

Majority Report: Referrals GE-[002...12]-167

Academic Senate
April 5th 2017

Majority Report

- The Referrals recommend the satisfaction of Subarea A3 “Critical Thinking” by completion of Engineering Degree
 - Double counting 3 units within the major courses
 - Majority of GE committee support these referrals
 - Including college representatives from Agriculture, Engineering, Business, and CEIS
- Maintains the quality of CPP 48-unit GE program
 - Complies with EO 1100
 - Not a “waiver”

Majority Report

- Suggested by the Chancellor's Office upon review of the 120 units exception forms (Nov 2016)
 - 11 of 15 CSU campuses (except CPP) with Engineering programs have the same policy
 - Reviewed by the GEAC (Chancellor's General Education Advisory Committee)
 - Reduces the units to degree
 - Improves the graduation rates (GI 2025)
 - Reduces the financial burden on students and the California tax payers

A3 and CPP Engineering Programs

- Each of the CPP 11 engineering programs address satisfaction of A3 by engineering design process in major courses (see individual referrals)
- Allows for introduction, development and mastery of student learning outcomes (SLO's) throughout the major curriculum
 - multiple courses and not just one course.

ABET Criterion 5. Curriculum

“Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision- making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

Students must be prepared for engineering practice through a curriculum culminating in a **major design experience** based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.”

Engineering Design Process and SLOs

Engineering Design Process (EDPPSR)	General Education Outcomes (CPP GE SLO)
Presenting and Justifying a Problem and Solution Requirements	1c. Find, evaluate, use and share information effectively and ethically
Generating and Defending an Original Solution	
Constructing and Testing a Prototype	4b. Demonstrate activities, techniques or behaviors that promote intellectual or cultural growth 1d. Construct arguments based on sound evidence and reasoning to support an opinion or conclusion
Evaluation, Reflection, and Recommendations	
Documenting and Presenting the Project	
	1a. Write effectively for audiences

Each programs addresses these SLOs through multiple major courses (assessment methods are detailed in each referral.)

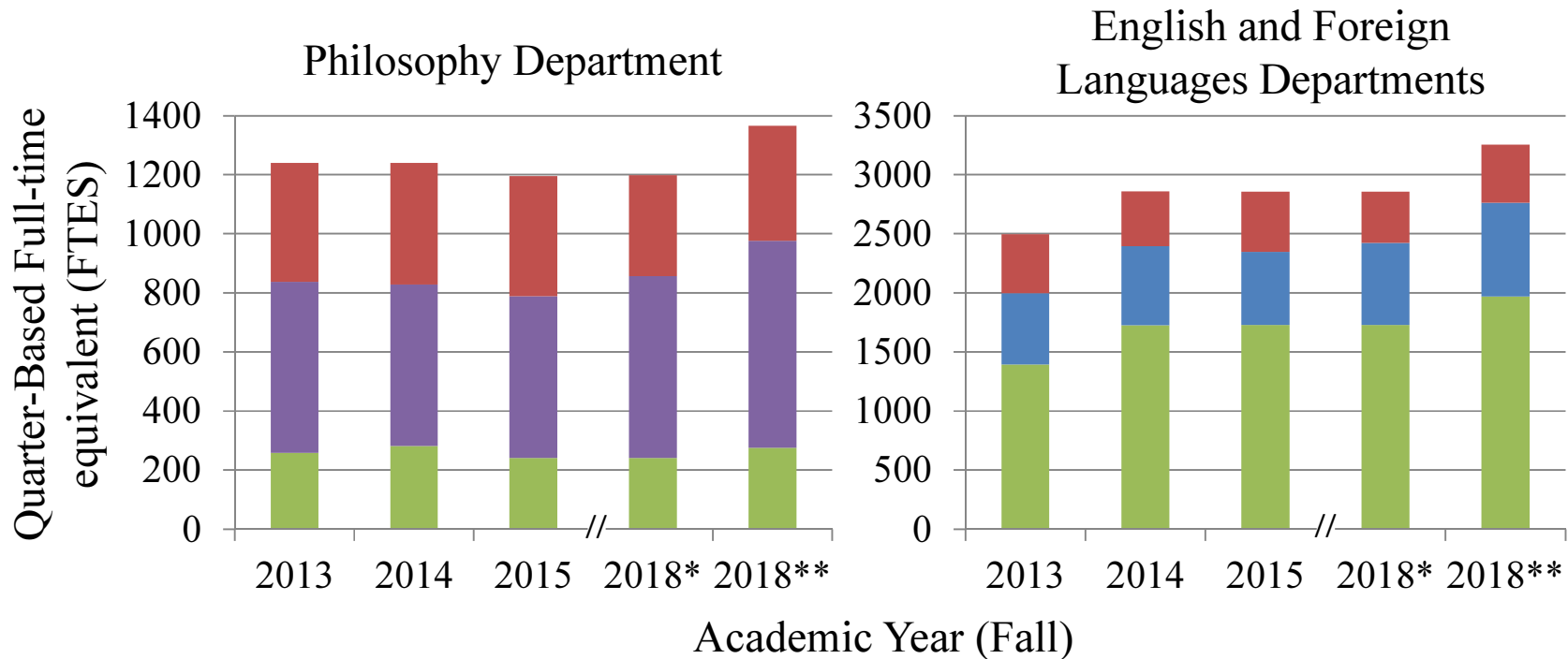
Impact on Students

- This policy will impact only first-time freshmen engineering students (13% of undergraduates)
 - 24% of undergraduate population are engineering majors, and 55% of engineering majors are first-time freshmen
- Transfer students (45% of engineering majors) do not currently take an A3 course at CPP
 - Currently required to satisfy A3 prior to arriving at CPP
 - Under the new policy, transfer students will be exempted from this requirement prior to transferring

Impact on A3 Departments

- GE courses are converted from 4 quarter to 3 semester units (40 to 45 contact hours)
 - Directly leads to an increase of 12.5% of FTESs

- Subarea A3
- Subarea A2
- Subarea C2
- Remaining Dept FTES



* Based on 2015 enrollment

** Based on estimated 2018 enrollment (growth rate 800 student/yr)

Impact on College of Engineering

- If referrals are **not** approved, engineering programs will face additional unit reductions
 - To satisfy 120 unit cap (Title 5)
 - Semester engineering programs (126-131 units)
- Over the past 15 years including semester conversion, engineering programs have removed 11-15 major quarter units
 - No special GE waivers or alternations from EC 1100
 - Common practice for CSU Engineering Programs
 - Remove B2 requirement, Area C and D courses
 - < 30 unrestricted GE units
 - In contrast, CPP has 32 unrestricted GE units

CPP GE Programs relative to other CSU

University	Enrollment of UG EGR Majors	% of UG population	US News Ranking	University GE Program	Waivers (altered EO 1100)	Unrestricted GE Units
CPP	5,580	24%	15 th	48	none	32 (proposed 29)
CP SLO	5,749	28%	7 th	48 (72)	D4,D	26.7 (40)
SJSU	4,675	17%	28 th	39	Many	21
CSUN	4,085	12%	46 th	48	D4,B2,E	27
CSULB	3,744	12%	46 th	48	B2, C4, D4	27
CSU Sac	3,640	13%	80 th	48	B2	30
CSU Fullerton	3,455	9%	58 th	51	B2,B5, D2,D4,E	24
SDSU*	3,429	12%	n/a	Currently under review		
CSULA	3,054	13%	39 th	48	B2, C1,C4,D4	24
CSUC	2,302	14%	98 th	48	C,D	24

*Under review: Engineering Programs over max approved by Chancellors Office (email from Vice Chancellor Mallon)

CPP College of Engineering

- 1 in 4 Broncos is an Engineering Major
 - High quality engineering program
 - Graduates are successful in the local labor market
 - Train a large and diverse student population
- CPP is a leader in advancing the social mobility of its students

Necessary to maintain the quality, integrity and uniqueness of CPP Engineering programs

Addressing Concerns: Timeline

Feb 2015 – Oct 2015: Developed semester engineering programs (126-131 units)

April 2016: Submitted 120 units exception forms to CO

Nov 2016: Response from CO recommending proposed policy

Jan 2017: Developed referrals with individual engineering departments

Feb 6-8th, 2017: Submitted referrals to Academic Senate

Feb 15th and March 1st, 2017: GE committee discussion

April 5th, 2017: First Reading at Academic Senate

- Engineering programs still need to be approved by the Chancellor and Senate by the summer 2017
 - Advising incoming students on upcoming semester system
 - Only 3 senate meetings remaining in the academic year

Addressing Concerns: GE Program Semester Conversion

“Reduced the overall GE unit requirement under semesters from 51 to 48, the minimum allowed.. ..carefully designed and balanced program that has already been slimmed down to the minimum allowable units in order to accommodate the College of Engineering’s need for unit reductions”

-Minority Report

- Current quarter GE program: 68 quarter units is equivalent to 45.3 semester units not 51 units.
- This is an increase of 2.7 semester unit (4 quarter units)

Addressing Concerns: A3 Description

“This language essentially describes (subarea A3) the humanistic tradition of reasoned argument. These are skills that are central to a university education. After college, they become key tools for sound decision-making in contexts of social or political ambiguity (in other words, when dealing with questions of politics, the social good, or ethics). Likewise, they become key to the leadership abilities of our graduates, since they focus on reasoned persuasion.”

-Minority Report

- The Chancellor’s Office has suggested this policy. (Executor of EO 1100)
- As demonstrated across the CSU system, engineering programs provide an applied, problem-solving approach to developing the necessary critical-thinking skills and reasoning techniques
- Throughout the engineering curricula; students learn, discuss, and evaluate the role of engineering in society and nature (discussed in individual referrals).
- The “learn-by-doing” pedagogy of CPP allows students to directly apply their critical thinking skills to real-world problems.

Addressing Concerns: A3 Description

“Only english and philosophy can teach CT”

- Consultation process (minutes of GE committee March 1st)

“..represents a clear degradation to the integrity of our GE program. It weakens the principle of GE as a central aspect of a university education.”

- Minority Report

- Critical thinking is area A (**not** area C and D)
 - Critical thinking is **not** the Arts: Arts, Cinema, Dance, Music, Theater (Area C1)
 - Critical thinking is **not** the Humanities: Literature, Philosophy, Languages other than English (Area C2)
 - Critical thinking is **not** the Social Science (Area D)
- Multiple discipline offer A3 courses at other CSUs and CCC (articulation agreement with CO)
 - Natural Science, Women Studies, Computer Engineering, Computer Science, Geography, Information Systems, Visual & Public Art, Mathematics, Education, Business, History, Psychology, and Counseling courses
- CPP only CSU campus that limits A3 courses to two offerings

Addressing Concerns: GE SLO 1d

“For 1d, the courses do satisfy the SLO, though the reasoning and argument construction the students are asked to perform are technical (rather than political/social) in nature.”

-Minority Report

Nothing stated in CPP GE program requires that GE SLO 1d needs to be strictly political or social in natural.

Other subareas with GE SLO 1d is B1, B2, B3, B5, C2, C4, and D4 (scientific, political, and social arguments are all accepted to satisfy GE SLO 1d).

Addressing Concerns: Breadth of GE Courses and GE SLO 1A

“1a presents a problem because the SLO stipulates writing for “various audiences” and an engineering audience is quite uniform. This could be justified by supposing that engineers would write for various audiences when they take their other GE coursework.”

-Minority Report

- Currently policy, AS-2465-145/AP, ensures that all students are exposed to a breadth general education courses and a exposed to various audiences upon completion the of CPP general education program.

“The General Education is intended to provide breadth but may include courses that are foundational to major, therefore programs will be allowed to double-count courses for both general education and the major, with the restriction that they may double-count no more than 9 units of courses offered by the major discipline (as indicated by the major prefix) is allowed.”

If referrals are approved, **all** engineering programs will remain in compliance with this policy.

*It is worth noting, there is a double standard here. There is a not policy restricting a philosophy (or any other major for that matter) from taking 6 philosophy courses to satisfy 18 of the 48 units for their general education. (subareas A3, B4, B5, C2, C4, and D4).

Addressing Concerns: GE SLO 4b

“With regard to 4b, the SLO is clearly not met. The proposals argue that “this learning objective offers students the ability to consider broader impacts of their engineering solutions,” or similar. They do not address the lifelong learning aspect of 4b.”

-Minority Report

- The process that each program satisfies this GE SLO is unique to program and is outlined in the individual A3 referrals.
- One of the ABET outcomes is lifelong learning:
 - (i) a recognition of the need for, and an ability to engage in life-long learning
- This ABET outcome is achieved through the major (see individual program proposals for more detail).

Addressing Concerns: Assessment

“The proposals do not provide evidence of internal Engineering assessment of critical thinking (rubrics, assessment committees, exams, and so forth). AVP Preiser-Houy, in her feedback to the GE Committee, mentioned the possibility of administering exams measuring the critical thinking value add of a CPP engineering major (she referred specifically to the CLA). The proposals do not take up this possibility, and offer no indication of exam-based assessment of critical thinking within Engineering.”

-Minority Report

- Critical thinking rubric is attached, Appendix E of referrals.
- GE SLOs will be assessed by the General Education Assessment Committee as outlined by the General Education Assessment Plan (Appendix G).
 - GE assessment plan is currently undergoing revisions to align with the new SLOs
 - The assessment methods for each GE SLO are provided (listed in referral)
- No assessment is being done on current A3 courses (applying double standard for engineering majors)
 - Assessment of critical thinking for **All** students should be performed, not just engineering students

Addressing Concerns: Assessment

“No evidences of critical thinking being achieved through engineering major. CLA test should be considered to assess critical thinking. Data is needed..”

- Consultation period with GE Committee

“CLA+ for colleges ... use real-world, problem-solving performance tasks to measure critical-thinking skills. The results help institutions better understand how well students are learning these skills, providing a snapshot of proficiency, growth, and program efficacy.”

- Council for Aid to Education

Student CLA+ Performance by Class and Demographic Characteristic, 2015-16

DEMOGRAPHIC CHARACTERISTIC	FRESHMEN			SENIORS		
	N	Mean	SD	N	Mean	SD
Field of Study						
Sciences and Engineering	3,677	1115	146	1,617	1162	147
Social Sciences	1,233	1086	147	1,274	1140	144
Humanities and Languages	988	1089	150	1,158	1119	146
Business	1,769	1054	142	1,656	1107	138
Helping / Services	2,650	1033	136	2,094	1100	137
Undecided / Other / N/A	1,283	1060	150	483	1090	138

Addressing Concerns: ABET

“There is an established consensus in the literature of Engineering Education that explicit training in critical thinking is necessary for engineers. Responding to this recognition of the importance of critical thinking, the Accreditation Board for Engineering and Technology (ABET) includes among its eleven student outcomes several relating directly to these skills:

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

Critical thinking, then, is an essential professional tool as engineers move into their careers and through their careers. It must be explicitly trained, whether in stand-alone classes, or integrated purposefully following a Writing in the Disciplines model. Proficiency in critical thinking is not an inevitable byproduct of the kinds of writing assignments engineering students currently do in their programs.”

-Minority Report

ABET accreditation is required at a minimum of every 6 years.

- Each program achieves and assessment each of these outcomes through major courses**
- The assessment plan for all ABET outcomes are addressed in each individual program proposals**

Addressing Concerns: Ethics

“There is another aspect to this which goes beyond questions of whether an individual CPP graduate may be personally well-educated or fit for leadership roles. As a pressing matter of sound social policy, we need engineers capable of socially-informed decision-making in a democratic society. A subset of the scholarship takes up this dimension of engineering education (for example Nusbaum 2006). ABET has addressed the social consequences of ethical lapses in the profession recently—for instance, with a 2016 panel on the Flint, MI, water crisis, and the Volkswagen emissions scandal. These cases suggest that it is vital that we give engineering students tools to deal with complexity in the political/social arena for the good of our democracy.”

-Minority report

- A3 is not about ethics
- The ABET panel “Teaching Ethics in Light of Flint and Volkswagen” was addressing case studies associated in the STEM field.
 - This panel was **not** a discussion on how engineers lack critical thinking skills.

Addressing Concerns: ECOs changes

“The proposals include no curricular changes indicating that critical thinking, writing or argument will be addressed through a Writing in the Disciplines model within Engineering. The ECOs incorporate no critical thinking modules, assignments, assessments or other meaningful pedagogical components directed at critical thinking. The ECOs do not incorporate the GE SLOs for area A3.”

-Minority Report

The ECOs will be updated upon the approval of these referrals. These ECOs have already been completed in curriculog and it is difficult to edit these ECOs during current curriculog review process.

CPP College of Engineering

- 15th overall “Best Undergraduate Engineering Program” (non-PhD offering universities)
 - 2nd for public universities
 - Cal Poly San Luis Obispo, 7th overall
- 2nd Largest producer of engineers in California
 - 1 in 12 engineers in California are CPP alumni
 - More than any UC or other CSU (beside Cal Poly SLO)
- CPP engineers are highly desired by local industry
 - There are 13 other ABET accredited programs within a 50 miles radius of CPP

CPP College of Engineering

- Largest awarder of engineering degrees to Hispanic engineers in California, and 6th in the Nation
- 11th in the Nation in awarding degrees to Asian-American engineers.
- CPP: 51% of students are Pell grant eligible (family income is < \$55k)
 - Cal Poly SLO: 21% of students are Pell grant eligible
- CPP: Social Mobility
 - 9th in the Nation for students to come the bottom quintile and end up in top quintile
- Engineering is the largest college on campus
 - 1 of 4 Broncos are Engineering Majors

EC 1100

- Area A: English Language Communication and Critical Thinking
 - Minimum 9 units
- Area B: Scientific Inquire and Quantitative Reasoning
 - Minimum 12 units
- Area C: Arts and Humanities
 - Minimum 12 units
- Area D: Social Science
 - Minimum 12 units
- Area E: Lifelong Learning and Self-Development
 - Minimum 3 units

University	Links to University GE and Engineering GE programs
CPP	Unrestricted GE Units A: 9 units, B2: 2 units, C1-C3: 9 units , D1-D3: 9 units, E:3 units
CP SLO	http://ge.calpoly.edu/content/ge-requirements-and-courses http://flowcharts.calpoly.edu/downloads/curric/15-17.Mechanical%20Engineering.pdf
SJSU	http://info.sjsu.edu/web-dbgen/narr/static/schedules/general-education-corege.html http://bcme.sjsu.edu/ChE-4-Year-Plan
CSUN	http://catalog.csun.edu/general-education/ http://catalog.csun.edu/academics/me/programs/bs-mechanical-engineering/
CSULB	http://web.csulb.edu/depts/enrollment/registration/ge_courses/overview2012.html http://web.csulb.edu/divisions/aa/catalog/current/coe/mechanical_engineering/mae_bs01.html
CSU Sac	http://www.csus.edu/acad/faq/general%20education.html http://www.ecs.csus.edu/me/Roadmap_Final1.pdf
CSU Fullerton	http://catalog.fullerton.edu/content.php?catoid=2&navoid=109 http://catalog.fullerton.edu/preview_program.php?catoid=2&poid=641
SDSU	http://arweb.sdsu.edu/es/advising/gradreqge.html http://arweb.sdsu.edu/es/catalog/GC1617/105_Mechanical%20Engineering.pdf
CSULA	http://www.calstatela.edu/academicadvisement/general-education-and-university-requirements http://www.calstatela.edu/ecst/me/ge-requirements
CSUC	http://catalog.csuchico.edu/viewer/GENED/GNEDNONEUN.htm https://www.csuchico.edu/aap/documents/GE-2016-Mechanical_Engineering.pdf