February 2, 2012

To: Ana Mari Cauce and Paul Jenny
From: Matt O’Donnell
Subject: Program Fee for the College of Engineering (CoE)

Employers, citizens, and legislators all agree that Washington State needs additional engineering graduates. Local tech industries employ twice as many engineers as two decades ago; yet our production of engineers has changed very little. Last year we rejected more than 500 kids, most of whom were “worthy.” They were not accepted into any of our programs, and the acceptance rate for our most popular majors was below 30%. There is a great unmet need because we cannot cover the marginal cost of educating an engineer.

We have analyzed the need, and many of our conclusions are presented in the attached slides we put together as part of the Engineering Initiative proposal to the Governor. They address the major issues of access, demand, and career opportunities. We have also analyzed differential costs for engineering majors (electronic versions of spreadsheets available upon request) – more about this below. Overall, we clearly have an access problem. But access starts with two A’s: affordability and availability. We must address both in any sustainable funding model.

The CoE satisfies all criteria required to institute a significant program fee. The plan we have developed will maintain the academic quality of our programs and enable us to grow significantly at the margins. In particular, we propose a plan that will cover our marginal costs so that we can grow without requiring additional subsidies.

**Access - Availability:** To maximize undergraduate engineering slots, total tuition revenues must cover marginal costs. We have analyzed costs from both top-down and bottom-up perspectives, and estimate that the total marginal cost to the university is about $18,280 per student.¹ To sustainably manipulate the margin and grow engineering slots, we believe that the sum of operating and program fees should approach this total.

The current operating fee for in-state undergraduates is $9,261. If we assume a 20% tuition increase for next year, this becomes $11,113 – call it $11,100. The current operating fee for non-resident undergraduates is $26,000. Assume that this will increase to $27,000 for next year. The in-state/non-resident ratio is about 4:1, yielding a blended basic tuition rate for the CoE of $14,280. This is probably a high estimate, but let’s use it for the rest of the analysis. The difference between marginal cost and tuition revenue is at least $4,000 per student per year. We propose a program fee of $5,000 per year per student admitted to a CoE administered program.² This fee would not be applied to pre-engineers.

There are a lot of secondary questions we need to address, including lower/upper division fees, the size of the program fee for non-resident students, and engineering programs not

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¹ $18,280 total includes $11,515 for CoE plus $6,765 central costs, representing 10% financial aid off the top and 30% tax.
² At least $1,500 per quarter applied to the fall-winter-spring quarter full-time operating fee and a differential fee factored into the per credit charge for the summer quarter.
formally administered by the College of Engineering.\textsuperscript{3} We can quickly address these issues if we agree on the basic structure for core programs applied primarily to in-state students.

The $5,000 per year program fee addresses availability, but not affordability. For in-state students, this will raise the cost to an engineering student to $16,100 per year. This is competitive with current upper-division, in-state engineering tuition at two top-20 public schools I know well, Michigan ($17,272) and Illinois ($15,928). Of the $16,100 total, at least 10% (or $1,610 on average per student) will be available for financial aid. To make this approach sustainable, we have to significantly raise the average financial aid.

**Access – Affordability:** To complement the proposed $5,000 program fee, we also propose a financial aid program which shares costs between the CoE and the Provost’s Office and will incent us to raise significant privately-funded financial aid. Of the $16,100 total income per in-state student, $10,140 comes to the CoE. This is $1,375 short of marginal costs. A total of $1,610 goes to financial aid, and $4,350 goes to the Provost’s Office.\textsuperscript{4} We propose that 100% of the tax on the program fee ($1,350) be given to the CoE to meet marginal costs. In return, the CoE promises to raise privately-funded financial aid equivalent to $1,350 per student, so that the average aid per student increases to $2,960 by the end of the next capital campaign, an increase of 84% in financial aid funds compared to the current model.\textsuperscript{5} On top of this, the CoE will continue to provide several million dollars of department-based need/merit scholarships from philanthropy.

To help incent scholarship fund raising after initiating the program fee, we propose that half of the Provost’s investment, $675 per student, be used by the CoE out of the gate for need-based financial aid, raising the average aid per student to $2,285.\textsuperscript{5} For every $2 in additional financial aid per student the CoE provides, we are allowed to use $1 per student from the Provost’s contribution for operations rather than financial aid up to the $675 limit.

If we reach a steady state in which the entire $675 is returned to the CoE budget, then we have a win-win-win scenario. First, the UW will provide 18.4% of total revenues for need-based financial aid, or about double the current rate. Additional need/merit-based financial aid is available from individual departments in the CoE. Second, the Provost’s office will continue to receive full tax revenues from the base operating fee. And finally, the CoE will fully cover the marginal cost of in-state students. I am confident that we can raise current-use gifts and endowment income during the next capital campaign to reach the $1,350 per student per year average needed to fully fund this program.

I hope this document can help us finalize a plan for a $5,000 per year program fee for all students enrolled in CoE majors. We look forward to a conversation with you about optimal enrollments, and are prepared to work on the necessary documents for regental approval of the program fee starting in the fall quarter of 2012, and on a memorandum of understanding (MOU) between your office and mine regarding the financial aid agreement.

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\textsuperscript{3} e.g., Bioengineering and Bioresource Science and Engineering

\textsuperscript{4} $1,350 from tax on the program fee and the rest from tax on the base operating fee

\textsuperscript{5} Representing 14.2% of total revenues and a 42% increase in total financial aid funds
Let’s put the vowel back in STEM!
Figure 1: Our technology industry employment has quadrupled since 1974.
Figure 2: STEM careers are where the growth is – but not all STEM is created equal.


Source: Bureau of Labor Statistics
Figure 3: We rank very low in Computer Science degree production relative to Computer Science occupations.

In-state Computer Science Degree Production per 1,000 Computer Science Occupations (2005)

- Utah: 55.7
- New York: 53.8
- Maryland: 48.5
- Colorado: 46.8
- California: 44.7
- New Jersey: 44.1
- Washington: 21.0
- Massachusetts: 20.8
- Virginia: 19.1
- Connecticut: 15.4

Source: NCHEMS/U.S. Census Bureau
Figure 4: It’s the same story in other fields of Engineering.

In-state Engineering Degree Production Per 1,000 Engineering Occupations (2005)

Source: NCHEMS/U.S. Census Bureau
Figure 5: The gap between demand and supply is greater in Computer Science and other fields of Engineering than in any other fields.

Comparison of current Supply with Future Demand for Baccalaureate & Graduate Degrees

Research scientists, technical: Current supply 1,655, Additional demand 280
Human/protective service professionals: Current supply 1,850, Additional demand 498
Editors/writers/performers: Current supply 1,359, Additional demand 607
Medical professionals: Current supply 2,493, Additional demand 1,134
Computer science: Current supply 2,052, Additional demand 2,973
Engineering/software engineering/architecture: Current supply 1,292, Additional demand 1,148
Business and management: Current supply 7,805, Additional demand 304

Figure 6: Currently, computer science dominates all job availability in Washington.

57% of the job openings among the top 10 occupations are in computing.

Source: Used with permission from the Seattle Times.
Figure 7: UW Computer Science & Engineering can accommodate only 30% the students who seek to pursue the major.
Figure 8: The UW College of Engineering overall must turn away almost half of prospective majors.