Differential Tuition Proposal
College of Engineering
January 2018

The College of Engineering requests permission to extend its differential tuition model to freshman and sophomore courses beginning Fall Semester 2018.

Background

Engineering differential tuition was implemented at the University of Utah in the Fall of 2009 as a way to avoid eliminating programs in the face of state higher-education budget cuts due to the financial crisis. The implementation of this differential tuition was justified in part by a Ph.D. dissertation that was published in December of 2008 by Glen R. Nelson, a student at the University of Nebraska-Lincoln (now an associate dean at ASU), titled "Differential Tuition by Undergraduate Major: Its Use, Amount, and Impact at Public Research Universities." This study showed that more US universities had differential tuition in engineering than in any other discipline, and that the average differential tuition was higher in engineering than in any other discipline. Then Sr. Vice-President for Academic Affairs, David Pershing, allowed differential tuition for graduate and upper-division undergraduate courses, but not for lower-division undergraduate courses, in an effort to be fair to the College of Science which did not have differential tuition, and which teaches engineering students math, physics and chemistry in the freshman and sophomore years. The initial engineering differential tuition was $35/credit hour for undergraduate courses and $50/credit hour for graduate courses. These rates have risen in proportion to the base tuition; the undergraduate differential tuition is now $54.36/credit hour. Representative current engineering differential tuitions are shown in Table 1.

Justification

There are good reasons why engineering programs have differential tuition. As Fig. 1 shows, the cost of educating undergraduate engineering students is more than 60% higher than the average cost in other disciplines, and more than twice as expensive as eleven of the disciplines listed. Most university budget models (including the University of Utah) do not consider the variation in costs in their formulas for distributing funding.

Table 1: Examples of Engineering Differential Tuition at several universities.

School	Base Undergraduate Tuition	Engineering
University of Illinois	$13,658	$18,386
University of Iowa	$7,417	$9,585
University of Michigan	$13,154	$16,174
Michigan State University	$11,722	$12,212
Univ. of Missouri—Columbia	$7,368	$8,268
Nebraska	$7,312	$8,512
Ohio State University	$9,420	$10,500
Pennsylvania State University	$14,412	$16,506
University of Pittsburgh	$14,076	$15,016
Purdue University	$9,070	$10,120
Rutgers University	$9,926	$11,024

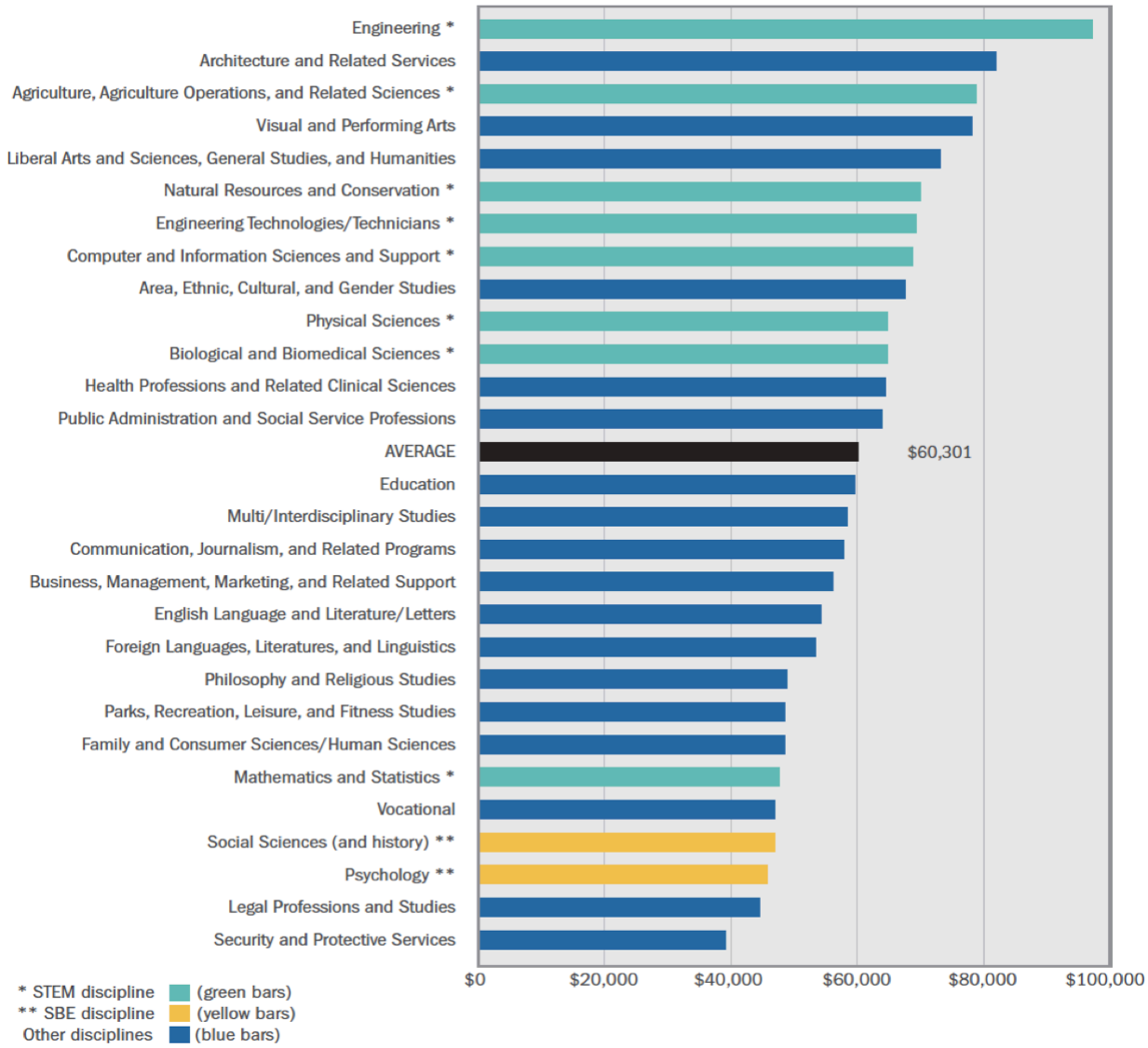

Fig. 1: Average cost of educating undergraduate students in various disciplines. ("How Much Does It Cost Institutions to Produce STEM Degrees?" American Institutes for Research, Sept. 2013.)

Fortunately, there is a good return on the investment that engineering and computer science students pay for tuition. Fig. 2 data, taken from 2017 National Association of Colleges and Employers survey of starting salaries for bachelor's graduates show that the highest starting salaries are all in engineering and computer science, so even if these graduates have to take loans to get through school, they can afford to pay them back quickly upon graduation.

Despite the fact that College of Engineering students at the University of Utah have been paying differential tuition for eight years, it has not seemed to discourage students from selecting engineering or computer science as a major. As seen in Fig. 3, the absolute number of freshman students entering the College and the percentage of the total U of U freshman class have both increased significantly since 2005, reaching 776 new students and 20% of the incoming freshman class.

Career*	National Median BS Starting Salary
Petroleum Engineering	$79,146
Computer Science	$75,590
Computer Engineering	$69,667
Chemical Engineering	$68,513
Electrical Engineering	$68,023
Industrial Engineering	$67,076
Aerospace Engineering	$66,366
Materials Engineering**	$64,180
Mechanical Engineering	$63,000
Biomedical Engineering	$61,440
Construction Engineering	$60,000
Civil Engineering	$56,283
Finance	$54,077
Accounting	$51,000
Mathematics	$50,833
Nursing	$50,644
Geological and Earth Sciences**	$45,200
Liberal Arts, Sciences & Humanities	$40,000
Chemistry	$38,987

Fig. 2: Highest starting salaries for bachelors graduates. *Disciplines with more than 100 salaries reported. **Less than 100 graduates. (National Association of Colleges and Employers, Fall 2017.

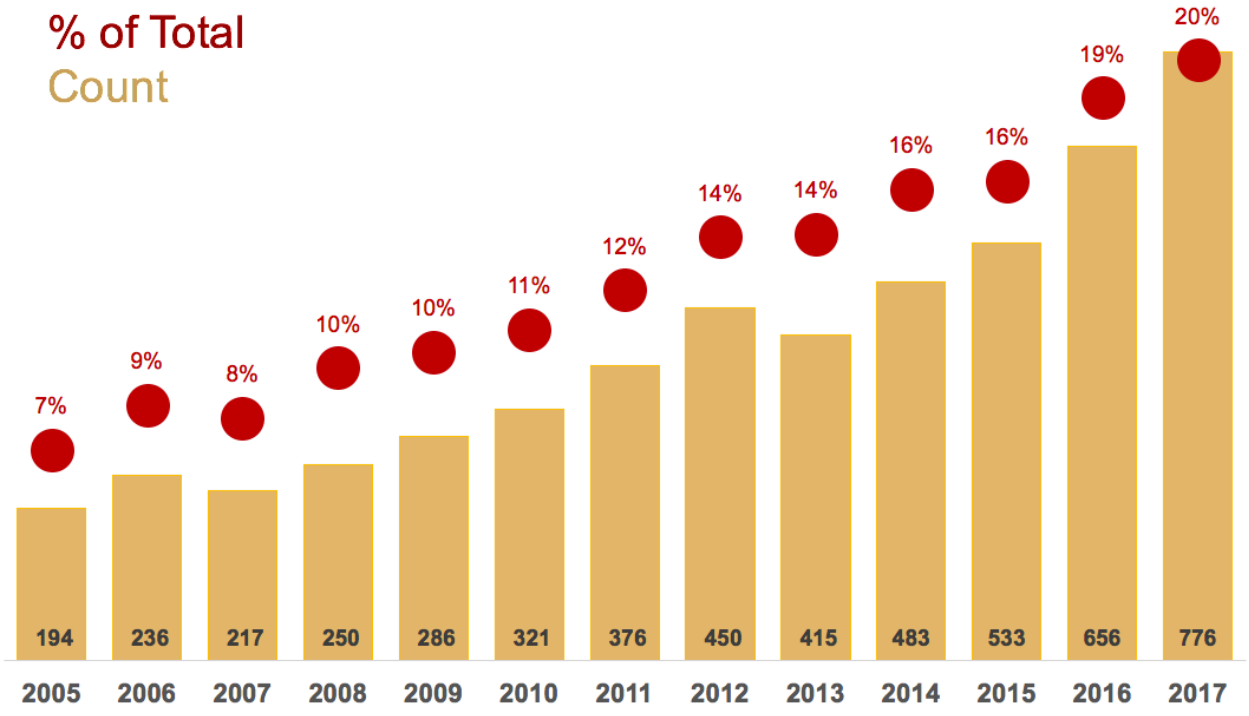

Fig. 3: Number of freshmen entering U of U College of Engineering (bars) and percentage of total U of U freshman class that is entering the College of Engineering (red dots).

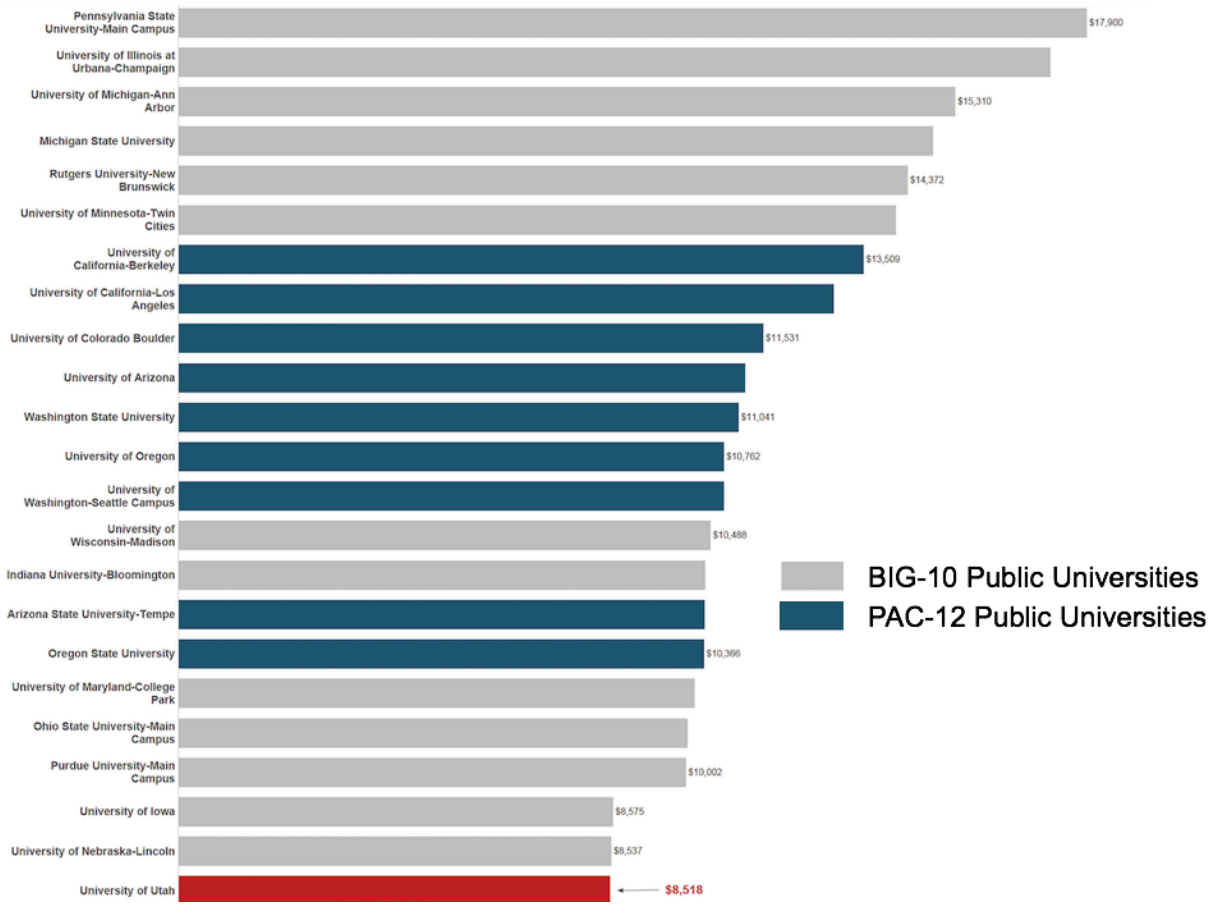

Fig. 4: 2017 base tuition at PAC-12 and BIG-10 schools (does not included differential tuition).

We strive to give the U of U engineering students a world-class education, equivalent to what they would get in the best PAC-12 or BIG-10 universities, but we have fewer resources with which to work. Fig. 4 shows tuition at the public universities in these two groups. Of course, the private schools (not shown) are much more expensive. The University of Utah has the lowest tuition of any of these schools. Considering the high cost of educating engineers and the low base tuition at the U, differential tuition is especially important to our ability to provide a quality education. The primary reason for requesting this additional differential tuition is to support our core engineering education mission. Two examples will be given. Because of the rapid increase in enrollment, Engineering has the highest ratio of students to advisor in the university. The latest data show 387 students per advisor in the College of Engineering compared to an average of 258 to one in the rest of the University. Advisors play a critical role in retention and time to graduation. Another example of the need for these resources is the Engineering Tutoring Center, located on the main floor of the Warnock Engineering Bldg. At one time, we had general engineering tutors in this Center many hours per weekday; they could tutor students in any of the freshman and sophomore courses. A shortage of funds caused us several years ago to quit staffing the tutoring center with TAs. We would love to make this service available again. We could give many other examples like this of ways that student success could be improved if more resources were available.

As mentioned above, the primary reason for not including lower-division courses in the Engineering Differential Tuition in 2009 was that the College of Science, which teaches a number of lower-division courses to engineering students, did not have differential tuition. It now has differential tuition, so Engineering students pay more per credit hour for math, physics, chemistry and biology courses than they do for their engineering courses. In any case, the reason for not including lower-division courses in the Engineering Differential Tuition model no longer exists. As the number of students in Engineering has grown (see again Fig. 3), the need for more teaching assistants and advisors has grown faster than the budget model has provided funds. Extending Engineering Differential Tuition to the lower-level courses would go far in addressing this funding shortfall.

Another consideratioin for this request is that our School of Computing has developed two computer programming courses, initially designated CP1 and CP2, that were designed for non-CS, non-engineering students from across campus. This has been a two-year effort that looked at best practices at top universities and considered what would work best at the U. It is our belief that almost all university students these days need to have a foundation in computer programming. Most do not need to be experts, but they will benefit greatly in their careers if they know more about computing than their peers do. We have developed these courses to be good citizens of the university. We have been preparing to teach a large number of students. The first offering of the CP1 class, now officially known as "Programming for All 1," was taught in Fall 2017 by David Johnson and Mike Kirby to 85 students. CP2 is being taught Spring 2018 by Mike Kirby and David Johnson to 73 students. Prof. Kirby is Associate Director of the School of Computing, and one of the best teachers in the College, as well as being a top researcher and wonderful administrator. Clearly, the School of Computing cares about the quality of instruction for these "service" courses. Our current plan is to continue to refine and extend these courses. In the short-term, we will offer these courses in sequence once a year. In the long term, we anticipate that we will possibly offer these courses in multiple sections with examples from various disciplines and also possibly offer both courses each semester. We have already been fielding inquiries from various departments across campus interested in adding these two courses to their elective lists. The problem is that with the current budget model, there is inadequate funding to support the large number of teaching assistants required to properly teach programming to the masses. Extending differential tuition to these lower-division courses will provide the funds to make these courses fiscally solvent, so that we can afford to offer them.

Proposal

We propose that Engineering Undergraduate Differential Tuition be extended to lower-level (freshman and sophomore) engineering courses under the same rules that apply to the upper-level courses. The current rate is $54.36 per credit hour; it is anticipated that the differential tuition rate will change in the future as it has done in the past, proportionally to changes in the basic tuition cost.

Impact on Students

The total additional cost due to the proposed change for a typical student in each of the engineering departments over their full undergraduate experience is $901, as shown in Table 2.

The cost varies considerably by department as a function of how many required engineering courses are taught in the program at the freshman and sophomore level.

Considering the high comparative cost of educating engineers, the low base tuition cost at the University of Utah, the earning power of engineering graduates, the need for more teaching assistants and counselors in order to deliver a top-quality educational experience, the growing engineering enrollment, and our desire to offer programming courses to students across campus, we believe that this additional tuition burden will be well worth the cost. Furthermore, virtually all of the new teaching assistants hired will be undergraduate engineering and computer science students, so on-campus employment will be provided to many of these students who pay this new differential tuition when they become juniors and seniors.

Table 2: Total additional tuition costs for students in various disciplines by extending Engineering Differential Tuition to freshman and sophomore courses.

Dept	Lower-Div Eng Credit Hours	Additional Cost
Bio	8	440
ChE	12	660
CompEng	24	1320
CvEE	20	1100
ECE	17	935
ME	24	1320
MSE	12	660
SoC	14	770
Average	16.4	901

Approvals

The proposal was presented to the groups listed below and approved as noted.

Body	Date	Vote Yes/No/Abstain
College of Engineering Executive Committee (Deans and Dept. Chairs)	9/15/17	10-0-0
College Council	10/20/17	unanimous
Engineering National Advisory Council	11/3/17	unanimous
Engineering Industrial Advisory Board	11/7/17	unanimous
College of Engineering Student Council	12/8/17	16-1-1
College of Engineering Open Student Meeting	1/26/18	unanimous
College of Engineering Open Student Meeting	2/1/18	
Sr. Vice-President for Academic Affairs		
Trustees		