mechanics and Aerodynamics
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will understand the fundamentals of Compressible flow: stagnation properties, 1-D compressible flow, quasi 1-D compressible flow with area change, Rayleigh flow, oblique shock waves, and Prandtl-Meyer expansions.
    - ✓ Students will be able to understand Rocket propulsion: performance/requirement, multistage rockets, solid and hybrids.
    - ✓ Students will have the knowledge of air-breathing propulsion systems: ramjects, turbojets, afterburning, turbofans, turboprops, cycle analysis, non-ideal component and cycle analysis.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science and engineering. (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ A knowledge of contemporary issues (outcome **j**)

- **Brief list of topics to be covered in the course**
  - Introduction to concepts and definitions in compressible flows.
  - Introduction to thrust, energy, and efficiency.
  - Stagnation Properties, 1-D Isentropic Flow..
  - Shock Waves, Raleigh Flow and 2-D Supersonic Flow.
  - Rocket Performance and Multistage Rockets.
  - Solid Rockets and Hybrid Rockets.
  - Ideal Ramjets and Turbojets.
  - Ideal Turbojets with Afterburners, Turbojets, and Turbofans.
  - Propeller Theory, Turboprops.
  - Non-ideal Cycle Analysis.

CALIFORNIA STATE UNIVERSITY, FULLERTON

Department of Mechanical Engineering

EGME 419: DESIGN PROJECT II

- **Credits and Contact Hours**
  - 2 units, 12 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Nina P. Robson (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Design: A Project Based Introduction,* 3rd Edition (2008), by C.L.Dym, P. Little, Wiley & Sons
  - *Design Concepts for Engineers,* 4th Edition (2009), by Horenstein, Pearson

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Completion of the design project initiated in EGME 414; Construction of prototype, model or components; Testing of the proposed design, and preparation of a final design report; Teamwork and communications skills are emphasized. Oral presentation is required
    Prerequisites or co-requisites
    EGME 414: Design Project I
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Ability to perform project planning and design review
    - ✓ Ability to fabricate and test prototype
    - ✓ Ability to document and present design project

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability (outcome **c**)
    - ✓ Ability to function in multidisciplinary teams (outcome **d**)
    - ✓ An understanding of professional and ethical responsibility (outcome **f**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)

- ✓ Ability to use the techniques, skills and modern engineering tools necessary for modern engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Project definition and planning using Gantt Chart
  - Design review of calculations and drawings for fabrication
  - Prototype fabrication planning and procedure verification
  - Prototype construction and testing of components
  - Fabricate and test assemblies
  - Prototype presentation
  - Project documentation and report

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 421: MECHANICAL DESIGN

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester.

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Fundamentals of Machine Component and Design*, 5th edition (2012), by Juvinall, Robert C. and Marshek, Kurt M., John Wiley & Sons, Hoboken, New Jersey

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Design and application of machine components such as brakes, clutches, gears, springs, fasteners; lubrication of machine elements, bearings, gaskets, seals, "O" rings; methods for study of impact, dynamic loading and fatigue; comprehensive treatment of failure, safety and reliability.
  - **Prerequisites or co-requisites**
    EGME 331: Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to analyze, evaluate machine components
    - ✓ The student will be able to select material for, and design machine components
    - ✓ The student will be able to use the tools and techniques learned in the course for prevention of failure of machine components

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering(outcome **a**)
    - ✓ Ability to identify, formulate and solve engineering problems(outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Review of Strength of Materials
  - Analysis and Selection of Fasteners
  - Introduction to Appropriate Weld Design
  - Spring Design Analysis
  - Gear Design Methods

- Design and Analysis of Belts, Pulleys and Chains
- Introduction to Brake and Clutch Mechanisms
- Fundamental Bearing and Shaft Design in Applications

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 422: MECHANICAL DESIGN USING PRO/ENGINEER

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Pro/ ENGINEER Wildfire 5.0 Instructor*, D. S. Kelley, McGraw-Hill, 2009.

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Modeling, assembly and design documentation using Pro/ENGINEER; design of mechanical components and assemblies using advanced Pro/ENGINEER features such as blends, drafts, user defined features, relations, family tables, and assembly management; collaborative design project; utilizing online resources; may be repeated for one credit
  - **Prerequisites or co-requisites**
    EGME 322L: Introduction to Computer-Aided Design or equivalent
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Ability to use advanced Pro/ENGINEER modeling feature
    - ✓ Ability to use productivity tools such as family tables
    - ✓ Ability to work collaboratively in a technology based environment to design and document a mechanical engineering project

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Constraint-Based Sketching
  - Extruding, Modifying, and Redefining Features
  - Feature Construction Tools
  - Revolved Features
  - Feature Manipulation Tools

- Creating a Pro/E Drawing
- Sections and Advanced Drawing Views
- Swept and Blended Features
- Advanced Modeling Techniques
- Assembly Modeling (Mechanism Design)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 424 - DATA ACQUISITION AND INSTRUMENTATION USING LabVIEW

- **Credits and Contact Hours**
  - 3 units, 2 hours discussion, 3 hours laboratory per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  LabVIEW 2009 Student Edition, by Robert Bishop, Prentice Hall, 2010.

  Other Supplemental Materials:
  National Instruments Website: http://www.ni.com/academic/students

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Graphical programming ; design and development of virtual instruments using LabVIEW programming environment; building applications for data acquisition and data reduction, measurement, testing and control of engineering systems; Collaborative term project.
  - **Prerequisites or co-requisites**
    EGME 306A: Unified Laboratory or equivalent
  - **Required, Elective, Or Selected Elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will develop a strong background on the principles of instrumentation, testing, data acquisition, and graphical programming.
    - ✓ The student will have an opportunity to apply the industry-standard general purpose LabVIEW software to better understand the above principles.
    - ✓ The student will have the opportunity to integrate mechanical systems and electronic devices and test their performance.

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ Ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to Virtual Instruments – LabVIEW Basics (Chapter 1)
  - Creating Virtual Instruments (VIs) (Chapter 2)
  - Editing and Debugging Techniques (Chapter 3)
  - Creating Sub-Vis (Chapter 4)
  - Loops and Case Structures (Chapter 5)
  - Programming Techniques (Chapter 5)
  - Arrays and Clusters (Chapter 6)
  - Charts and Graphs (Chapter 7)
  - Data Acquisition (Chapter 8)
  - Strings and Data/File Transfer (Chapter 9)
  - Data Analysis & Signal Conditioning (Chapter 11)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 426: DESIGN OF THERMAL AND FLUID SYSTEMS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Peter Mignosa (Part Time Lecturer of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Design of Fluid Thermal Systems, 3rd edition* by William S. Janna, Cengage Learning, 2010

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
  - Integration of fundamental principles of thermodynamics, fluid mechanics, heat transfer and related subjects in the design of thermal and fluid systems. The design process is applied to pumps, fans, turbines, boilers, and heat exchangers using economics and optimization with case studies
  - **Prerequisites or co-requisites**
    EGME 407: Heat Transfer
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Students will understand the fundamentals of hydraulic flow through piping networks.
    - ✓ Students will be able to select appropriate pump style and size for a given hydraulic application.
    - ✓ Students will have the knowledge of basic industrial heat exchanger selection and performance analysis.
    - ✓ Students will be able to explain and apply the 5 step project management process that is applied in industry.

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science and engineering. (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to concepts and definitions in Project Engineering Management.
  - Introduction to concepts and definitions in fluid properties and basic equations.
  - Introduction to 1-D piping flow with losses included and through multiple cross sectional areas.
  - Optimization of 1-D piping systems.
  - Analysis through network piping configurations. Design of thin walled pressure vessels, and thermal stresses in pipes.
  - Introduction to pumps and piping systems, with an emphasis on pump sizing and type selection.
  - Review of the concepts and definitions in heat transfer.
  - Introduction to basic heat exchanger design with double pipe exchangers.
  - Introduction to Shell and Tube heat exchangers as well as multiple other non-standard industrial heat exchanger designs

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 431: MECHANICAL VIBRATIONS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Sang June Oh (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Vibration*, 4th Edition (2013), by Daniel J. Inman, Prentice Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Modeling and analysis of single and multiple degrees of freedom systems; Response to forcing functions; Vibrations of machine elements; Design of vibration isolation systems; Balancing of rotating machinery; Random excitation and response of mechanical structures
  - **Prerequisites or co-requisites**
    EGME 205: Digital Computation; EGCE 302: Dynamics; EGME 308: Engineering Analysis
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to derive the equations of motion for single and multiple degree of freedom (DOF) mechanical systems
    - ✓ The student will be able to solve for the undamped and damped vibration response of single and multiple DOF mechanical systems, including systems with arbitrary forcing functions
    - ✓ The student will be able to model multiple DOF mechanical systems using MATLAB and SIMULINK software
    - ✓ The student will be able to relate mathematical vibration problem to the real world applications

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An a ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Review of ODE and Laplace transform
  - Introduction to vibrations (selected sections from Chapter 1)
  - Free vibration analysis using Newtonian and Lagrangian equations of motion (selected sections from chapter 1)
  - Harmonic force analysis using time and frequency domain methods (selected sections from chapter 2)
  - General forced response using convolution integral, Laplace transform, and Fourier series (selected sections from chapter 3)
  - Multiple degree of freedom (MDF) using Lagrangian equations of motion, modal analysis and Laplace transform methods (selected sections from chapter 4)
  - Simulation of MDF vibration systems using MATLAB/SIMULINK (through handout)
  - Vibration suppression design including active/passive design methods, and fundamentals of vibration control (selected topics from chapter 5)
  - Applications in vibrations (through handout)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 438 - ANALYTICAL METHODS IN ENGINEERING

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Advanced Engineering Mathematics*, by E. Kreyszig, 10th Edition, Wiley, 2011.

Other Supplemental Materials:
WileyPLUS: https://www.wileyplus.com

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Ordinary and partial differential equations with constant and variable coefficients; orthogonal functions; conformal mapping; potential theory; engineering applications.
  - **Prerequisites or co-requisites**
    EGME 308: Engineering Analysis and Statistics
  - **Required, Elective, Or Selected Elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will learn advanced mathematical concepts that are required for modeling, analysis, design, and testing of complex engineering systems.
    - ✓ The student will develop skills needed for formulating advanced multidisciplinary problems.
    - ✓ The student will have a strong foundation for learning more advanced topics and preparing for long-life learning.
  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science, and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)

- **Brief list of topics to be covered in the course**
  - Review of First Order Differential Equations (Chapter 1)
  - Linear Differential Equations of Second Order (Chapter 2)
  - Higher Order Linear ODEs (Chapter 3)
  - Review of Linear Algebra (Chapter 7)
  - Systems of Differential Equations (Chapter 4)
  - Power Series Solutions (Chapter 5)
  - Eigenvalue Problems (Chapter 8)

- Vector Differential Calculus (Chapter 9)
- Line and Surface Integrals, Orthogonal Functions (Chapters 10 & 11)
- Partial Differential Equations (Chapter 12)
- Applications to Vibrations and Heat Flow Problems (Chapter 12)
- Complex Analytic Functions, Conformal Mapping (Chapters 13 &17)
- Complex Integration, Power Series (Chapters 14 &15)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 447: PIPING SELECTION AND PIPING NETWORK DESIGN

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Piping Handbook*, M. Nayyar, McGraw-Hill, 1999 (ISBN: 978-0-07-047106-1).

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Pressure losses in piping networks; selection of piping based upon fluid, temperature, pressure and economic considerations; piping connections, fittings and components; stress analysis; review of national piping codes
  - **Prerequisites or co-requisites**
    EGME 333: Fluid Mechanics and Aerodynamics; EGME 331: Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Ability to design a piping network to engineering specifications
    - ✓ Ability to specify materials for the piping network
    - ✓ Ability to use computer software to determine load and stress conditions in the piping network as well as the pressure losses across the branches
    - ✓ Being current with the engineering codes and standards associated with piping networks

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ An ability to communicate effectively (outcome **g**)
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to Piping and Piping Components
  - Piping Materials
  - Piping Codes and Standards
  - Fabrication and Installation of Piping
  - Bolted Joints
  - Selection and Application of Valves
  - Hierarchy of Design Documents, Design Bases
  - Piping Layout, Stress Analysis of Piping
  - Heat Tracing and Thermal Insulation of Piping
  - Pressure and Leak Testing of Piping Systems, Fire Protection and Steam Piping Systems
  - Oil, Gas and Compressed Air Piping Systems

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 451: HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Thermal Environmental Engineering*, T.H. Kuehn, J. W. Ramsey and J. L. Threlkeld, 3rd ed., Prentice Hall, 1998 (ISBN: 978-0-13-917220-5).

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    The fundamentals of controlling heating, ventilating and air conditioning systems; theory and analysis of fundamental thermodynamics relating to these systems; laboratory demonstrations of actual systems
  - **Prerequisites or co-requisites**
    EGME 304: Thermodynamics; EGME 407: Heat Transfer
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ To be proficient in the area of thermo-environmental conditioning and control
    - ✓ Ability to analyze, synthesize and design system components, subsystems and complete systems
    - ✓ Ability to work with moist air using theoretical equations, psychometric charts and practical measurements

  - **ABET EAC SO addressed in the course**
    - ✓ An Ability to function in multidisciplinary team (outcome **d**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Vapor Compression Refrigeration, Absorption Refrigeration and Refrigerants
  - Thermodynamics Properties of Moist Air
  - Psychrometric Chart and Applications
  - Psychrometer and Humidity Measurements
  - Direct Contact Transfer Processes Between Moist Air and Water
  - Heating and Cooling of Moist Air by Extended-Surface Coils

- Human Thermal Comfort and Indoor Air Quality
- Winter Design Heat Loss
- Instantaneous Heat Gain and Cooling Load

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 452: FLUID MACHINERY

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Turbomachinery: Basic theory and applications*, 2nd Edition (1993), by Logan, Earl J., Marcel Dekker
  - *Fundamentals of Turbomachinery*, 1st Edition (2008), by Peng, William W., John Wiley

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Thermal and hydraulic design and analysis of pumps, fans, turbines and compressors; Component selection, system design and performance evaluations.
  - **Prerequisites or co-requisites**
    EGME 304: Thermodynamics; EGME 333: Fluid Mechanics and Aerodynamics
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able have a fundamental understanding of basic types of fluid machinery
    - ✓ The student will be able to design basic fluid machinery such as centrifugal pump or water turbine
    - ✓ The student will be able to apply the concepts of thermodynamics, heat transfer and fluid mechanics to the design of fluid machinery

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Basic types of fluid machinery
  - Basic concepts of thermodynamics, heat transfer and fluid mechanics
  - Dimensional analysis

- Velocity diagrams and characteristic curves
- Performance evaluation of pumps and turbines
- Design of pumps and turbines

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EGME 454: OPTIMIZATION OF ENGINEERING DESIGN

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Optimum Design,* 3rd Edition (2012), Arora, Jasbir S., Academic Press (Elsevier), Waltham, MA

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Application of analytical and computer optimization techniques to engineering design; Presentation of design as an optimization task; One dimensional minimization; Unconstrained and constrained nonlinear programming; Approximation concepts; Duality; Computer applications to design problems using a general purpose optimization program
  - **Prerequisites or co-requisites**
    EGME 308: Engineering Analysis and Statistics
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student is able to apply basic analytical methods to engineering design problems
    - ✓ The student is able to apply basic computer optimization methods to engineering design problems

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction to Design Optimization (selected sections from Chapter 1)
  - Optimum Design Problem Formulation (selected sections from Chapter 2)
  - Graphical Optimization (selected sections from Chapter 3)
  - Optimum Design with Excel Solver (selected sections from Chapter 6)
  - Optimum Design with MATLAB (selected sections from Chapter 7)
  - Linear Programming Methods (selected sections from Chapter 8)
  - Optimum Design in: Mathematical, Geometrical, and Graphical Concepts (selected sections from Chapter 4)
  - Practical Aspects of Optimization (selected sections from Chapter 14)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 456: INTRODUCTION TO MECHATRONICS FOR ENGINEERS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Mechatronics and Measurement Systems*, 4th Edition (2012), by D. J. Alciatore, M.B. Histand, McGraw Hill

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Introduction to mechatronics; Design issues. Sensors, actuators, programmable controllers; Hardware components for control systems; System performance; Data acquisition and control; Mechatronic control in automated manufacturing; Advanced applications and case studies
  - **Prerequisites or co-requisites**
    EGGN 308: Engineering Analysis and Statistics; EGEE 203L: Electric Circuits Laboratory; EGME 306A: Unified Laboratory
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able study the modern design philosophy based on multiple disciplines within engineering and their synergistic integration
    - ✓ The student will recognize that, for optimum system performance, some mechanical components could be altered based on principles of optics, electronics, and electromagnetism
    - ✓ The student will develop skills needed for non-sequential design process
    - ✓ The student will be able to formulated multidisciplinary problems using mathematics and computational tools
    - ✓ The student will form a strong foundation needed for learning more advanced topics in this field throughout professional career

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ A knowledge of contemporary issues (outcome **i**)

- ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction, review of circuits (selected sections from Chapter 1, 2)
  - Semiconductor electronics (selected sections from Chapter 3)
  - Systems modeling and simulation (selected sections from Chapter 4)
  - Operational amplifiers (selected sections from Chapter 5)
  - Digital devices, logic network design (selected sections from Chapter 6)
  - Data acquisition (selected sections from Chapter 8)
  - Sensors (selected sections from Chapter 8, 9)
  - Actuators (selected sections from Chapter 10)
  - Control architectures (selected sections from Chapter 11)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 457L: INTELLIGENT SYSTEMS LABORATORY

- **Credits and Contact Hours**
  - 2 units, 8 hours per week, 15 instructional weeks per semester.

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Mechatronics,* 3rd Edition (2005), by Alciatore, D.G., Histand, M.B., McGraw-Hill

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Design and assembly of microprocessor-based mechanisms; Lab experiments encompass machine/high level programming, and interfacing of microcontrollers with sensors and actuators
  - **Prerequisites or co-requisites**
    EGME 456: Introduction to Mechatronics for Engineers
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to drive applications of microprocessors/microcontrollers and active materials to the design of intelligent systems
    - ✓ The student will be able to derive for the integration of mechanical components and electronic devices
    - ✓ The student will be able to practice teamwork, organization, collaborative learning, and communications
    - ✓ The student will develop skills needed for concurrent and multi-disciplinary design process
    - ✓ The student will develop a strong foundation that is required for learning more advanced topics in this field throughout the professional career

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design & conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)

- ✓ Ability to function in multidisciplinary teams (outcome **d**)
- ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
- ✓ An understanding of professional and ethical responsibility (outcome **f**)
- ✓ Ability to communicate effectively (outcome **g**)
- ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h)**
- ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)
- ✓ Knowledge of contemporary issues (outcome **j**)
- ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Introduction, review of electronics (selected sections from Chapter 1)
  - Microprocessors and microcontrollers fundamentals (selected sections from Chapter 1, 2)
  - High-level language programming (basic) (selected sections from References)
  - Low-level language programming (assembly) (selected sections from Chapter 2)
  - Interfacing digital devices, design project initiation (selected sections from Chapter 1, 2)
  - Device selection (selected sections from References)
  - Interfacing digital devices: Actuators (selected sections from Chapter 1)
  - Interfacing analog devices: Sensors and active materials (Selected sections from Chapter 1)
  - Computer simulations and data acquisition (selected sections from Chapter 1)
  - Integration and system assembly (selected sections from Chapter 1, 2)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 459: PLASTICS AND OTHER NON-METALLICS

- **Credits and Contact Hours**
  - 3 units, 3 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Plastics-Materials and processing*, 3rd Edition (2006), Strong, A. Brent, Prentice-Hall, Upper Saddle River, New Jersey

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Simplified chemistry of plastics; Applications; Manufacturing processes; Methods for preventing deterioration of nonmetallic materials; Ceramics; Composites; Refractories; Wood; Destructive and nondestructive testing of nonmetallic materials
  - **Prerequisites or co-requisites**
    EGME 331: Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to identify, select and evaluate plastics
    - ✓ The student will be able to apply the principles and tools learned in the course in their engineering practice

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate and solve engineering problems (outcome **e**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to communicate effectively through oral presentations and written reports and assignments(outcome **k**)

- **Brief list of topics to be covered in the course**
  - Historical Background of Plastics and Non-Metallics
  - Overview of the Four Basic Categories of Engineering Materials
  - Review of Mechanics of Materials
  - Study of Thermoplastics
  - Design and Analysis of Thermosets
  - Application of Elastomers
  - Other Nonmetallic analysis using fundamental methods
  - Plastics Manufacturing Processes
  - Case Studies

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 460: FAILURE OF ENGINEERING MATERIALS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Mechanical Behavior of Materials*, 4th Edition (2012), by Dowling, Norman E., Prentice Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Imperfections in solids; fracture initiation and crack propagation; dislocations; yield point phenomenon; fatigue; creep; ultrasonic effects; radiation damage; stress corrosion; hydrogen embrittlement; composite materials
  - **Prerequisites or co-requisites**
    EGME: 331 Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to utilize methods and techniques of deformation, creep and fatigue analysis in engineering materials
    - ✓ The student will be able to use the concepts and tools of fracture mechanics in analysis and design of engineering components
    - ✓ The student will have an understanding of the ethical and professional responsibilities of an engineer in preventing failure of engineering components and systems
    - ✓ The student will understand that failure can be the beginning of success

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Review of engineering materials, basic mechanical tests, stress-strain relationships and elastic and plastic deformation
  - Types of mechanical failures
  - Review of statistical concepts
  - Fracture mechanics and fracture toughness
  - Fatigue failure and the S-N curves
  - Creep failures
  - Ethical responsibility of an engineer in failure prevention
  - Analysis of engineering successes and failures
  - Case studies

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 461: FABRICATION METHODS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Manufacturing Engineering and Technology*, 7th Edition (2014), by Kalpakjian, Serope and Schmid, Steven R., Pearson Prentice-Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Manufacturing processes; Metal joining processes; Casting, forging, powder metallurgy, machining and machining tools, finishing, coating, plating, non-metallic materials inspection and gaging, and tolerances
  - **Prerequisites or co-requisites**
    EGME: 331 Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to utilize concepts, theory, and tools in a manufacturing environment
    - ✓ The student will understand that design for manufacturability (DFM) is an important element of engineering design
    - ✓ The student will be able to work as a team member in a manufacturing work environment

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Basic concepts of manufacturing engineering
  - Attributes of manufactured products
  - Common manufacturing processes
  - Manufacturing systems (FMS and CIM)
  - Interface between ergonomics, manufacturing and quality
  - Concurrent engineering
  - Manufacturing expositions
  - Competitive analysis in manufacturing
  - Design for manufacturability

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 462: COMPOSITE MATERIALS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hossein Moini (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Composite Materials Design,* 2nd Edition (2011), by E. Barbero, CRC Press

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Application, mechanical properties and fabrication studies of fiber reinforced composite materials, stress analysis of laminated anisotropic composite structures; Studies of special problems unique to composites
  - **Prerequisites or co-requisites**
    EGCE 301: Mechanics of Materials; or EGME 331: Mechanical Behavior of Materials
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able gain a solid knowledge of mechanics of composite materials and applications
    - ✓ The student will enhance their ability for creative thinking, teamwork, collaborative learning, and effective communications.
    - ✓ The student will be able to utilize CADEC software for real world applications

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h)**
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)
    - ✓ Knowledge of contemporary issues (outcome **j**)

- **Brief list of topics to be covered in the course**
  - Introduction to Composite Materials (selected sections from Chapter 1)
  - Design for Reliability (selected sections from Chapter 1)
  - Materials and Manufacturing (selected sections from Chapter 2, 3)
  - Micro-Mechanical Behavior Analysis (selected sections from Chapter 4)
  - Micromechanics (selected sections from Chapter 4)
  - Ply Mechanics (selected sections from Chapter 5)
  - Macro-mechanics (selected sections from Chapter 6)
  - Strength and Failure Criteria (selected sections from Chapter 7)
  - Composite Beams (selected sections from Chapter 10)

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 463: INTRODUCTION TO ROBOTICS

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Nina P. Robson (Assistant Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Introduction to Robotics: Mechanics and Control*, 3rd Edition (2005), by John J. Craig, Pearson Prentice-Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Kinematic, dynamic, control and programming fundamentals associated with industrial robots and programmable manipulator; Trajectory planning, application of robotics in manufacturing and integration of robots into flexible manufacturing systems
  - **Prerequisites or co-requisites**
    EGME 335: Introduction to Mechanical Design; EGME 476A: Dynamic Systems and Controls Laboratory
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to analyze and evaluate mechanical linkage systems
    - ✓ The student will be able to select material for, and design robotic components
    - ✓ The student will be able to use the tools and techniques learned in the course for prevention of failure of mechanical systems
    - ✓ The student will be able to relate mathematical robotic complications to the real world applications

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Mathematics and software review, mechanical linkages
  - Introduction to robotics, planar robotics, mobility, forward and inverse kinematics
  - Spatial descriptions and transformations

- Manipulator kinematics
- Forward and inverse spatial manipulator kinematics
- Jacobians
- Dynamics and trajectory planning
- Manipulator design and control

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 475: ACOUSTICS AND NOISE CONTROL

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Timothy W. Lancey (Lecturer)

- **Text book, title, author, and year**
  - *Fundamentals of Acoustics,* 4th Edition (1999), by Kinsler, et. al., John Wiley and Sons

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Basic phenomena on the propagation, absorption and generation of acoustic waves, specification and measurement of noise, effects of noise on speech and behavior, legal aspects of industrial and building noise, principles and application of noise control
  - **Prerequisites or co-requisites**
    Physics 227: Fundamental Physics: Waves, Optics, and Modern Physics
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able to derive wave equations for vibrating strings, and plates
    - ✓ The student twill derive techniques for solutions to wave propagation, absorption and acoustical resonance
    - ✓ The student will relate theories and practical topics of environmental and architectural acoustics
    - ✓ The student will be able to enhance their ability in the design of an acoustic system, component or process for noise generation, propagation or control

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to apply knowledge of mathematics, science and engineering (outcome **a**)
    - ✓ Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Knowledge of contemporary issues (outcome **j**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Oscillator (selected sections from Chapter 1)
  - String, membrane (selected sections from Chapter 2, 4)
  - Acoustic plane waves (selected sections from Chapter 5)
  - Transmission phenomena (selected sections from Chapter 6)
  - Absorption (selected sections from Chapter 6)
  - Resonators, spherical waves (selected sections from Chapter 8, 9 10)
  - Environmental, architectural acoustics (selected sections from Chapter 12, 13)
  - Acoustic wave kinematics visualization (selected sections from Chapter 13, 14)
  - Architectural acoustics design (selected sections from Chapter 13, 14)

CALIFORNIA STATE UNIVERSITY, FULLERTON
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EGME 476A: DYNAMICS AND CONTROL LABORATORY

- **Credits and Contact Hours**
  - 2 units, 5.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Sang June Oh (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *An Introduction to Error Analysis*, John R. Taylor, 2nd edition, University Science Books, 1982 (Recommended Textbook)
  - *A Guide to Writing as an Engineer*, D. F. Beer and D. A. McMurrey, 3rd ed., Wiley, 2010 (Recommended Textbook)

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Dynamic systems, vibration, acoustics and other mechanical components; computer simulation of dynamic systems; robotics, computer controlled machining and automatic data acquisition. Must be passed with a grade of "C" (2.0) or better to count towards the upper division writing requirement; not available for graduate degree credit
  - **Prerequisites or co-requisites**
    EGME 431: Mechanical Vibrations
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ To reinforce the understanding of dynamical/electromechanical systems with practical hands-on experience and simulations
    - ✓ To develop competence in the application of statistics to estimation of experimental uncertainty, documentation of experimental data and analysis and communication

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ An ability to communicate effectively (outcome **g**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Error Analysis

- MATLAB/SIMULINK simulations on submarine towing, optimization, control systems, and 2D automobile suspension problem
- Fundamental Frequency of a Beam
- Damped Torsional Vibration
- DC Motor Control Experiment
- Inverted Pendulum/Ball on a Beam Experiment

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 476B: ENERGY AND POWER LABORATORY

- **Credits and Contact Hours**
  - 2 units, 5.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Experimental Methods for Engineers*, J. P. Holman, 8th ed., McGraw-Hill, 2012 (Recommended Textbook)

  - *A Guide to Writing as an Engineer*, D. F. Beer and D. A. McMurrey, 3rd ed., Wiley, 2010 (Recommended Textbook)

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Mass transfer, heat transfer and thermodynamic phenomena and their interaction with mechanical systems; team experiment; use of computers in data acquisition, reduction and analysis; each student must write a complete set of individual engineering laboratory reports; must pass with a "C" (2.0) or better to count towards the upper-division writing requirement; not available for graduate degree credit
  - **Prerequisites or co-requisites**
    EGME 304: Thermodynamics; EGME 306B: Fluids and Thermal Laboratory; EGME 407: Heat Transfer
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ To reinforce the thermal/fluids courses with practical hands-on experience and simulations
    - ✓ To develop competence in the application of statistics to estimation of experimental uncertainty, documentation of experimental data and analysis and communication

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to design and conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ An ability to communicate effectively (outcome **g**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Uncertainty and Statistical Analysis
  - Thermal Time Constant
  - Conduction and Convective Heat Transfer
  - Heat Exchangers
  - Refrigeration Systems
  - Diesel and Gas Engines
  - Ramjet
  - Gas Turbine Engine

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 480: HUMAN FACTORS ENGINEERING

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Jesa H Kreiner (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Human Factors in Engineering and Design,* 7th Edition (1992), by Mark S. Sanders and Earnest J. McCormick, McGraw-Hill

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Principles of design for making products and systems faster, easier, and more effective to use; Design project using these principles that consider human capabilities and limitation of senses and responses to sensory stimuli; Physiological, psychological and work factors are evaluated for design of equipment, work methods, environments and standards
  - **Prerequisites or co-requisites**
    Approved study plan
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will build the attitude, understanding, and guidance for the engineering when designing
    - ✓ The student gain the discipline necessary to the designer or engineering design
    - ✓ The student will gain knowledge to make more practical applications of human factors information
    - ✓ The student will be acquainted with the primary literature and resource data pertaining to human factors as it is applied to industrial design

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ An understanding of professional and ethical responsibility (outcome **f**)
    - ✓ Ability to communicate effectively (outcome **g**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h)**
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)
    - ✓ Knowledge of contemporary issues (outcome **j**)

- ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Ergonomics and machine safety
  - The mechanical design process
  - Anatomy, posture, and body mechanics
  - Equilibrium diagrams
  - Hazard and risk evaluation
  - Product liability
  - Biomechanics, safety and health
  - Biomechanics of musculoskeletal injury
  - Human behavior and performance on safety
  - Noise control practices
  - Climate conditions
  - Principles of hazard control

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 483: COMPUTER-INTEGRATED MANUFACTURING

- **Credits and Contact Hours**
  - 3 units, 10 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Andy R Bazar (Professor of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Automation, Production Systems, and Computer-Integrated Manufacturing,* 3rd Edition (2008), by Groover, Mikell P., Pearson Prentice Hall

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Introduction to computer-aided manufacturing processes; CNC machines, robot and PLC programming; Design for CIM. Fixed and flexible manufacturing systems; Process planning and scheduling; Simulation software for manufacturing systems; Laboratory experiments
  - **Prerequisites or co-requisites**
    EGME 476A: Dynamic Systems and Controls Laboratory; or equivalent
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be have a working knowledge (theoretical and practical) of the various components of a computer-integrated manufacturing system
    - ✓ The student will be able to use concepts of design for manufacturability, ergonomics, and mechanical engineering in a manufacturing environment
    - ✓ The student will have a total system view (people, materials, machines, processes, and environment) of a manufacturing plant

  - **ABET EAC SO addressed in the course**
    - ✓ Ability to design & conduct experiments, as well as to analyze and interpret data (outcome **b**)
    - ✓ Ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Elements of a quality product or system
  - Elements of a computer-integrated manufacturing system
  - Manufacturing cells and FMS
  - Lean, agile and intelligent manufacturing systems
  - Just-in-time manufacturing, statistical process control, and concurrent engineering
  - Competitive benchmarking
  - Robots and humanoids in manufacturing

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 486: INTRODUCTION TO ELECTRONICS PACKAGING

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - Handbook of Electronic Package Design, M. Pecht, CRC Press, 1991 (ISBN: 978-0-82-477921-4).

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Electronic components and devices. The chip carrier, packaging and production of printed circuit boards. First, second and third level packaging. Introduction to thermal analysis and vibration of electronic equipment.
  - **Prerequisites or co-requisites**
    EGEE 303: Electronics; EGME 306A: Unified Laboratory
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ Ability to perform electronic package design and analysis
    - ✓ Ability to formulate mathematical models for mechanical vibrating systems
    - ✓ Ability to design dynamic absorbers and gain experience in simulating mechanical vibrating systems
  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h**)
    - ✓ A recognition of the need for an ability to engage in life-long learning (outcome **i**)

- **Brief list of topics to be covered in the course**
  - Design Considerations, Components, Packages
  - PWB Fabrication, Die Assemblies, Component Mounting
  - Thermal Design of Simple Electronic Systems
  - Vibration Design of Simple Electronic Systems
  - Fatigue Analysis of Simple Electronic Systems

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 487: THERMAL CONTROL OF ELECTRONIC PACKAGES

- **Credits and Contact Hours**
  - 3 units, 2.5 hours per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Chean Chin Ngo (Assistant Professor of Mechanical Engineering)

- **Textbook, title, author, and year**
  - *Thermal Management of Microelectronic Equipment*, L. T. Yeh and R. C. Chu, ASME Press, 2002 (ISBN: 978-0-79-180168-0).

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    Fluid mechanics and heat transfer as related to the thermal control of electronic packages of varying sizes; analysis of individual components, complete boards and complete systems is considered; liquid and gas cooling mediums
  - **Prerequisites or co-requisites**
    EGME 308: Engineering Analysis and Statistics; EGME 407: Heat Transfer
  - **Required, elective, or selected elective**
    Elective course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ To be able to analyze heat transfer problems related to electronic cooling applications

  - **ABET EAC SO addressed in the course**
    - ✓ An ability to apply knowledge of mathematics, science & engineering (outcome **a**)
    - ✓ An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability (outcome **c**)
    - ✓ An ability to identify, formulate, and solve engineering problems (outcome **e**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h**)
    - ✓ Knowledge of contemporary issues (outcome **j**)
    - ✓ An ability to use the techniques, skills and modern engineering tools necessary for engineering practice (outcome **k**)

- **Brief list of topics to be covered in the course**
  - Extended Surfaces and Thermal Interfacial Resistance
  - Components & Printed Circuit Boards
  - Direct Air Cooling and Fans

- Exchanges and Cold Plates
- Advanced Cooling Technologies I: Single-Phase (Liquid)
- Advanced Cooling Technologies II: Two-Phase
- Heat Pipes
- Thermoelectric Coolers

CALIFORNIA STATE UNIVERSITY, FULLERTON
Department of Mechanical Engineering

EGME 490: SEMINAR IN ENGINEERING

- **Credits and Contact Hours**
  - 1 units, 1 hour per week, 15 instructional weeks per semester

- **Instructor's or course coordinator's name**
  - Hai Phan (Lecturer of Mechanical Engineering)

- **Text book, title, author, and year**
  - *Engineering Ethics: Concepts and Cases*, 5th Edition (2014), by Pritchard Harris, Jr. and James Rabins, Cengage Learning
  - *A Guide to Writing as an Engineer*, 4th Edition by David Beer and David McMurrey (Recommended)

- **Specific course information**
  - **Brief description of the content of the course (catalog description)**
    The engineering profession, professional ethics, and related topics. May be repeated once for credit with the approval of the department
  - **Prerequisites or co-requisites**
    Senior Standing
  - **Required, elective, or selected elective**
    Required course

- **Specific goals for the course**
  - **Specific outcome of instruction**
    - ✓ The student will be able link the technical skills and how it impacts the society
    - ✓ The student will be able to learn about the broader impact of technology
    - ✓ The student will be able to attain the knowledge of engineering ethics
    - ✓ The student will be able to build professionalism in engineering

  - **ABET EAC SO addressed in the course**
    - ✓ An understanding of professional and ethical responsibility (outcome **f**)
    - ✓ The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (outcome **h**)
    - ✓ A recognition of the need for an ability to engage in a life-long learning (outcome **i**)
    - ✓ Knowledge of contemporary issues (outcome **j**)

- **Brief list of topics to be covered in the course**
  - Engineering Ethics
  - Morality
  - Engineering Responsibility
  - The Social and Value Dimensions of Technology

- Trust and Reliability
- Risk and Liability in Engineering
- Engineers in Organizations
- Engineers and the Environment
- Engineering in the Global Context

APPENDIX B:

FACULTY VITAE

FULL TIME FACULTY

Full Time Faculty

Name & Academic Rank

Andy Bazar, Professor
Mechanical Engineering

Education

Ph.D., Industrial Engineering, North Carolina State University, 1974
M.S., Industrial & Systems Engineering, University of Southern California, 1972
B.S., General Engineering, Abadan Institute of Technology, 1965

Academic Experience

California State University, Fullerton, 1990 - Present, Full Time
Professor, Department of Mechanical Engineering, 1997 - Present
Dean, School of Engineering and Computer Science, 1990 - 1996
California Polytechnic State University, Pomona, 1983-1990, Full Time
Chair, Department of Industrial and Manufacturing Engineering
California State University, Fresno, 1978-1983, Full Time
Wichita State University, 1974-1978

Non-academic Experience

Executive Director, Foundation for the Advancement in Manufacturing Education, 1997-1998
Five years industrial experience and 12 major consulting projects, 1965-1990

Certification or Professional Registration

Professional Engineer (PE), State of California

Current Membership in Professional Organizations

American Institute of Aeronautics and Astronautics (AIAA) until 2013

Honors and Awards

None in the past five years
Many during the 1965-1998 period, including:
Invitation to Vietnam by the Vietnam Ministry of Education and Training for presentation on engineering education in the U.S., 1996.
Keynote speaker at the NSF Engineering Education Innovator's Conference, 1997.
Under the auspices of NSF visited German research institutions, universities and industry to discuss and exchange information on the most recent manufacturing technologies, Summer 1997.

Service Activities

Taught 22 courses in the Mechanical Engineering Department at CSUF

Developed new courses: EGME 350: Living and Working in Space, EGME 418: Space and Rocket Engineering

Chair of Department Faculty Search Committee

Chair of Department Personnel Committee 2013-2014

Mechanical Engineering Department's Master's Oral Exam Committees

Mechanical Engineering Department's M.S. Thesis Committees

Panelist, Manufacturing Education Panel of National Science Foundation, Design and Manufacturing Grantees Conference, Monterey, Mexico, January 6, 1998.

"FAME and the Concept of Teaching Factory", presented at the National Coalition for Advancement of Manufacturing (NACFAM) meeting, Wyndham Hotel, Los Angeles, California, January 12, 1998.

"FAME: A Model Industry-Government-University Partnership -- Institutionalizing the Success of SCCEME" (with Richard Williams), presented at the NSF Engineering Education Innovators' Conference, April 8, 1997, Arlington, Virginia.

"Southern California Coalition for Education in Manufacturing Engineering" (with Karl Grote) Ho Chi Minh City, University of Technology, Vietnam, August 5-9, 1996.

"Engineering Education in the United States", invited presentation at Vietnam's Ministry of Education and Training, University of Technology, August 6-7, 1996, Vietnam.

Reviewer for engineering books and manuscripts for McGraw-Hill, Prentice Hall, John Wiley & Sons, and the Oxford University Press

Principal Publications and Presentations (Past 5 years)

None in the past 5 years

Space Pioneers, book manuscript, in progress.

75 papers, presentations, and technical reports, 1965-1998

Most Recent Professional Development

Regularly attend national expositions and seminars in the Southern California area.

Visited several major universities, industrial plants, and national expos (Fall 2010)

Works on book manuscript

Full Time Faculty

Name & Academic Rank
Salvador Mayoral, Assistant Professor
Mechanical Engineering

Education
Ph.D., University of California, Irvine, Mechanical and Aerospace Engineering, 2013
M.S., University of California, Irvine, Mechanical and Aerospace Engineering, 2010
B.S., University of California, Irvine, Aerospace Engineering, 2008
B.S., University of California, Irvine, Materials Science Engineering, 2008

Academic Experience
California State University Fullerton, Assistant Professor, Starting August 2014, Full Time
California State University Fullerton, Adjunct Professor, March 2014-Present, Part Time
University of California Irvine, Teaching Assistant, January 2011 - June 2012, Part Time

Non-academic Experience
Sonendo Inc, Laguna Hills, CA, R&D Engineer II, April 2013 - November 2013, Full Time
Sonendo Inc, Laguna Hills, CA, R&D Consultant, September 2012 - March 2013, Part Time

Certification or Professional Registration
None

Current Membership in Professional Organizations
American Institute of Aeronautics and Astronautics, 2008-present

Honors and Awards
Recipient of the 2008 Western Region Award of the Sigma Gamma Tau
Recipient of the 2008 UCI Sigma Gamma Tau Award
President of Sigma Gamma Tao Aerospace Engineering Honor Society
Recipient of the Parker Hannifin Scholarship
Recipient of Chancellor's Excellence Scholarship

Service Activities
Advisory Board for the Certified Quality Engineer for Boeing, 2014
Student mentor in the AGEP Summer Competitive Edge program, 2010

Principal Publications and Presentations (Most important from past 5 years)
1. Mayoral, S. and Papamoschou, D., “Prediction of Jet Noise Shielding with Forward Flight Effects," AIAA-2013-0010, 51st AIAA Aerospace Sciences Meeting, Grapevine, TX, Jan. 7-10, 2013.
2. Papamoschou, D. and Mayoral, S., “Modeling of Jet Noise Sources and their Diffraction with Uniform Flow," AIAA-2013-0326, 51st AIAA Aerospace Sciences Meeting, Grapevine, TX, Jan. 7-10, 2013.

3. Papamoschou, D. and Mayoral, S., "Jet Noise Shielding for Advanced Hybrid Wing-Body Configuration," AIAA-2011-0912, 49th AIAA Aerospace Sciences Meeting and Exhibit, Jan. 4-7, 2011 Orlando, FL.
4. Mayoral, S. and Papamoschou, D., "Effects of Source Redistribution on Jet Noise Shielding," AIAA-2010-0652, 48th AIAA Aerospace Sciences Meeting and Exhibit, Jan. 4-7, 2010, Orlando, FL.
5. Papamoschou, D., and Mayoral, S., "Experiments on Shielding of Jet Noise by Airframe Surface," AIAA-2009-3326, 15th Annual AIAA/CEAS Aeroacoustics Conference, May 10-12, 2009, Miami, FL.

Most Recent Professional Development (Past 5 years)
Updating the CSUF Wind Tunnel Laboratory
Attended AIAA Aerospace Sciences Meeting, Orlando, FL, 2010 & 2011
Attended AIAA Aeroacoustics Conference, Miami, FL, 2009

FULL TIME FACULTY

Name & Academic Rank
Hossein Moini, Professor
Mechanical Engineering

Education
Ph.D., Mechanical Engineering, University of California, Santa Barbara, 1986
M.S., Mechanical Engineering, University of California, Santa Barbara, 1981
B.S., Metallurgical Engineering, Arya-Mehr (Sharif) University of Technology, Iran, 1978

Academic Experience
California State University, Fullerton, Full Time
Professor, 1997 – Present
Chairman, Department of Mechanical Engineering, 2005 – 2008
Head, Department of Mechanical Engineering, 2000 – 2003
Associate Professor, 1991- 1997 (Early Promotion)
Assistant Professor, 1988 -1991
Lecturer, August 1987-1988
University of California, Santa Barbara
Numerical Analyst, Department of Geological Sciences, 1987
Lecturer, Office of Summer Sessions, 1986

Non-academic Experience: Consulting
Computer Assisted Engineering, Orange, CA: Stress and modal analyses for a vibrating tubular support.
McGaw, Inc., Irvine, CA: Analysis of polypropylene universal set port for IV solution containers.
Beckman Industrial Corporation, Fullerton, CA: Analysis of contact wires for electromechanical switches.
Engineering Design Optimization Inc., Santa Barbara, CA: Analysis of the forward swept wing X-29 aircraft and optimal design of gears.
Rancho Los Amigos Medical Center, Downey, CA: Design of sensors/actuators for the rehabilitation of patients recovering from brain injury.

Current Membership in Professional Organizations
ASME, AIAA, ASEE, SAE

Honors and Awards
Outstanding Recognition Award as a teacher scholar, CSUF, 1996.
Outstanding Recognition Award for Creative and Scholarly Activity, CSUF, 1998, and 2001.
ASME Industrial Relations Recognition Award, American Society of Mech. Eng., 1991.
Outstanding Faculty Member Award. CSUF's Student Section of ASME, 1990.
American Society of Mechanical Engineers Membership Development Achievement Award, 1989.
Faculty Appreciation and Service Awards for 25 years of dedicated service at CSUF, 2013.

Service Activities

University Faculty Personnel Committee
Extended Education's LabVIEW Advisory Board
Department's Master's Oral Exam Committees
College of ECS Curriculum Committee
Academic Senate University Advancement Committee
Department Search/Selection Committee (2 terms, served as Chairman for 1 term)
Department Personnel Committee and Department Scheduling Committee
College of ECS Associated Dean Selection Committee
Design Review and Evaluation Team for ME Senior Design Projects
Assisted with organizing the SAE Seminar Series on "Future Vehicle Technologies" at CSUF
Assisted with organizing "Optomechanical Systems and Applications", presentation by Dr. Jeffrey Hunt, Boeing Associate Technical Fellow. April 2009.

Principal Publications and Presentations (Most Important from past 5 years)

1. *Coombes, S.*, and Moini, H., "Collaborative Program to Reinvigorate the Aerospace Engineer", *Proceedings of the Sixth Annual AIAA Southern California Aerospace Systems and Technology Conference*, Santa Ana, CA, 2009.
2. "Automobile Suspension - Evaluating a Mechatronics Approach", a presentation at the Boeing's Electromechancial Packaging TIG meeting, June 2009 and June 2010.
3. "Mechatronics", a presentation at the Boeing's Electromechancial Packaging TIG meeting, May 2010.
4. "Mechatronics - Enhanced Quality and Shorter Development Cycle, A Presentation to the Boeing's Electro-mechanical Packaging Technical Interest Group, The Boeing Company, October and November 2008; May 2010, and May 2011.

Most Recent Professional Development (Past 5 years)

"Clean Tech Business Plan Competition", Anaheim Center for New Energy Technologies, CSUF, April 2009.
"Funding Opportunities at NSF and Complex Systems Optimization", by Dr. Robert L. Smith, NSF Program Director for Operations Research, April 2009.
Workshop on Federal Contract Procurement Training for Minority Serving Institutions, 2/2009.
"Harvesting Energy - Entrepreneurial Opportunities in Clean Tech", Caltech/MIT Enterprise Forum. January 2010.
SAE Seminar Series: "Energy Innovation Performance", and "Design of Hybrid for Everyone", UCI, October 2009.
"Delivering Quality Education in Times of Financial Crisis", Academic Affairs/Academic Senate Retreat, August 2009.
"Preparing and Submitting Government Contract Proposals", CSUF, January, 2009.
National Instruments' LabVIEW Hands-On Campus Workshop, UCI, March 2009.
Workshop on the Application of Camtesia Software, June 2010.
Live Webinar on Green Energy Simulations, October 2009.
Live Webinar on Accelerating the Design of Embedded Controls Systems for Vehicle Applications, November 2009. Sponsored by MapleSoft and SAE International.
Live Webinar on Advanced Physical Modeling Techniques Accelerate the Design of Complex Systems, June 2010. Sponsored by MapleSoft.

Full Time Faculty

Name & Academic Rank
Chean Chin Ngo, Assistant Professor
Mechanical Engineering

Education
Ph.D., Mechanical Engineering, University of Oklahoma, Norman, OK, 2006
M.S., Mechanical Engineering, University of Oklahoma, Norman, OK, 1999
B.S., Mechanical Engineering, University of Oklahoma, Norman, OK, 1997

Academic Experience
California State University, Fullerton, Assistant Professor, 1/2011-Present
University of North Dakota, Grand Forks, Visiting Assistant Professor, 1/2008-12/2010
University of Oklahoma, Norman, Postdoctoral Research Associate, 1/2007-12/2007

Non-Academic Experience
None

Certifications or Professional Registration
None

Current Membership in Professional Organizations
Member, American Society of Mechanical Engineers
Senior Member, American Institute of Aeronautics and Astronautics
Member, American Society for Engineering Education
Associate Member, American Society of Heating, Refrigerating and Air-Conditioning Engineers

Honors and Awards
Awardee of 2014 Faculty Recognition: Teaching (Exceptional Teaching Effectiveness)
Faculty-Student Research and Creative Activities Grant, 2012
Named one of 11 semi-finalists for 2010-2011 Outstanding Teaching Award at UND
Members of Tau Beta Pi: The Engineering Honor Society, Pi Tau Sigma Honorary Mechanical Engineering Fraternity and Golden Key National Honor Society

Service Activities
Graduate Program Advisor (April 2012 – present)
ABET Co-Coordinator (Fall 2013 – present)
Undergraduate Advisor (Summer 2012, 2013, 2014)
Faculty Advisor, Tau Beta Pi: The Engineering Honor Society, California Chi Chapter (Fall 2013 – present)

Faculty Search Committee (Spring 2012; Academic Year 2013-2014)
Faculty Hearing Panel (Fall 2012 – present)
Faculty Senate Information Technology Committee (2011 – 2013)
Reviewer for Journal of Electrostatic (2009 – present)
Judge for 2013 ASME District D South – Student Professional Development Conference (Old Guard Poster Competition), California State University, Long Beach, April 27, 2013

Principal Publications and Presentations (Most Important from Past 5 Years)

Peer-Reviewed Journal Paper

C. C. Ngo and F. C. Lai, "Heat Transfer Analysis of Soil Heating Systems," *International Journal of Heat and Mass Transfer*, Vol. 52, pp. 6021-6027, 2009.

Presentations

"Power – Pollution = ?," Journey to Success for Asian American & Pacific Islander Families & Students, California State University, Fullerton, California, November 5, 2011.

"Thermal-Fluid Sciences Online Interactive Media," California State University, Fullerton, California, November 19, 2010.

"Thermal-Fluid Sciences Online Interactive Media," West Virginia University Institute of Technology, Montgomery, West Virginia, October 18, 2010.

"Thermal-Fluids Interactive Learning Media," Union College, Schenectady, New York, July 16, 2010.

"Computational Modeling and Visualization in Teaching and Research", Computational Engineering for Engineering Educators Workshop, Ohio Supercomputer Center, Ohio State University, Columbus, Ohio, July 17, 2009.

"Teaching Thermal-Fluid Sciences Using Online Interactive Multimedia," Grand Valley State University, Grand Rapids, Michigan, February 16, 2009.

Most Recent Professional Development (Past 5 Years)

ABET Program Assessment Workshop, Portland, Oregon, April 14, 2013.
2013 ABET Symposium, Portland, Oregon, April 12-13, 2013.
NSF Day, University of Southern California, Los Angeles, California, April 12, 2012.
Carbon Capture and Storage: Science, Technology, and Policy, Massachusetts Institute of Technology Professional Education – Short Programs, Cambridge, MA, July 26-28, 2010.
Advanced Renewable Energy for Educators: More Hands On Experience, Solar Energy International, Carbondale, CO, June 28-30, 2010.
Renewable Energy for Educators: How to Implement Renewable Energy Education into Your Classroom, Solar Energy International, Carbondale, CO, June 22-25, 2010.
Grant Writing Workshop, Grant Writing USA, Fargo Regional Training Center, Fargo, ND, September 24-25, 2009
Computational Engineering for Engineering Educators (COMSOL Multiphysics and OpenFOAM), SC09 Educational Summer Workshop, Ohio Supercomputer Center, Ohio State University, Columbus, OH, July 13-18, 2009

Full Time Faculty

Name & Academic Rank
Sang June Oh, Assistant Professor
Mechanical Engineering

Education
Ph.D., Mechanical Engineering, Columbia University, New York, NY, 2004
M.Phil., Mechanical Engineering, Columbia University, New York, NY,1996
M.S., Mechanical Engineering, Columbia University, New York, NY, 1993
B.S., Mechanical Engineering, Columbia University, New York, NY, 1991

Academic Experience
California State University Fullerton, Assistant Professor, 8/2009-Present, Full Time
California State University Fullerton, Lecturer, 8/2008-8/2009, Full Time
Yale University, New Haven, CT, Postdoctoral Associate, 12/2006-8/2008, Full Time
Johns Hopkins University, Baltimore, MD, Postdoctoral Fellow, 3/2005-9/2006, Full Time

Non-academic Experience
Defense Security Command of South Korea, Military Analyst and Assistant to
Naval Captain, 3/1997-6/1999, Full Time

Certification or Professional Registration
None

Current Membership in Professional Organizations
American Institute of Aeronautics and Astronautics
American Society of Engineering Education

Honors and Awards
Awardee of 2012 CSUF Faculty Recognition for Outstanding Service
Awardee of 2011 CSUF Faculty Recognition for Exceptional Teaching Effectiveness
Recipient of 2009 Cal State Fullerton ASI Outstanding Educator of the Year Award
Highest GPA holder among 1993 Mechanical Engineering MS graduates at Columbia University

Service Activities
CSUF Mechanical Engineering ABET Co-Coordinator, 4/2013 - Present
CSUF Graduation Initiative Committee, 12/2012 - Present
CSUF Academic Standards Committee, 8/2011 - Present
CSUF Mechanical Engineering Faculty Search Committee (Fall 2010, Spring 2012, Fall 2013)

CSUF Mechanical Engineering Academic Support Coordinator Search Committee (Spring 2010, Summer 2013)
CSUF Mechanical Engineering Graduate Program Advisor, 9/2010 - 4/2012
Reviewer for Journal of Intelligent and Robotic Systems (2011, 2012)
Reviewer for Journal of Intelligent Service Robotics (2011)
NSF Grant Proposal Review Panel Member (Twice in 2009)

Principal Publications and Presentations (Most Important from Past 5 Years)

Peer-Reviewed Journal Paper/Conference Paper

1. S. J. Oh and H. Luong, "Increasing Production Capacity of Heat Shrink Tubing Operation Through Device Reconfiguration," International Journal of Engineering Sciences and Management, Vol. III, Issue I, January-June 2013
2. S. J. Oh and R. Unnikrishnan, ""Infusing Assistive Technology in Undergraduate Engineering Education," Interdisciplinary Engineering Design Education Conference, Santa Clara, CA, March, 2011

Papers "Dynamic Analysis of Rzeppa and Cardan Joints in Monorail Drive Train Systems," "Quaternion Attitude Estimation," "Use of Deadbeat Output Basis Functions with Support for Isolated Local Refinement in Iterated Learning Control," are all pending in journals

Presentation

3. "Infusing Assistive Technology in Undergraduate Engineering Education," Interdisciplinary Engineering Design Education Conference, Santa Clara, CA, March, 2011
4. "Assistive Technology from Engineering Perspective," at CSUF Assistive Technology Summit, May, 2011
5. "Assistive Technology and the Engineering Curriculum," at CSUF College of Engineering and Computer Science Dean's Advisory Board Council Meeting, August, 2009

Most Recent Professional Development (Past 5 years)

ABET Accreditation Coordinator, CSUF, March 2013 to Present
Workshop on *Frontiers of Additive Manufacturing Research and Education* (NSF Sponsored), Arlington, VA, June 2013
ANSYS Seminar on Design Optimization of Robust and Quiet Electric Machines, Irvine, CA, November, 2013
ABET Accreditation Symposium and Assessment Workshop, Portland, OR, April 2013
NSF Day, University of Southern California, Los Angeles, California, April 2012
ENGAGE Workshop (NSF Funded) -- Engage Students in Engineering, Denver, CO, May-June 2011
CSUF Faculty Representative for visitation of National Funding Agencies, Washington, DC, April, 2010

Full Time Faculty

Name & Academic Rank
Joseph Piacenza, Assistant Professor
Mechanical Engineering

Education
Ph.D., Mechanical Engineering, Oregon State University, Corvallis, OR, 2014
M.S., Mechanical Engineering, Oregon State University, Corvallis, OR, 2010
M.B.A., University of South Florida, Tampa, FL, 2008
B.S., Mechanical Engineering, University of South Florida, Tampa, FL, 2001

Academic Experience
Oregon State University, Instructor, 01/2014-06/2014, Part Time
Oregon State University, Graduate Teaching Assistant, 8/2011-12/2013, Part Time

Non-academic Experience
Classic Camber Inc., Pinellas Park, FL, Founder/Operator, 04/2003-08/2010, Full Time
Harris Corporation, Melbourne, FL, Mechanical Engineer, 06/2001-03/2002, Full Time

Certification or Professional Registration
None

Current Membership in Professional Organizations
American Society of Mechanical Engineers (ASME), 2010-Present
Affiliation: Society of Manufacturing Engineers (SME), 2011-Present

Honors and Awards
Mechanical Engineering Outstanding Graduate Teaching Assistant, Oregon State U., 2013-2014
NSF travel grant, International Mechanical Engineering Congress & Exposition, 2013
DARPA FANG Mobility Challenge 1 Finalist, 2013

Service Activities
Engineering Design Seminar Series Coordinator, Oregon State University, 08/2011-06/2014
Peer reviewed publications for the International Design Engineering Technical Conference, and the International Mechanical Engineering Conference & Exposition, 08/2011-Present
OSU Engineering consultant for Pacific Northwest College of Art (PCNA) design project, Hotbin Diaper-Composting Vessel, 08/2013-04/2014
Session Co-Chair, Design for Manufacturing and the Life Cycle Conference - Conceptual Design, Manufacturability Analysis, Manufacturing Cost Estimation, and Total Cost of Ownership session at the International Design Engineering Technical Conferences, 2013

Principal Publications and Presentations (Most important from past 5 years)

Peer-Reviewed Journal Papers

1. **J. Piacenza**, J. J. Fields, C. Hoyle, and I. Y. Tumer, "Quantification of Indoor Environmental Quality in Sustainable Building Designs Using Structural Equation Modeling," In Review: Journal of Energy and Buildings.
2. **J.Piacenza**, Mir Abbas Bozorgirad, C. Hoyle, and I. Y. Tumer, "Robust Topology Optimization of Complex Infrastructure Systems" In Review: Journal of Mechanical Design.
3. **J. Piacenza**, Mir Abbas Bozorgirad, Eduardo Cotilla-Sanchez, C. Hoyle, and I. Y. Tumer, "Evaluating the Impact of Human In-the-Loop Decision Making in Robust Infrastructure Design" In Preparation: IEEE Transactions on Power Systems.
4. **J. Piacenza**, S.H. Seyedmahmoudi, Karl R. Haapala, C. Hoyle, and I. Y. Tumer, "Sustainability Performance for Cross Laminated Timber in Sustainable Building Designs", In Preparation: Journal of Mechanical Design.

Peer-Reviewed Conference Papers

5. **J. Piacenza**, I. Y. Tumer, R. Stone, J. Knighton, and I. Elzeyadi, 2011, "Towards a System Analysis and Integration Framework for Early Design Trades in Sustainable Building Design", 2011 International Mechanical Engineering Congress & Exposition, Denver, Colorado.
6. **J. Piacenza**, I. Y. Tumer, and C. Hoyle, 2012, "Lighting Optimization for Sustainable Building Design Considering User Productivity", International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, Illinois.
7. **J. Piacenza**, I. Y. Tumer, C. Hoyle, and J. Fields, 2012, "Power Grid System Design Optimization Considering Renewable Energy Strategies and Environmental Impact", International Mechanical Engineering Congress & Exposition, Houston, Texas.
8. **J. Piacenza**, S.H. Seyedmahmoudi, Karl R. Haapala, C. Hoyle, and I. Y. Tumer, 2013, "Comparison of Sustainability Performance: Cross Laminated Timber Versus Concrete", International Design Engineering Technical Conferences, Portland, Oregon.
9. **J. Piacenza**, J. J. Fields, Mir Abbas Bozorgirad, C. Hoyle, and I. Y. Tumer, 2013, "Robust Design of North American Power Grid to Mitigate Cascading Failures", International Mechanical Engineering Congress & Exposition, San Diego, California.

Most Recent Professional Development (Past 5 years)

Proposal Key Personnel: "Design of Robust Cyber-Physical Energy Infrastructure Systems" (co-PIs: C. Hoyle, E. Cotilla-Sanchez, I. Y. Tumer, OSU), National Science Foundation, submitted 06/2014

Proposal Primary Author: "Robust Optimization of Complex Cyber-Physical Systems" (co-PIs: I. Y. Tumer, and C. Hoyle, OSU), NASA Marshall (Subaward to University of Alabama in Huntsville), 03/2013-09/ 2013

Proposal Primary Author: "Reliability and Functional Failure Analysis of Complex Cyber-Physical Systems" (co-PIs: I. Y. Tumer, and C. Hoyle, OSU), NASA Marshall (Subaward to University of Alabama in Huntsville), 03/2012-09/2012

Full Time Faculty

Name and Academic Rank
Roberta Rikli, Professor of Kinsiology and Dean Emeritus
Mechanical Engineering (*Acting Chair*)
Dean Emeritus of College of Health and Human Development

Education
Ph.D., Higher Education, University of Colorado, Boulder, 1972
M.S., Health and Physical Education, Indiana University, Bloomington, 1965
B.S., Health and Physical Education, Phillips University, Enid, Ok, 1964

Academic Experience
California State University Fullerton, Full Time Faculty, 1972-2002
California State University Fullerton, Dean, College of Health & Human Development, 2002-2011
California State University Fullerton, Acting Chair, Mechanical Engineering, 2012-present

Current Membership in Professional Organizations
National Academy of Kinesiology
Society of Health and Physical Educators

Honors and Awards
Invited Speaker, 8th World Congress on Active Ageing, Glasgow, Scotland, August 2012
Keynote Speaker, International Symposium on Silver Industry and Human Resource Development Kangnam University, Yongin, South Korea, 2008
Amy Morris Homans 40th Commemorative Lecture, National Association for Kinesiology and Physical Education in Higher Education, San Diego, 2006
Opening Speaker, VII International Seminar on Physical Activity for Elderly People, Brasilia, Brazil, November 2004.
International Council on Active Aging, Innovation in Industry Award, 2004
National Council on Aging Molly Mettler Award for Leadership in Health, 2001
Invited speaker, International Exchange Symposium sponsored by Overseas Chinese Institute on Aging, Beijing Civil Affairs Bureau, and China National Comm. on Aging -- Beijing, July 2000
Invited speaker, International Symposium on Physiological Evaluation of Working Capacity in Laborers -- Kitakyushu, Japan, October 2000.
Fellow, American College of Sports Medicine, 1998
Measurement & Evaluation Council Honor Award, 1995
American Alliance for HPERD Honor Award, 1992
Distinguished Professor Award, School of Human Development & Community Service, 1988

Service Activities

Service Activities – Selected Professional Activities Since 2000
Editorial Board, Research Quarterly for Exercise and Sport, 2008-2011
Editorial Board, Journal of Aging and Physical Activity, 1994-Present
Editorial Board, Measurement in Physical Education and Exercise Science, 1995-Present
Editorial Board, American College of Sports Medicine Health & Fitness Journal, 2000-2010

Journal Reviewer for 15+ Peer-reviewed research journals
Board of Directors, American Kinesiology Association, 2007 – 2012
Conference Chair, National Academy of Kinesiology (formerly AAKPE), 2010-2011
President, National Academy for Kinesiology, 2009-2010
Vice President, American Kinesiology Association, 2007 – 2009
Secretary/Treasurer, Internat'l Society on Aging and Physical Activity, 1999-2004
Scientific Program Committee, World Congress on Physical Activity &Aging, 2004, 2008, & 2012

Service Activities – Selected University Service since 2000)
Chair, University Planning, Resource, and Budget Committee, 2000-01
Academic Senate, 1998-2002 (Academic Senate Executive Committee, 2001-02)
Search Committee, Athletic Director, 2001-02
University Student Rating of Instruction Committee, 2004-06
Search Committee, Dean, Natural Science and Mathematics, 2005-06
Chair, Post Award Committee, 2005-07
University Planning Committee, 2000-2010
Chair, Search Committee, Dean of Humanities and Social Science, 2009-10
Council of Chairs Committee, College of ECS, 2012-Present

Principal Publications and Presentations (Most important from past 5 years)

1. Rikli, R.E. & Jones, C.J. (2013). *Senior Fitness Test Manual, 2nd Edition*. Champaign, IL: Human Kinetics. Reprinted in Traditional Chinese, 2013, ISBN 978-986-5998-40-0
2. Rikli, R. & Jones, C.J. (2012). Development and validation of criterion-referenced, clinically relevant fitness standards for maintaining physical independence in later years. *The Gerontologist, 53 (2)*, 255-267. doi: 10.1093/geront/gns071
3. Jones, C.J. and Rikli, R.E. (August, 2012). Developing regional/national norms for the Senior Fitness Test: Issues, guidelines, and special considerations. 8th World Congress on Active Ageing, Glasgow, Scotland
4. Rikli, R. E. (August, 2012). Development and use of criterion-referenced fitness standards for maintaining physical independence in later years. 8th World Congress on Active Ageing, Glasgow, Scotland.
5. Rikli, R. & Jones, C.J. (November, 2012). Criterion fitness standards for maintaining physical independence in later years. International Council on Active Aging Conference, New Orleans, LA.
6. Jones, C.J. and Rikli, R.E. (November, 2012). Development and validation of criterion-referenced, clinically relevant standards for maintaining physical independence in later years. Gerontology Society of America's 65th Annual Meeting, San Diego, CA.
7. Rikli, R.E. (2009). The role of master's institutions in developing researchers: Rethinking the 'Master Plan,' *QUEST (The Academy Papers: Advancing Research in Kinesiology), 6* ones, C.J. and Rikli, R.E. (November, 2012). Software technologies for managing fitness assessments of older adults. International Council on Active Aging Conference, New Orleans, LA.

Full Time Faculty

Name & Academic Rank
Nina Robson, Assistant Professor
Mechanical Engineering

Education
Ph.D., University of California, Irvine, Mechanical and Aerospace Engineering, 2008
M.S., University of California, Davis, Mechanical and Aeronautical Engineering, 2001
M.S., Technical University of Sofia, Robot and Flexible Manufacturing Systems, 1996
B.S., Technical University of Sofia, Electronics and Automation Engineering, 1994

Academic Experience
Assistant Professor, Mechanical Engineering, CSUF, 08/12 – Present, Full Time
Assistant Researcher, Mechanical and Aerospace Engineering, UCI, 11/11 - Present
Adjunct Assistant Professor, Eng. Tech. and Industrial Distribution, TAMU, 09/11 - Present
Assistant Professor, Eng. Tech. and Industrial Distribution, TAMU, 08/09 - 08/11

Certification or Professional Registration
04/12 Advanced Accident Reconstruction, Texas A&M University, TEEX, Bryan/College Station, TX

Current Membership in Professional Organizations
IEEE, ASME, IAJC, ASEE, SWE, CA2RS

Honors and Awards
09/13 "Design and Implementation of a Titan Rover", NASA Sample Return Robot Challenge, coadvising with J. Huang, EE, CSUF, funded by WD, Total: $7,500, (duration: 1 year).
06/13 "Mechanical Design Projects I and II", funded by Instructionally Related Activities, CSUF, Total: $27,750, (duration: 1 year).
09/12 "Development of a Lightweight Semiconductor Wafer Handling Robot Manipulator", funded by Genmark Automation Inc., Total: $4,800, (duration: 1 year).
09/12 "A Design Methodology for Multi-fingered Robotic Hands with Second-Order Kinematic Constraints", (PI on CSUF sub-award Id # 2013-2908, collaboration between CSUF ($271,711), ISU, UCI), funded by NRI/NSF, Total: $850,000, (duration: 4 years).

Service Activities
Int. Assoc. of Journals and Conferences IAJC, Editorial Review Board, member, 04/14 - Present
CSUF Society of Women in Engineering, faculty advisor, 09/13 - Present
CSUF Campus Initiative UNICEF, faculty advisor, 01/13 - Present
CSUF ASME Student Chapter, faculty advisor, 09/12 - Present
CSUF ECS Student Projects/Professional Practice Committee, member, 09/12 - Present
CSUF Faculty Focus Group, Developing CSUF Research Gateway, member, 04/14
ECS faculty member to discuss research at NSF headquarters in Washington DC, 04/14
CSUF Alumni Association Vision & Visionaries, ME Department representative, 02/14
NSF Graduate Research Fellowship Program, panelist, 12/13 - 02/14

Principal Publications and Presentations (Most important from past 5 years)

1. H. S. Moon, **N. Robson**, R. Langari, Approximating Elbow Constrained Hand Paths via Kinematic Synthesis with Contact Specifications, In: *Advances in Robot Kinematics*, ed. J. Lenarcic and O. Khatib, pp. 375-384, ISBN: 3-319-06697-4, Springer 2014.
2. S. Ghosh, **N. Robson**, Development of a One Degree of Freedom Mechanical Thumb Based on Anthropomorphic Tasks for Grasping Applications, In: *Advances in Robot Kinematics*, ed. J. Lenarcic and O. Khatib, pp. 375-384, ISBN: 3-319-06697-4, Springer 2014.
3. **N. Robson**, J. Allington, G.S. Soh, 2014, "Development of Under-actuated Mechanical Fingers based on Anthropometric Data and Anthropomorphic Tasks", *ASME IDETC*
4. H. S. Moon, **N. Robson**, R. Langari, S. Shin, 2014, "An Experimental Study on the Redundancy Resolution Scheme of Postural Configurations in Human Arm reaching with an Elbow Joint Kinematic Constraint", *Second Middle East Conference on Biomedical Engineering*, pp. 257-260, Doha, Qatar.
5. **N. Robson**, J. Skrobarczyk, A. Wendenborn, 2013, "Development of an Assistive Wrist Brace for a Patient with Cerebral Palsy", *Int. Journal of Eng. Sciences and Management*, vol. 4, issue 1, pp. 22-30.
6. J.J. Buchanan, **N. Robson**, J. Ramos, 2013, "Development of the Link between Perception and Action is Supported by Both Observational Learning and Physical Practice Training Protocols*", Journal of Sport and Exercise Psychology,* supplement v. 35.
7. E. Simo-Serra, A. Perez, H. S. Moon, **N. Robson**, Design of Multi-Fingered Robotic Hands for Finite and Infinitesimal Tasks using Kinematic Synthesis, In: *Latest Advances in Robot Kinematics*, ed. J. Lenarcic and M. Husty, pp. 173-181, Springer 2013.
8. **N. Robson**, S. Ghosh, G.S. Soh, 2013, "Development of a Sensor-Based Glove Device for Extracting Human Finger Motion Data used in the Design of Minimally-Actuated Mechanical Fingers", 3rd *IFToMM International Symposium on Robotics and Mechatronics,* Singapore.
9. G.S. Soh, **N. Robson**, 2013, "Kinematic Synthesis of Minimally Actuated Multi-Loop Planar Linkages with Second Order Motion Constraints for Object Grasping", *ASME DSCC Human Assistive Systems and Wearable Robots*, Stanford Univ., Palo Alto, CA.
10. **Robson**, J. Morgan, H. Baumgartner, 2012, "Mechanical Design of the Standardized Ground Mobile Platform SGMP", *Int. Journal of Modern Engineering, IJME M12-S-16.*
11. H. S. Moon, H. Baumgartner, **N. Robson**, 2011, "Toward a 21 Century Crutch Design for Assisting Natural Gait", *Int. Journal of Innov. Tech. and Creative Eng.*, v.8(1): pp.11-20.
12. **N. P. Robson**, J. M. McCarthy, 2010, "Non-Branching Solutions for the Design of Planar Four Bar Linkages Using Task Velocity Specifications", *Int. Journal of Engineering Research and Innovation*, v.2(2): pp.33-42.
13. **N. P. Robson**, J. M. McCarthy, 2010, "Second Order Task Specifications Used in the Geometric Design of Spatial Mechanical Linkages", *International Journal of Modern Engineering*, v.11:pp.5-11.
14. **N. Patarinsky Robson**, J. M. McCarthy and I. Tumer, 2009, "Failure Recovery Planning for an Arm Mounted on an Exploratory Rover*", IEEE Transactions on Robotics,* 25(6), pp. 1448-1453.

Most Recent Professional Development
NSF Career and ABET workshops, ASEE conference, 06/13

Full Time Faculty

Name & Academic Rank
Haowei Wang, Assistant Professor
Mechanical Engineering

Education
Ph.D., Mechanical Engineering, Rensselaer Polytechnic Institute, Troy, NY, 2012
M.S., Mechanical Engineering, Rensselaer Polytechnic Institute, Troy, NY, 2009
B.Eng., Thermal Energy and Power Engineering, Southeast University, Nanjing, China, 2008

Academic Experience
California State University Fullerton, Assistant Professor, 8/2012-Present, Full Time

Non-academic Experience
GE Global Research Center, Niskayuna, NY, R&D Intern, Combustion Laboratory, 5/2010-8/2010, Full Time

Certification or Professional Registration
None

Current Membership in Professional Organizations
American Society of Mechanical Engineering
Combustion Institute

Honors and Awards
Junior/Senior Intramural Research Grant Award, CSUF, 2013
Faculty Enhancement and Instructional Development Grant Award, CSUF, 2014

Service Activities
Faculty Search Committee, 10/2013-Present
Continuous Improvement Committee, 10/2013-Present
Master's Students Exam Committee, 10/2012-Present
ABET Course Coordinator for EGME 333 and EGME 407, 3/2013-Present
EPOCHS Faculty/Student Mentoring Program (Enhancing Postbaccalaureate Opportunities at CSUF for Hispanic Students) Committee, 9/2012-4/2013
Reviewer for six different journals, 2011-2014
Reviewer, American Chemical Society, Petroleum Research Fund, 2013
Session Chair, Laminar Flames session at the Spring Meeting of Western States Section of the Combustion Institute, Pasadena, CA, 2014
Instructor, Engineering Innovation - A summer program for high school students offered by Johns Hopkins University and CSUF Partnership, 2013

Principal Publications and Presentations (Most important from past 5 years)

1. S.H. Won, S. Dooley, P.S. Veloo, **H. Wang**, M.A. Oehlschlaeger, F.L. Dryer, Y. Ju, "The Combustion Properties of 2,6,10-Trimethyl Dodecane and a Chemical Functional Group Analysis," *Combustion and Flame*, 161, 826-834 (2014).
2. A. Quilala, H. Zazueta, V. Gonzalez, **H. Wang**, Experimental Study of the Effects of Biodiesel on Engine Performance and Emissions, Spring Meeting of Western States Section of the Combustion Institute, Pasadena, CA, (2014)
3. **H. Wang**, W. J. Gerken, W. Wang, and M.A. Oehlschlaeger, "Experimental Study of the High-Temperature Autoignition of Tetralin," *Energy & Fuels*, 27, 5483-5487 (2013).
4. M.A. Oehlschlaeger, **H. Wang** and M.N. Sexton, "Prospects for Biofuels: A Review," *Journal of Thermal Science and Engineering Applications*, 5(2), (2013).
5. S.H. Won, S. Dooley, P.S. Veloo, **H. Wang**, M.A. Oehlschlaeger, F.L. Dryer, Y. Ju, Quantification of Molecule Structure Impact on Combustion Properties for Synthetic Diesel Fuel: 2,6,10-Trimethyldodecane, 8th US National Technical Meeting of the Combustion Institute, Salt Lake City, UT, (2013)
6. **H. Wang** and M.A. Oehlschlaeger, "Autoignition Studies of Conventional and Fischer-Tropsch Jet Fuels," *Fuel*, 98, 249-258 (2012).
7. S. Dooley, S.H. Won, J. Heyne, T.I. Farouk, Y. Ju, F.L. Dryer, K. Kumar, C.J. Sung, **H. Wang**, M.A. Oehlschlaeger, V. Iyer, T.A. Litzinger, R.J. Santoro, T. Malewicki, K. Brezinsky, "The Experimental Evaluation of a Methodology for Surrogate Fuel Formulation to Emulate Gas Phase Combustion Kinetic Phenomena," *Combustion and Flame*, 159, 1444-1466 (2012).
8. S. Dooley, S.H. Won, S. Jahangirian, Y. Ju, F.L. Dryer, **H. Wang**, M.A. Oehlschlaeger, "The Combustion Kinetics of A Synthetic Paraffinic Jet Aviation Fuel and a Fundamentally Formulated, Experimentally Validated Surrogate Fuel," *Combustion and Flame*, 159, 3014-3020 (2012).
9. S. Dooley, S.H. Won, S. Jahangirian, Y. Ju, F.L. Dryer, **H. Wang**, M.A. Oehlschlaeger, An Experimentally Validated Surrogate Fuel for the Combustion Kinetics of S-8, a Synthetic Paraffinic Jet Aviation Fuel, American Institute of Aeronautics and Astronautics, 2012-619, 50th AIAA Aerospace Sciences Meeting, Nashville, TN, (2012)
10. S.M. Sarathy, C.K. Westbrook, M. Mehl, W.J. Pitz, C. Togbe, P. Dagaut, **H. Wang**, M.A. Oehlschlaeger, U. Niemann, D. Seshadri, P.S. Vello, C. Ji, F.N. Egolfopoulos, T. Lu "Comprehensive Chemical Kinetic Modeling of the Oxidation of 2-Methylalkanes from C_7 to C_{20}," *Combustion and Flame*, 158, 2338-2357 (2011).
11. S. Dooley, S.H. Won, M. Chaos, J. Heyne, Y. Ju, F.L. Dryer, K. Kumar, C.J. Sung, **H. Wang**, M.A. Oehlschlaeger, R.J. Santoro, and T.A. Litzinger, "A Jet Fuel Surrogate Formulated by Real Fuel Properties," *Combustion and Flame*, 157, 2333-2339 (2010).

Most Recent Professional Development (Past 5 years)

New Faculty Training Program at CSUF, 8/2012-5/2013
Set up the Combustion Laboratory on Campus, 8/2012-Present
Submitted NSF Research Proposal, 10/2013
Attended Combustion Institute conference, Pasadena, CA, 2014

PART TIME FACULTY

Part Time Faculty

Name and Academic Rank

Medhat Azzazy, Lecturer
Mechanical Engineering

Education

Ph.D, Mechanical Engineering, University of California, Berkley, 1982
M.Sc., Mechanical Engineering, Cairo University, 1977
B.Sc., Mechanical Engineering, Cairo University, 1977

Academic Experience

California State University, Fullerton, CA
Lectured mechanical engineering courses, 2001 - Present, Part Time
University of California, Los Angeles, CA
Taught graduate level courses related to thermodynamics, fluid mechanics and heat transfer, 1995
Cal State San Francisco, CA
Taught undergraduate courses in thermodynamics, 1981 -1982
Cairo University, Egypt
Taught undergraduate courses in the areas of fluid mechanics, turbomachinery, aerodynamics and hydraulic fluid control, 1975 - 1977

Non-academic Experience

Patents:

- "Multipoint Optical Volumetric Flowmeter," US Patent #5,701,172, 1997
- "Method and Apparatus for Detecting Vehicle Occupants Under the Influence of Alcohol," with A. Dabiri, US Patent #5,349,187, 1994
- "An Optical Instrument to Measure Ambient Pressure and Temperature Remotely from an Atmospheric Vehicle," with J.B. Abbiss, R. W. McCullough, and A. E. Smart, US Patent #5,055,692, 1991

Certification or Professional Registration

California

Current Membership in Professional Organizations

American Society of Mechanical Engineering (ASME)
Optical Society of America (OSA)

Honors and Awards

Listed among Who is Who in business professionals, 1998-1999
Most Valuable Performer of the Year, Titan Corporation, 1988
Earle C. Anthony Scholarship, UC Berkley, 1978-1981
Egyptian Ministry of Higher Education Scholarship, 1970-1975
Best Student of the Year, Egyptian Ministry of Higher Education, 1975

Service Activities
CSUF Mechanical Engineering Graduate Oral Exam Committee, Fall 2010

Principal Publications (Past 5 years)
N/A

Most Recent Professional Development
N/A

Part Time Faculty

Name and Academic Rank

Jacob S. Bailey, Lecturer
Mechanical Engineering

Education

M.S., Mechanical Engineering, California State University, Fullerton, expected Fall 2014
B.S., Mechanical Engineering, California State University, Fullerton, May 2013

Academic Experience

Lecturer, California State University, Fullerton. 8/2013-Present, Part Time

Non-academic Experience

Chief Engineer, Castor Engineering, Inc. La Habra, CA. 7/2008-Present, Full Time

Certification or Professional Registration

Certified SolidWorks Professional (CSWP).
Certificate ID: C-R7HH6Z5PG5
Certified SolidWorks Professional – Advanced Drawing Tools (CSWPA-DT).
Certificate ID: C-EEM7ZTBMCA
Certified SolidWorks Professional – Advanced Mold Tools (CSWPA-MT).
Certificate ID: C-3AB9GZ9UX2

Current Membership in Professional Organizations

American Society of Mechanical Engineering, 2009 - Present
Society of Automotive Engineers, 2012 - Present

Honors and Awards

Boeing/College of ECS Scholarship recipient, Spring 2012.

Service Activities

Faculty Advisor/Collaborator, 2013-2014 Titan UAV Team, 8/2013-Present
Faculty Advisor, Society for Unmanned Aerial Vehicle Engineering (SUAVE),
CSUF student organization, 2/2014-Present

Principal Publications (Past 5 years)

N/A

Most Recent Professional Development

N/A

Part Time Faculty

Name and Academic Rank
Greg Digilio, Lecturer
Mechanical Engineering

Education
Associate in Arts - Manufacturing Technology
Associate in Arts - CAD/CAM
Associate in Arts - CNC Operator
Associate in Science – Welding
Associate in Arts - Liberal Studies
Certificate of Completion - CAD/CAM
Certificate of Completion - CNC
Certificate of Completion - Manufacturing Technology
Certificate of Completion – Welding Technology

Academic Experience
Santa Ana College, September 2008 – Present, Part Time
Cal State Fullerton, September 2010 – Present, Part Time
Fullerton College, September 2009 - December 2012

Non-academic Experience
Canyon Composites Anaheim, California, May 2007 - October 2010
Apex Design Inc. Anaheim, California, November 2005 - March 2007
Camtech Inc. Irvine, California, August 2002 - October 2005

Certification or Professional Registration
None

Current Membership in Professional Organizations
None

Honors and Awards
None

Service Activities
None

Principal Publications (Past 5 years)
None

Most Recent Professional Development
None

Part Time Faculty

Name & Academic Rank

Gyunghwan Kim, Lecturer
Mechanical Engineering

Education

M.S., Mechanical Engineering, California State University Fullerton, Fullerton, CA, 2013
B.S., Mechanical Engineering, California State University Fullerton, Fullerton, CA, 2011

Academic Experience

California State University Fullerton, Lecturer, 8/2013-Present, Part Time
California State University Fullerton, Teaching Assistant, 11/2011- 6/2012, Part Time

Non-academic Experience

Sales/Manufacturing Engineer, Kumho Electric USA Inc. Santa Fe Spring, CA,
Inside Sales-Manufacturing, 2/2014-Present, Part Time

Certification or Professional Registration

None

Current Membership in Professional Organizations

American Society of Mechanical Engineering, 2012- Present

Honors and Awards

None

Service Activities

None

Principal Publications and Presentations (Most important from past 5 years)

None

Most Recent Professional Development (Past 5 years)

Improvement of EGME 306A: Unified Laboratory at CSUF, 8/2013- Present
Teach undergraduate students how to design a new experiment, 8/2013- Present

Part Time Faculty

Name & Academic Rank
Peter Mignosa, Lecturer
Mechanical Engineering

Education
M.S., Mechanical Engineering, California State University Fullerton, Fullerton, CA, 2009
B.S., Mechanical Engineering, California State University Long Beach, Long Beach, CA, 2002

Academic Experience
California State University Fullerton, Lecturer, 8/2010 - Present, Part Time

Non-academic Experience
Tesoro

Tank Specialist, May 2011 - Present

- Act as Site Technical Authority, (STA) for all design, construction, maintenance, and Inspection aspects of aboveground storage tanks, for all of the tanks in the Southwest region, Refineries and Logistics.

British Petroleum

Hydrocracker Facility Integrity Engineer, 2/2008 - 5/2011

- Engineer in charge of all integrity issues related to piping, pressure vessels and heat exchangers in the Hydrocracker area at the Carson refinery.

Endocare, Inc.

Mechanical Design Engineer, 6/2005 – 2/2008

- Product Design, from initial concept through final manufacturable product.

Riedon, Inc.

Facility Engineer

- Project Management, Developing the manufacturing processes of new product lines from origination to completion.

Certification or Professional Registration
California Professional Mechanical Engineers License
License # M 35880
API 653 Above Ground Storage Tanks Inspection Certification
ID 48206, Expires 04/30/2016

Current Membership in Professional Organizations
American Society of Mechanical Engineering, 2008 - Present
American Petroleum Institute Design Subcommittee for Aboveground Storage Tanks (SCAST)
11/2011 - Present

Honors and Awards
Selected as 2002 Mechanical Engineering Outstanding Graduate of the Year

Service Activities
N/A

Principal Publications and Presentations (Most important from past 5 years)
N/A

Most Recent Professional Development
N/A

Part Time Faculty

Name & Academic Rank
Hai Phan, Lecturer
Mechanical Engineering

Education
M.S., Mechanical Engineering, California State University, Fullerton, CA, 1981
B.S., Agricultural Engineering, California State Polytechnic University, Pomona, CA, 1973

Academic Experience
University of California, Irvine, Lecturer, 1996-1999, part time
California State University Fullerton, Lecturer, 1986-present, part time

Non-academic Experience
HPDV & Associates, Irvine, CA

Principal Engineer, 2003 - Present, Full time

- Provided mechanical engineering services to petrochemical, energy, aerospace, medical and commercial industries. Expertise includes mechanical engineering; pressure vessels, piping and mechanical equipment design; seismic assessment, FEA, fluid/thermal/ stress analysis, fitness-for-service assessment and compliance certification. Working experience with engineering standards includes ASME, API, ANSI, ASCE, DNV, NFPA, MIL, QQ

Emergency Respiratory Products, Inc., Florida (LSTI)

Subsidiary Startup President, 2000-2003, Full Time

- Managed the startup of Emergent Respiratory Products, a LSTI's subsidiary. Established infrastructure conforming to FDA and ISO quality system; successfully developed new continuous positive airway pressure (CPAP) products for treatment of patients with CHF (congested heart failure) and secured FDA 510K clearance for market launch. Successfully positioned the subsidiary for successful venture acquisition and new management transition

Life Support Technology

VP of Operations & Engineering, 1999-2000, Full Time

Computer Assisted Engineering, Orange, CA (CAE)

Principal Engineer/VP of Operations, 1986-1999, Full Time

- Responsible for consulting operations and execution of client projects; managed proposals and contracts, budgets, cash flow, staffing, projects planning and quality assurance; successfully executed all client projects and improved company revenue. A partial list of completed projects is attached.

Armco - National Production Systems, Los Nietos, CA

Engineering Manager, 1980-1986, Full Time

- Developed down-hole hydraulic pumps and oil well production systems. Implemented Autotrol 3-D CAD/CAM and finite element analysis in equipment design, and developed multiphase flow performance simulation of the jet pump production system which led to improvements in equipment design and system performance.

Vacco Industries

Project Engineer, 1975-1980, Full Time

Vinapro-Yanmar Diesel Co.

Manufacturing Manager, 1973-1975, Full Time

Certification or Professional Registration
Professional Engineer Registration #M20780

Current Membership in Professional Organizations
American Society of Mechanical Engineering, 1975-present

Honors and Awards
ASME Orange County Section Chairman Award, 1966
ASME Region IX Outstanding Section Chairman Award, 1997
ASME Orange Country Section, Biomedical Section Chairman Award, 2003

Service Activities
ASME Orange County Section, Program Chairman, 1994-1996
ASME Orange County Section, Section Chairman, 1996-1997
ASME Orange Country Section, Biomedical Section Chairman, 2004

Principal Publications and Presentations (Most important from past 5 years)
None

Most Recent Professional Development (Past 5 years)
Medical Product Development Certificate
Seismic Design and Retrofit of Equipment and Piping

Part Time Faculty

Name & Academic Rank
Pradeep Sharma, Lecturer
Mechanical Engineering

Education
M.B.A., University of Texas at Dallas, Dallas, TX., 1988
M.S. Mechanical Engineering, Imperial College of Science and Technology, London, U.K., 1977
B.S., Mechanical Engineering, Panjab University, Chandigarh, India, 1972

Academic Experience
California State University Fullerton, CA
Mechanical Engineering Department, Spring 2014, Part Time
Chaffey College, Rancho Cucamonga, CA.
Instructor for Engineering Drawing and Graphics, 1991, Part Time
North Lake College, Irvine, TX.
Instructor for courses in Solar Energy, Engineering Drawing and Graphics, Mathematics, and Science, 1980-82, Part Time
Private instructor for undergraduate in Engineering, Business Administration, Mathematics, Physics, Chemistry, Statics and Dynamics,1994 – Present, Part-Time

Technical Education/Training Industry Experience. 1976-2006. Full-Time
Designed technical training programs for both energy industry customers and internal company staff. Conducted training classes and seminars for public education in the areas of HVAC (Heating, Ventilating, & Air-Conditioning), Solar energy, Energy conservation, Reductions in carbon and VOC emissions, Energy-efficiency in buildings, and Project Management

Non-Academic Experience (in Industry)
Allegra Print And Imaging, Garden Grove, CA. 4 years. *President*
Thermosteam Systems, Inc., Diamond Bar, CA. 1 year. *Vice-President*
Maytag, Los Angeles, CA. 5 years. *Director, Research and Development*
Southern California Edison Company, Irwindale/Rosemead, CA. 4 years. *Technology Developmemt Manager/Product Manager*
Southern California Gas Company, Los Angeles, CA. 3 years. *Market Development Manager*
Hayward Industries, Pomona, CA. 3 years. *Engineering Manager*
Comfortzone Corporation, Nashville, TN. 1 year. *Chief Engineer*
Lennox Industries, Inc., Dallas, TX. 12 years. *Project Engineer*

Certification or Professional Registration
Professional Engineer
Certified Gas Engineer

Current Membership in Professional Organizations
Fellow, Institute for Advancement of Engineering
Member, Institution of Mechanical Engineers
Member, Los Angeles Council of Engineers and Scientists

Member, Orange County Engineering Council
Past President and Active Member, American Society of Gas Engineers
Technical Advisor, SCAQMD Rules 1171 and 1122 Advisory Committees

Honors and Awards

EPA Award for research and development of water-based industrial parts cleaners to replace chemical cleaners and reduce VOC emissions in Southern California by 40 tons per day.
Awarded the honor of "Fellow" by the Institute of Advancement of Engineering
Consortium of Energy Efficiency Award for outstanding service in the area of energy efficiency
Art Theobold Award for recognition of contributions and services to the gas industry from the American Society of Gas Engineers

Service Activities

Board Member of American Society of Gas Engineers
Main speaker at National Geothermal Heat Pump Consortium Technical Conference
Volunteer at UC Irvine Medical Center, Orange, CA
Volunteer at VA Administration Hospital Landscaping project in Long Beach, CA
Volunteer at 2 environmental control projects in Silverado Canyon and Huntington Beach, CA
Volunteer to help build an educational interpretive gazebo at Tucker's Wildlife Sanctuary, CA
Instructor for Boy Scouts of America merit badge training programs

Principal Publications and Presentations (Most important from past 5 years)

N/A

Most Recent Professional Development

Leeds and Green Energy Buildings Seminar - 05/2011
Efficient Technologies for Commercial Refrigeration Seminar - 12/2012
Title 24 Building Energy Standards Essentials for Residential Installations Workshop - 08/2013
Title 24 Building Energy Standards Essentials for Commercial Installations Workshop - 12/2013
CSI Commercial Solar Workshop - 01/2014

Part Time Faculty

Name & Academic Rank

Eryk Stacy, Lecturer
Mechanical Engineering

Education

B.S. Mechanical Engineering, CSU Fullerton, 1994

Academic Experience

California State University, Fullerton

Lecturer, 8/1998-Present, Part-Time 19 of 32 terms
Undergraduate Advisor 8/2010-Present, continuous except for summer terms

Non-academic Experience

Independent Contractor

Mechanical Engineer/Designer/Drafter, 3/2000 – 7/2007

- Worked for several different clients: primarily D&B Fabrication Plus and Emergency Medical Technologies (see details directly below)
- Hanford City Fire Department (Hanford, CA): converting CAD map drawings into AutoCAD, setting up CAD standards, customizing screen menu, training employees to use AutoCAD for updating map books

D&B Fabrication Plus, Corona, CA

Mechanical Engineer/ Designer/ Drafter (Independent Contractor), 3/2005 - 7/2007

- Designed window and door hardware (using SolidWorks and AutoCAD)—including invention of complex door latching mechanism (co-inventor on patent)
- Performed stress and deflection analysis of aluminum extrusions for glass windows and doors due to wind loads

Emergency Medical Technologies, Irvine, CA

Mechanical Engineer/ Designer/ Drafter (Contract to Full-time employee), 6/2000 - 10/2002

- Designed (using SolidWorks and AutoCAD), assembled, tested and documented prototype and initial-production breathing machines to meet FDA requirements
- Machines were CPAP (continuous positive airway pressure) devices— comprised of both a demand valve and patient valve, intended for use in pre-hospital care as an effective intervention for congestive heart failure
- Designed and built test equipment—mechanical lung with pressure and flow instrumentation combined with WinDaq data acquisition software
- Designed patient exhalation valve—created models and drawings in SolidWorks, worked with vendor to produce multiple stereolithography (rapid prototype) parts from computer generated models in the design process

Computer Assisted Engineering, Orange, CA

Mechanical Engineer/ Designer/ Drafter, 10/1989 - 1/2000

- Designed a very wide variety of mechanical devices using AutoCAD with some exposure and practice using Pro/Engineer
- Structural analysis and design documentation of a wide variety of mechanical structures and components using MSC Nastran for finite element analysis (FEA)—included validation of large drill-pipe handling robots for use on platforms and ships for Varco Systems in Orange, CA
- Analysis, design documentation, and project management for several compact, high power capacity planetary gearboxes for Centrilift in Huntington Beach, CA—extensive analysis of roller bearing life and gear tooth pitting and bending fatigue calculations per AGMA standards with Mathcad. Use of FEA modeling for deflection analysis of critical internal components
- Designed a sheet metal electronics enclosure (RFI shielded) for light aircraft using CADKEY for Kaiser Electroprecision in Irvine, CA
- Performed functions related to design, drafting, analysis, documentation and fabrication of a robotic hoist system for a hard-disk plating line for Seagate Substrates in Anaheim, CA
- Customized and maintained AutoCAD and other design software on workstations
- Contributed to in-house software development, drafting standards and procedures
- Proposal writing, project planning and managing drafters
- Interfaced with clients to determine design objectives and specifications, scheduling and budgeting

Certification or Professional Registration
Licensed Professional Engineer (PE), Mechanical Engineering; California

Current Membership in Professional Organizations
None

Honors and Awards
None

Service Activities
None

Principal Publications and Presentations (Most important from past 5 years)
None

Most Recent Professional Development (Past 5 years)
Teaching with Technology in Mind – CSUF Faculty Development Center, 1/2014-4/2014

APPENDIX C:

EQUIPMENT

Appendix C – Equipment

The following lists all the major equipment used by the Mechanical Engineering program in support of instruction. Almost all the information is also provided in Criterion 7 of the main body of the Self Study Report.

***Unified Engineering Laboratory* (*EGME 306A*) – Junior first semester laboratory**

- MTS Insight 50 Testing Machines – to conduct tensile and compression, and deflection/bending tests (Figure C-1).
- Charpy Impact Test Machine – to perform impact testing, and investigate the ductile to brittle transition temperature for various materials at different temperatures.
- Column Testing Machines – to study the crushing and buckling behavior of columns under axial compressive loading, and determine the critical loads of columns.

Figure C-1 MTS Testing Machines

***Fluids and Thermal Laboratory* (*EGME 306B*) – Junior second semester laboratory**

- Air Duct – to investigate the flow of air through a duct and examine pressure drop along the duct, as well as the velocity profile through the duct cross-section.
- Water Venturi Meter Experiment – to investigate the fluid mechanics principles, which govern the flow of an incompressible fluid through a venturi meter.
- Water Pipe Circuit Experiment – to study fluid mechanics principles that govern the flow of an incompressible fluid through pipe fixtures and straight and bent pipe sections; friction factors and loss coefficients based on pipe dimensions and configurations; and Reynolds Numbers for the different flow rates.
- Subsonic Wind Tunnel – to evaluate the principles that govern the flow of an incompressible fluid over various types of bluff and streamlined bodies as well as airfoil models consisting of different flap/slat configurations (Figure C-2).
- Hampden shell-and-tube heat transfer system with LabVIEW logging capability (Figure C-3).

Figure C-2 Subsonic Wind Tunnel

Figure C-3 Hampden Shell-and-Tube Heat Transfer System

***Dynamic Systems and Controls Laboratory* (*EGME 476A*) – Senior First Semester Laboratory**

- ECP Model 750 Control Moment Gyroscopes – to determine the relationship between the spin and precession angular velocities, and the applied moment of a gyroscope (Figure C-4).
- Multi-Degree of Freedom Spring-Mass Vibrating System Integrated with a High-Speed DSP-Based Control System – to measure and control several variables in real-time. This module enables students to perform a variety of experiments, e.g., subjecting the dynamic system to different loading conditions, evaluating its harmonic and transient responses, and implementing different control strategies (Figure C-5).
- Spectra Quest Machinery Fault Simulator – to check experimentally the methods of calculating the positions of counter balancing weights in rotating mass systems (Figure C-6).
- Quanser Control Experiment Modules – to conduct various control experiments that include DC Motor, Velocity Control Experiments, 2D Helicopter, and Ball and a Beam Control Experiment (Figure C-7)
- Beam Vibration – to investigate the resonance phenomena and measure the natural frequency of a beam.

- B & K Shaker Table – to investigate the response of vibrating system that is subjected to different loading conditions with different frequencies.
- Torsional Pendulum – to determine the damping coefficient of an rotary oscillating system as a function of submergence depth for the torsional oscillator in a liquid.

Figure C-4 ECP Control Moment Gyroscope

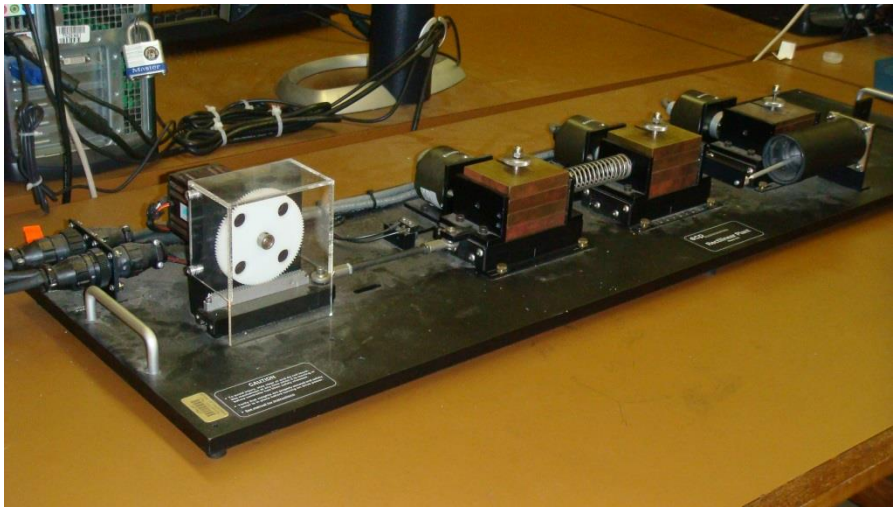


Figure C-5 Multi-Degree of Freedom Vibration and Control System

Figure C-6 Spectra Quest Machinery Fault Simulator

Figure C-7 *Quanser* Control Experiment Modules

***Energy and Power Laboratory* (*EGME 476B*) – Senior Second Semester Laboratory**

- Double Pipe Heat Exchanger – to study the heat transfer characteristics of a double pipe heat exchanger using hot and cold water as the working fluid (Figure C-8).
- Flotek 306 Subsonic Wind Tunnel – to examine lift and drag characteristics of an NACA airfoil and velocity pressure profile around the airfoil (Figure C-9).
- Hampden Refrigeration Unit – to investigate refrigeration theory, and determine the coefficient of performance for different operating conditions.
- Oil Pipe Flow – to examine the flow of oil in a pipe. Laminar, transition, turbulent flow conditions are explored and the use of a hot film anemometer to measure velocity profiles is introduced.

Figure C-8 Double Pipe Heat Exchanger

Figure C-9 Flotek Subsonic Wind Tunnel

Newest additions to EGME 476B

- **TurboGen Gas Turbine Electrical Generation System:** TurboGen, one of the newest units offered by Turbine Technologies, LTD, has been added to our EGME 476B Energy and Power Laboratory. TurboGen consists of an engine/generator combination: (a) SR-30 engine with a radial flow centrifugal compressor, a reverse flow annular combustor and an axial flow turbine, and (b) a trust driven free power turbine directly coupled to TG-2000 electrical generator. TurboGen comes with a laptop computer equipped with National Instruments DAQ system with LabVIEW display. This TurboGen unit provides a platform for the study of gas turbine power systems and gas turbine electrical generation systems. Students are able to apply the theories and concepts introduced in thermodynamics, fluid mechanics and heat transfer courses to the operation of an actual engine using Brayton cycle analysis. (Figure C-10)

Figure C-10 ***Turbogen Gas Turbine Electrical Generation System***

- **H-SHSP-1 Solar Heat and Solar Photovoltaic Trainer:** H-SHSP-1 Solar Heat and Solar Photovoltaic Trainer, offered by Hampden Engineering Corporation through Ranesco Technical Training, is the latest equipment addition to our EGME 476B Energy and Power Laboratory (Figure 7-13). H-SHSP-1 consists of both solar voltaic and solar hot water: (a) two solar photovoltaic modules, a charge controller controls the charging of a 12V DC battery and a 375W inverter to convert the 12V DC to 120V AC, and (b) a flat panel solar cell collector, a water tube solar collector along with circulation pumps. H-SHSP-1 comes with a computer data logging option. This solar heat and solar photovoltaic trainer provides a platform for incorporating solar energy study into our mechanical engineering undergraduate curriculum. It allows students to examine the hot water and electrical layouts and operational features associated with a solar heating system and photovoltaic power source. Our students will be beneficial through the integration of modern and cutting-edge knowledge in alternative energy through the addition of this solar heat and solar photovoltaic trainer.

Figure C-11 Solar Heat and Solar Photovoltaic Trainer

***Engineering Machine Shop (EGME 414 and 419)* – Capstone Senior Design Classes**

New additions to the machine shop include six CNC machines by Haas that worth more than $290,000. These machines include two TL-1 models (conventional/CNC lathes - Figure C-12), two TM-2 models (conventional/ CNC mills), one SL-20 (turning Center: lathe with auto tool changer) and one VF-3 model (vertical machining center: 5-axis milling machine). Figure C-13 shows the TL1, TM2, and VF-3 CNC machines. These machines introduce students to production manufacturing technology and prepare them to consider many facets of machining that could not be taught using conventional machines. The modified EGME 315 course material will include modern cutter geometry, tool offsets, calculable feed rates, and G-code programming. In addition, undergraduate students create prototypes using the existing 3D printer to realize a model before heading to actual manufacturing of the project (Figure C-14).

Figure C-12 Hass TL-1 Conventional/CNC Lathe

Figure C-13 Hass TL1, TM2, and VF-3 CNC Machines

Figure C-14 3D Systems Rapid Prototyping Machine

APPENDIX D:

INSTITUTIONAL SUMMARY

Appendix D – Institutional Summary

1. The Institution

a. Name and address of the institution

California State University, Fullerton
800 North State College Boulevard
Fullerton, CA 92831

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

Dr. Mildred Garcia, President

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

Dr. Raman Unnikrishnan, Dean, College of Engineering and Computer Science

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

Western Association of Schools and Colleges
985 Atlantic Avenue, Suite 100
Alameda, CA 94501
Phone: 510-748-9001
Email: wascsr@wascsenior.org
Internet: www.wascweb.org

Other accreditation and association recognition with initial and recent evaluation dates are included in the chart on the following page.

INVENTORY OF CONCURRENT ACCREDITATION AT CALIFORNIA STATE UNIVERSITY, FULLERTON

In addition to institutional accreditation, the following academic programs at CSUF are accredited by discipline-specific accreditation agencies and associations

College	Program	Degree	Accrediting Agency		Initial Accreditation	Most Recent Accreditation	Next Accreditation
College Of Arts	Art	BA	National Association of Schools of Art and Design	NASAD	1974	2003	2014
College Of Arts	Art	BFA	National Association of Schools of Art and Design	NASAD	1994	2003	2014
College Of Arts	Art	MA	National Association of Schools of Art and Design	NASAD	1974	2003	2014
College Of Arts	Art	MFA	National Association of Schools of Art and Design	NASAD	1994	2003	2014
College Of Arts	Dance	BA	National Association of School Of Dance	NASD	1993	2002	2014
College Of Arts	Music	BA	National Association of Schools of Music	NASM	1966	2002	2014
College Of Arts	Music	BM	National Association of Schools of Music	NASM	1975	2002	2014
College Of Arts	Music	MA	National Association of Schools of Music	NASM	1966	2002	2014
College Of Arts	Music	MM	National Association of Schools of Music	NASM	1975	2002	2014

College Of Arts	Theater Arts	BA	National Association of Schools of Theatre	NAST	1974	2005	2015
College Of Arts	Theatre Arts	BFA	National Association of Schools of Theatre	NAST	2005	2005	2015
College Of Arts	Theatre Arts	MFA	National Association of Schools of Theatre	NAST	1985	2005	2015
College Of Business and Economics	Accounting	MS	Association to Advance Collegiate Schools of Business	AACSB	1966	2014	2018
College Of Business and Economics	Business Administration	BA	Association to Advance Collegiate Schools of Business	AACSB	1965	2014	2018
College Of Business and Economics	Business Administration	MBA	Association to Advance Collegiate Schools of Business	AACSB	1972	2014	2018
College Of Business and Economics	International Business	BA	Association to Advance Collegiate Schools of Business	AACSB	1984	2014	2018
College Of Business and Economics	Taxation	MS	Association to Advance Collegiate Schools of Business	AACSB	1996	2014	2018
College Of Communication	Communicative Disorders	BA	Council on Academic Accreditation in Audiology and Speech-Language Pathology	CAA	1969	2011	2018
College Of Communication	Communicative Disorders	MA	Council on Academic Accreditation in Audiology and Speech-Language Pathology	CAA	1969	2011	2018
College Of Communication	Communications	BA	Accrediting Council on Education in Journalism and Mass Communications	ACEJMC	1971	2009	2015

College Of Communication	Communications	MA	Accrediting Council on Education in Journalism and Mass Communications	ACEJMC	1971	2009	2015
College Of Education	Credentials		National Council for Accreditation of Teacher Education	NCATE	1960	2007	2015
College Of Education	Education (various concentrations)	MS	National Council for Accreditation of Teacher Education	NCATE	1970	2007	2015
College Of Engineering and Computer Science	Civil Engineering	BS	ABET	ABET	1985	2009	2014
College Of Engineering and Computer Science	Computer Engineering	BS	ABET	ABET	2007	2007	2014
College Of Engineering and Computer Science	Computer Science	BS	ABET	ABET	1988	2009	2014
College Of Engineering and Computer Science	Electrical Engineering	BS	ABET	ABET	1985	2009	2014
College Of Engineering and Computer Science	Mechanical Engineering	BS	ABET	ABET	1985	2009	2014
College Of Health and Human Development	Counseling	MS	Council For Accreditation of Counseling and Related Educational Programs	CACREF	2007	2007	2015
College Of Health and Human Development	Human Services	BS	Council for Standards in Human Services Education	CSHSE	1982	2010	2016
College Of Health and Human Development	Kinesiology (Athletic Training Program)	BS	Commission on the Accreditation of Athletic Training Education	CAATE	2001	2006	2016

College Of Health and Human Development	Nursing	BS	Commission on Collegiate Nursing Education	CCNE	2007	2011	2021
College Of Health and Human Development	Nursing	DNP	Commission on Collegiate Nursing Education	CCNE	Initial visit 2013; Accreditation pending		
College Of Health and Human Development	Nursing	MS	Commission on Collegiate Nursing Education	CCNE	2002	2007	2017
College Of Health and Human Development	Public Health	MPH	Council on Education for Public Health	CEPH	2008	2013	2020
College Of Health and Human Development	Social Work	MSW	Council on Social Work Education	CSWE	2011	2011	2015
College Of Humanities and Social Sciences	Public Administration	MPA	Network of Schools of Public Policy, Affairs, and Administration	NASPAA	1989	2011	2015
College Of Natural Sciences and Mathematics	Chemistry	BS	American Chemical Society	ACS	1970	2004	2014
College Of Natural Sciences and Mathematics	Chemistry	BS	American Chemical Society	ACS	1970	2004	2014

2. Type of Control

The California State University, Fullerton is a public state university and is one of the 23 campuses of the California State University system.

3. Educational Unit

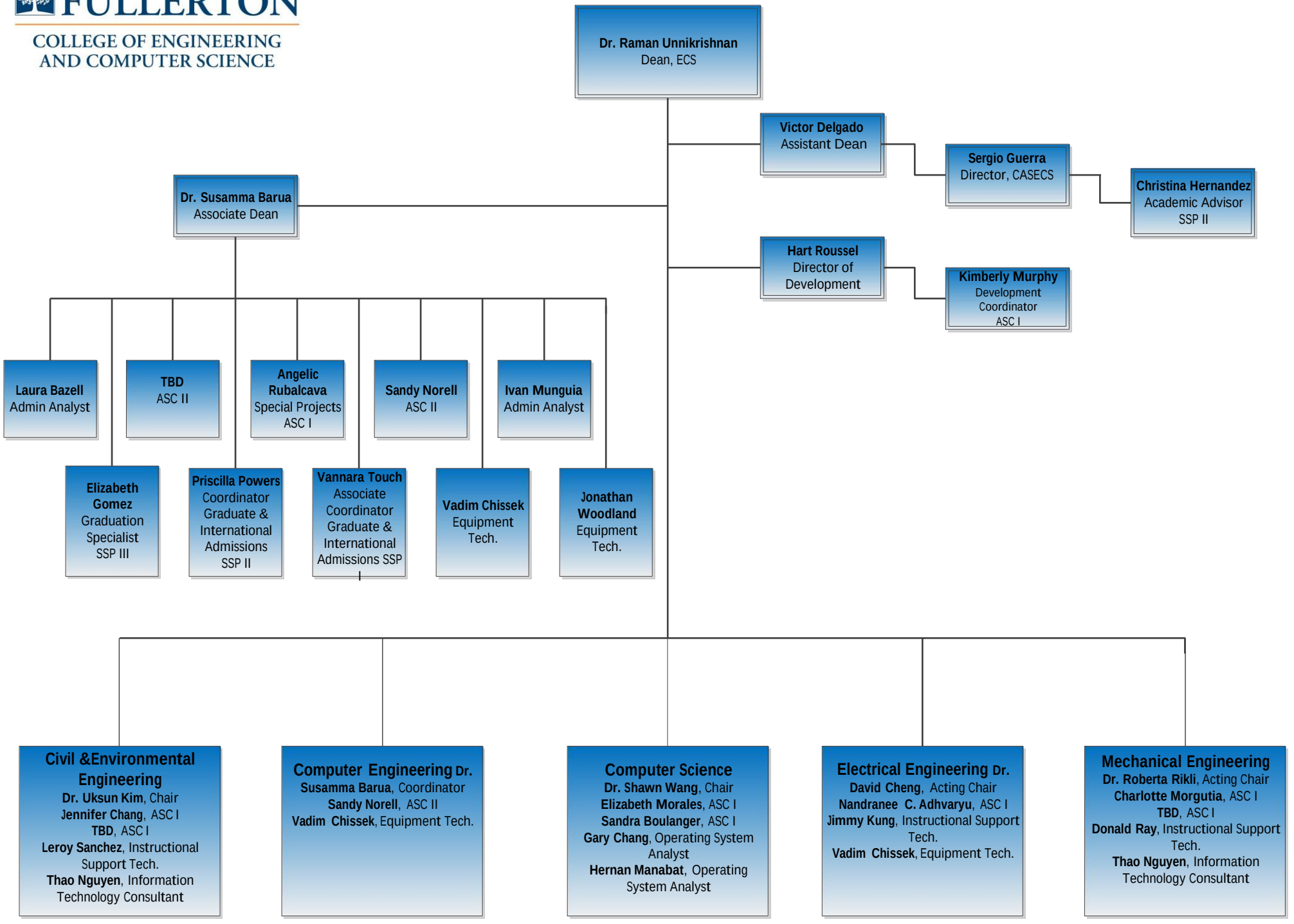
The College of Engineering and Computer Science is one of eight academic colleges of the University. Engineering is offered only within this College within CSUF. The College (which is headed by a Dean) consists of the departments of Civil & Environmental Engineering, Electrical Engineering, Mechanical Engineering, and Computer Science; each Department has its own Department Chair. Computer Engineering, Master's in Software Engineering and Master's in Environmental Engineering programs are also part of the College and are headed by their particular coordinators.

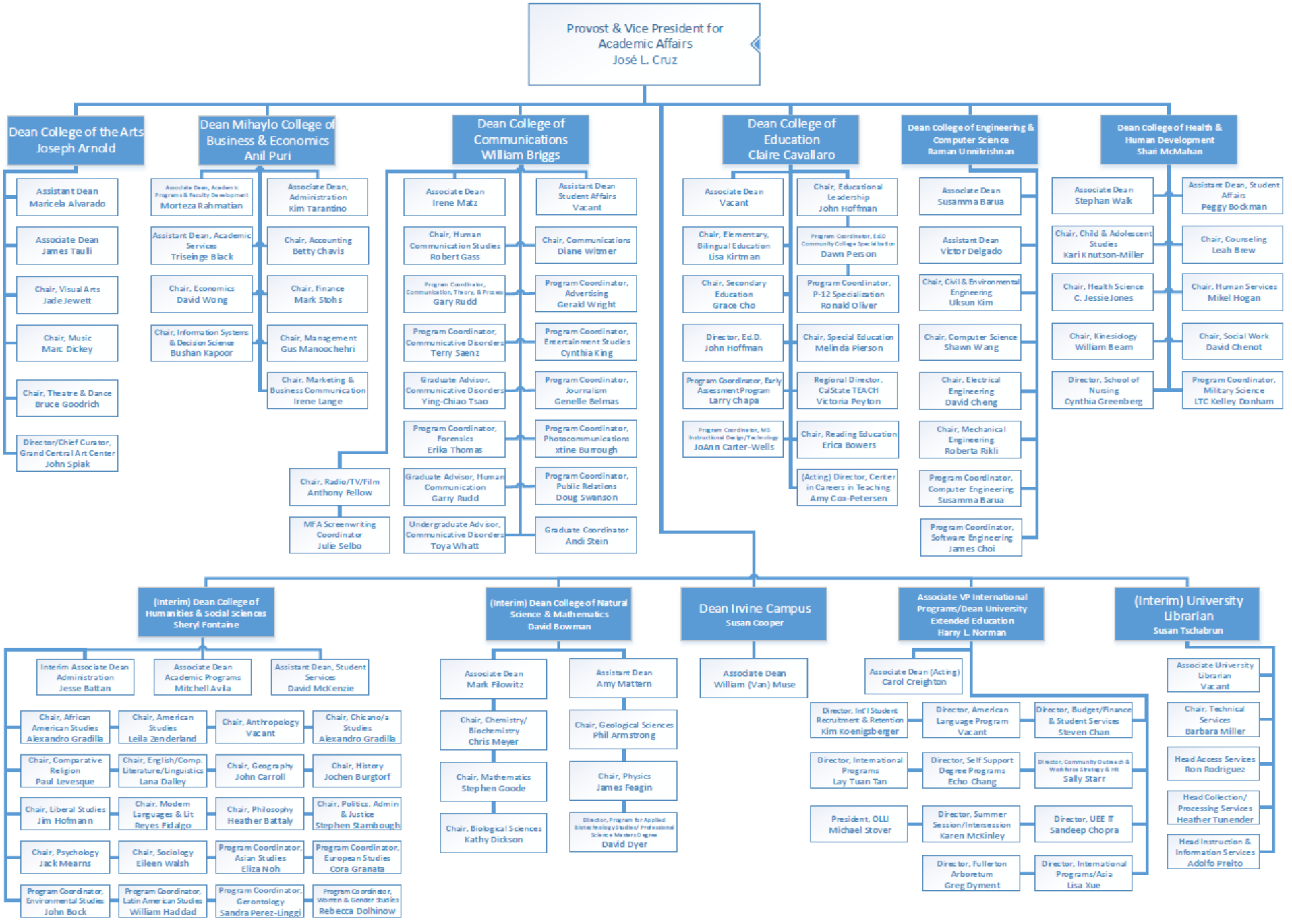
Engineering and Computer Science also houses CASECS (Center for Academic Support in Engineering and Computer Science) whose primary focus is on students enrolled at CSUF.

The organizational Charts for the office of President, the Office of the Provost/Vice President for Academic Affairs, and the College of ECS are given in the following pages. These Organizational Charts describe the people and the roles they play. The charts for the University and the Academic Affairs are simplified to create an easily readable document. In reality, the charts are significantly more complex and are of limited relevance in the context of this self-study.

Please see organizational charts attached.

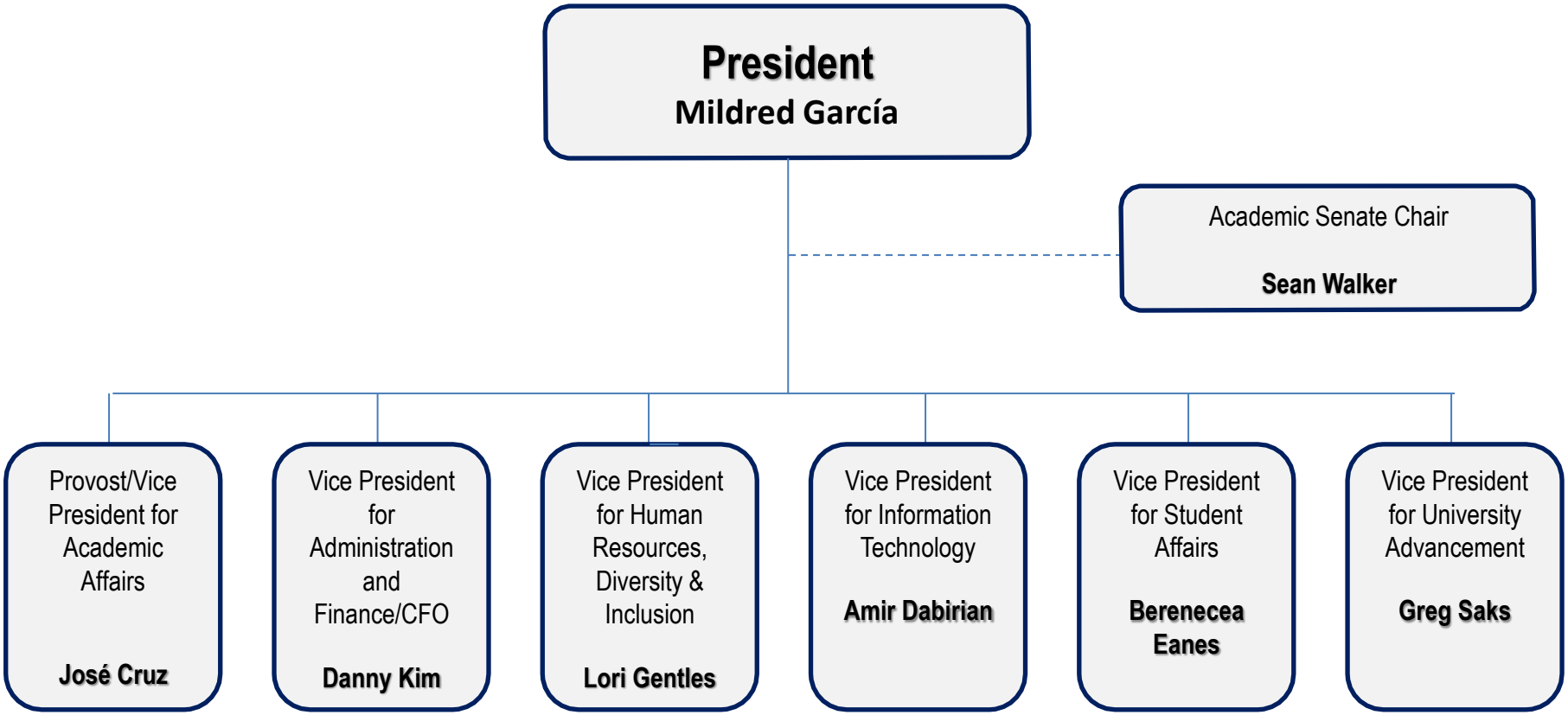
CALIFORNIA STATE UNIVERSITY
FULLERTON
COLLEGE OF ENGINEERING AND COMPUTER SCIENCE




Provost & Vice President for Academic Affairs
José L. Cruz
Dean College of the Arts
Joseph Arnold
Assistant Dean
Maricela Alvarado
Associate Dean
James Tauli
Chair, Visual Arts
Jade Jewett
Chair, Music
Marc Dickey
Chair, Theatre & Dance
Bruce Goodrich
Director/Chief Curator, Grand Central Art Center
John Spiak
Dean Mihaylo College of Business & Economics
Anil Puri
Associate Dean, Academic Programs & Faculty Development
Morteza Rahmatian
Assistant Dean, Academic Services
Triseinge Black
Chair, Economics
David Wong
Chair, Information Systems & Decision Science
Bushan Kapoor
Associate Dean, Administration
Kim Tarantino
Chair, Accounting
Betty Chavis
Chair, Finance
Mark Stohs
Chair, Management
Gus Manoochehri
Chair, Marketing & Business Communication
Irene Lange
Dean College of Communications
William Briggs
Associate Dean
Irene Matz
Chair, Human Communication Studies
Robert Gass
Program Coordinator, Communication, Theory, & Process
Gary Rudd
Program Coordinator, Communicative Disorders
Terry Saenz
Graduate Advisor, Communicative Disorders
Ying-Chiao Tsao
Program Coordinator, Forensics
Erika Thomas
Graduate Advisor, Human Communication
Garry Rudd
Undergraduate Advisor, Communicative Disorders
Toya Whatt
Assistant Dean Student Affairs
Vacant
Chair, Communications
Diane Witmer
Program Coordinator, Advertising
Gerald Wright
Program Coordinator, Entertainment Studies
Cynthia King
Program Coordinator, Journalism
Genelle Belmas
Program Coordinator, Photocommunications
xtine Burrough
Program Coordinator, Public Relations
Doug Swanson
Graduate Coordinator
Andi Stein
Chair, Radio/TV/Film
Anthony Fellow
MFA Screenwriting Coordinator
Julie Selbo
Dean College of Education
Claire Cavallaro
Associate Dean
Vacant
Chair, Elementary, Bilingual Education
Lisa Kirtman
Chair, Secondary Education
Grace Cho
Director, Ed.D.
John Hoffman
Program Coordinator, Early Assessment Program
Larry Chapa
Program Coordinator, MS Instructional Design/Technology
JoAnn Carter-Wells
Chair, Educational Leadership
John Hoffman
Program Coordinator, Ed.D Community College Specialization
Dawn Person
Program Coordinator, P-12 Specialization
Ronald Oliver
Chair, Special Education
Melinda Pierson
Regional Director, CalState TEACH
Victoria Peyton
Chair, Reading Education
Erica Bowers
(Acting) Director, Center in Careers in Teaching
Amy Cox-Petersen
Dean College of Engineering & Computer Science
Raman Unnikrishnan
Associate Dean
Susamma Barua
Assistant Dean
Victor Delgado
Chair, Civil & Environmental Engineering
Uksun Kim
Chair, Computer Science
Shawn Wang
Chair, Electrical Engineering
David Cheng
Chair, Mechanical Engineering
Roberta Rikli
Program Coordinator, Computer Engineering
Susamma Barua
Program Coordinator, Software Engineering
James Choi
Dean College of Health & Human Development
Shari McMahan
Associate Dean
Stephan Walk
Chair, Child & Adolescent Studies
Kari Knutson-Miller
Chair, Health Science
C. Jessie Jones
Chair, Kinesiology
William Beam
Director, School of Nursing
Cynthia Greenberg
Assistant Dean, Student Affairs
Peggy Bockman
Chair, Counseling
Leah Brew
Chair, Human Services
Mikel Hogan
Chair, Social Work
David Chenot
Program Coordinator, Military Science
LTC Kelley Donham
(Interim) Dean College of Humanities & Social Sciences
Sheryl Fontaine
Interim Associate Dean Administration
Jesse Battan
Associate Dean Academic Programs
Mitchell Avila
Assistant Dean, Student Services
David McKenzie
Chair, African American Studies
Alexandro Gradilla
Chair, American Studies
Leila Zenderland
Chair, Anthropology
Vacant
Chair, Chicano/a Studies
Alexandro Gradilla
Chair, Comparative Religion
Paul Levesque
Chair, English/Comp. Literature/Linguistics
Lana Dalley
Chair, Geography
John Carroll
Chair, History
Jochen Burgtorf
Chair, Liberal Studies
Jim Hofmann
Chair, Modern Languages & Lit
Reyes Fidalgo
Chair, Philosophy
Heather Battaly
Chair, Politics, Admin & Justice
Stephen Stambough
Chair, Psychology
Jack Mearns
Chair, Sociology
Eileen Walsh
Program Coordinator, Asian Studies
Eliza Noh
Program Coordinator, European Studies
Cora Granata
Program Coordinator, Environmental Studies
John Bock
Program Coordinator, Latin American Studies
William Haddad
Program Coordinator, Gerontology
Sandra Perez-Linggi
Program Coordinator, Women & Gender Studies
Rebecca Dolhinow
(Interim) Dean College of Natural Science & Mathematics
David Bowman
Associate Dean
Mark Filowitz
Chair, Chemistry/ Biochemistry
Chris Meyer
Chair, Mathematics
Stephen Goode
Chair, Biological Sciences
Kathy Dickson
Assistant Dean
Amy Mattern
Chair, Geological Sciences
Phil Armstrong
Chair, Physics
James Feagin
Director, Program for Applied Biotechnology Studies/ Professional Science Masters Degree
David Dyer
Dean Irvine Campus
Susan Cooper
Associate Dean
William (Van) Muse
Associate VP International Programs/Dean University Extended Education
Harry L. Norman
Associate Dean (Acting)
Carol Creighton
Director, Int'l Student Recruitment & Retention
Kim Koenigsberger
Director, International Programs
Lay Tuan Tan
President, OLLI
Michael Stover
Director, American Language Program
Vacant
Director, Self Support Degree Programs
Echo Chang
Director, Summer Session/Intersession
Karen McKinley
Director, Fullerton Arboretum
Greg Dyment
Director, Budget/Finance & Student Services
Steven Chan
Director, Community Outreach & Workforce Strategy & HR
Sally Starr
Director, UEE IT
Sandeep Chopra
Director, International Programs/Asia
Lisa Xue
(Interim) University Librarian
Susan Tschabrun
Associate University Librarian
Vacant
Chair, Technical Services
Barbara Miller
Head Access Services
Ron Rodriguez
Head Collection/ Processing Services
Heather Tunender
Head Instruction & Information Services
Adolfo Preito

CALIFORNIA STATE UNIVERSITY FULLERTON

University Division Heads



March 2014

4. Academic Support Units

Academic Supporting Units, Names an Titles of the Individuals Responsible, and the Courses Taught			
Academic Supporting Units	Individuals Responsible	Courses Taught	Credit Hours
Departments of Mathematics	Dr. Stephen Goode, Dept. Chair & Professor	Math 150A Calculus	4
		Math 150B Calculus	4
		Math 250A Intermediate Calculus	4
		Math 250B Intermediate Calculus	4
		Math 270A - Mathematical Structures I	3
		Math 270B – Mathematical Structures II	3
		Math 338 – Statistics Applied to Natural	4
Department of Physics	Dr. James Feagin, Dept. Chair & Professor	Physics 225 & 225L - Mechanics	4
		Physics 226 & 226l - Electricity and Magnetism	4
		Physics 227 & 277L - Waves, Optics, and Modern Physics	4
Department of Biological Sciences	Dr. Kathryn Dickson, Dept. Chair & Professor	Biology 101 & 101L - Elements of Biology	4
Department of Chemistry	Dr. Christopher Meyer, Dept. Chair & Professor	Chemistry 115 – Intro to General Chemistry	4
		Chemistry 120A- General Chemistry	5
		Chemistry 120B – General Chemistry Lecture	3
		Chemistry 123 – Chemistry for Engineers	3
Department of Geology	Dr. Phil Armstrong, Dept. Chair & Professor	Geology 101 & 101L– Physical Geology	3
		Geology 201 & 201L – Earth History	4

5. Non-academic Support Units

Non-Academic Support Units for the College of Engineering & Computer Science		
Support Unit	**Individual Responsible**	**Title**
Academic Advising Center	Dr. Bridget Driscoll	Director
Career Center	Michelle Ajemian	STEM Industry Specialist
Center for Internships and Community Engagement	Dawn Macy	Director
CSUF Irvine Campus	Dr. Susan Cooper	Dean
Pollak Library	Susan Tschabrun	Interim-University Librarian
Titan Student Union	Kurt Borsting	Director
Student Academic Services	Rochelle Woods	Director
University Learning Center	Dr. Lea Beth Lewis	Assistant Director

6. Credit Unit

One academic year equals thirty weeks of instruction, with an additional final examination week for the fall and spring semesters.

7. Tables

Please see subsequent pages.

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering

	Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
			1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
Current Year	Fall 13	FT	187	95	99	89	56	526	6	n/a	30	24	n/a
		PT	8	10	27	18	20	83	56				
1	Fall 12	FT	154	67	86	71	40	418	8	n/a	28	15	n/a
		PT	11	5	18	5	11	50	62				
2	Fall 11	FT	117	74	62	34	40	327	5	n/a	33	21	n/a
		PT	9	3	15	5	14	46	51				
3	Fall 10	FT	123	48	42	33	34	280	5	n/a	21	10	n/a
		PT	16	6	7	9	14	52	55				
4	Fall 09	FT	89	30	39	32	34	224	4	n/a	27	8	n/a
		PT	12	4	14	9	8	47	46				

Table D-2. PERSONNEL

Mechanical Engineering

Year Fall 2013

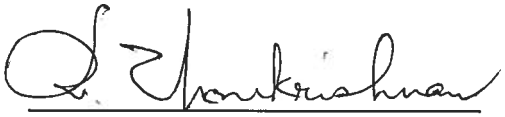
	HEAD COUNT		FTE
	FT	**PT**	
Administrative	1	0	0.5
Faculty (tenure-track)	7	0	6.5
Other Faculty (excluding student Assistants)	0	7	3.1
Student Teaching Assistants	0	2	0.5
Technicians/Specialists	2	0	1.5
Office/Clerical Employees	1	0	1
Others	0	0	0

Signature Attesting to Compliance

By signing below, I attest to the following:

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

RAMAN UNNIKRISHNAN
Dean's Name (As indicated on the RFE)



Signature

6/27/2014
Date