Engineering Expansion at Washington State University

Washington State University (WSU) respectfully submits the following report as required by Section 607(2) of Engrossed Substitute Senate Bill 5187 (2023).

Enrollment

The following table illustrates the total number of students enrolled in computer science and engineering degree programs. This provides a comprehensive picture about the size of the program and student enrollment.

WSU Enrollment: Undergraduate and Graduate Computer Science and Engineering Programs

	Fall 2013[1]	Fall 2023	Increase	% Incr
Undergraduate	3697	3771	74	2%
Master's	120	123	3	3%
Doctoral	283	266	-17	-6%
Total Students	**4100**	**4160**	**60**	**1%**

As of Fall 2023, the net increase in total enrollment of all WSU undergraduate plus graduate students in computer science and engineering programs was 60 students more than Fall 2013. In Fall 2023 relative to the prior academic year, WSU's total enrollment in computer science and engineering programs decreased approximately 3.4%, corresponding to 147 students. Enrollment numbers in Fall 2023 reflect the effects of the pandemic where the number of incoming graduate and undergraduate students decreased relative to Fall 2019 (pre-pandemic).

[1] Total enrollment data for Fall 2012 are not available. Fall 2013 is used as baseline for illustrative purposes.

Table 1: Undergraduate Program Enrollment Growth.

Bachelor's Program	2013	2021	2022	2023	Growth 2013-2023
Bioengineering	153	157	128	117	-36
Chemical Engineering	267	158	145	131	-136
Civil Engineering	601	368	325	307	-294
Construction Engineering		47	51	32	32
Electrical Engineering	333	210	180	190	-143
Cybersecurity				29	29
Computer Engineering	148	126	122	92	-56
Computer Science (BA and BS)	415	781	830	760	345
Software Engineering		78	71	77	77
Data Analytics		76	77	84	84
Materials Science and Engineering	59	59	61	49	-10
Mechanical Engineering	780	702	675	675	-105
Engineering-Undecided	187	69	45	33	-154
Data Analytics - Global Campus		81	97	106	106
Mechanical Engineering - Bremerton	26	48	32	28	2
Electrical Engineering - Bremerton		19	20	15	15
Cybersecurity-Everett				4	4
Mechanical Engineering - Everett	60	58	43	36	-24
Electrical Engineering - Everett		41	28	29	29
Software Engineering - Everett		56	50	55	55
Data Analytics - Everet		11	8	15	15
Civil Engineering - Tri-Cities	19	52	42	54	35
Engineering-Undecided - Tri-Cities		12	17	21	21
Electrical Engineering - Tri-Cities	71	65	57	64	-7
Computer Science - Tri-Cities (BA and BS)	49	91	88	98	49
Mechanical Engineering - Tri-Cities	92	93	89	96	4
Data Analytics - Vancouver		30	29	30	30
Engineering-Undecided - Vancouver		14	9	13	13
Electrical Engineering - Vancouver	125	99	97	106	-19
Computer Science - Vancouver	126	278	268	258	132
Mechanical Engineering - Vancouver	186	185	169	167	-19
Total Bachelor's	**3697**	**4064**	**3853**	**3771**	**74**

Table 1 summarizes the Fall 2013 baseline numbers for undergraduate students by discipline and campus and compares them to Fall 2021, Fall 2022, and Fall 2023 enrollments. The overall growth in undergraduate students enrolled in engineering or computer science programs at WSU from Fall 2013 to Fall 2023 is 74, or approximately 2.0 percent.

[1] Total enrollment data for Fall 2012 are not available. Fall 2013 is used as baseline for illustrative purposes.

Table 2: Master's Program Enrollment Growth[1]

Master's Program	2012	2021	2022	2023	Growth 2012-2023
Chemical Engineering	7	7	3	0	-7
Civil Engineering	33	35	21	25	-8
Computer Engineering	2	2	2	0	-2
Computer Science	28	69	59	35	7
Electrical Engineering	28	39	30	20	-8
Engineering	2	4	1	0	-2
Environmental Engineering	7	7	9	5	-2
Materials Science and Engineering	13	7	3	4	-9
Mechanical Engineering	40	50	37	29	-11
Software Engineering		10	9	5	5
Total Master's	**160**	**230**	**174**	**123**	**-37**

Table 3: Doctoral Program Enrollment Growth

Doctoral Program	2012	2021	2022	2023	Growth 2012-2023
Chemical Engineering	44	42	45	40	-4
Civil Engineering	37	42	41	34	-3
Computer Science	38	50	40	45	7
Electrical and Computer Engineerin	51	55	54	46	-5
Engineering Science (Multidisciplin	35	17	12	15	-20
Materials Science and Eng.	44	58	38	35	-9
Mechanical Engineering	38	54	50	51	13
Total Doctorate	**287**	**318**	**280**	**266**	**-21**

From Fall 2012 through Fall 2023 the total enrollment of graduate students decreased by 58, as shown in Tables 2 and 3, with a decrease of 37 Master's students and a decrease of 21 Ph.D. students. Enrollment numbers in Fall 2021, 2022 and 2023 reflect the effects of the pandemic where the number of incoming graduate students in general and international graduate students in particular decreased relative to Fall 2019, when total doctoral enrollment was 361 students.

[1] Self-supporting programs like Engineering and Technology Management and Professional Science Masters have not been included here, since they are outside the scope of this report.

Degrees Awarded

WSU Degree Awarded: Undergraduate and Graduate Computer Science and Engineering Programs				
	2007-2011 Baseline	**FY 2024**	**Increase**	**% Increase**
Undergraduate	411	743	332	81%
Master's and Doctoral	132	110	-22	-17%
Total Students	**543**	**853**	**310**	**57%**

Funding provided under HB 2127 (2012) and SB 5034 (2013) brought with it expectations of an increase in undergraduate and graduate degree production of 190 and 104 degrees, respectively, over the 2007–2011 baseline for a total target of 294 new degrees. WSU's 2007-2011 baseline was 543 degrees (411 undergraduate and 132 graduate). In Fiscal Year (FY) 2024, WSU produced a total of 853 degrees (743 undergraduate and 110 graduate [64 Master's and 46 Ph.D.]) in engineering and computer science. Thus, 16 *graduates were produced above the target associated with the additional funding*. The 2015-2016 Academic Year was the first year where degree production could be reported owing to the lag between when students start and when they graduate. WSU has thus exceeded the target degree-creation value for each of the past five years.

Tables 4, 5, and 6 summarize the number of computer science and engineering undergraduate degrees (BS and BA), master's degrees (MS) and doctoral (PhD) degrees awarded in FY 2022, 2023, and 2024. Note that WSU's official degrees conferred for the fiscal year are updated in October of each year. The degrees conferred reported for FY 2024 are unofficial, based on a snapshot from August 10, 2024, and may differ slightly from the official degree counts in October.

Table 4: Undergraduate degrees awarded

Bachelor's Program	Degrees Awarded: FY 2022	Degrees Awarded: FY 2023	Degrees Awarded: FY 2024
Bioengineering	31	19	28
Chemical Engineering	25	35	43
Civil Engineering	101	86	84
Construction Engineering	6	16	8
Electrical Engineering	110	71	92
Computer Engineering	15	11	17
Computer Science (BS and E	185	209	186
Software Engineering	31	25	32
Data Analytics	34	51	7
Cybersecurity			1
Materials Science Engineering	20	15	8
Mechanical Engineering	265	224	237
Total Undergraduate degre	**823**	**762**	**743**

Table 5: Master's degrees awarded[2]

Master's Program	Degrees Awarded: FY 2022	Degrees Awarded: FY 2023	Degrees Awarded: FY 2024
Chemical Engineering	6	3	3
Civil Engineering	21	15	13
Computer Engineering	2	1	0
Computer Science	45	32	14
Electrical Engineering	24	14	11
Engineering	3	1	1
Environmental Engineering	5	6	3
Materials Science and Engineerin	6	4	2
Mechanical Engineering	31	29	13
Software Engineering	2	4	4
Total Master's degrees	**145**	**109**	**64**

[2] Self-supporting programs like Engineering and Technology Management and Professional Science Masters have not been included here, since they are outside the scope of this report.

Table 6: Doctoral degrees awarded

PhD Program	Degrees Awarded: FY 2022	Degrees Awarded: FY 2023	Degrees Awarded: FY 2024
Chemical Engineering	8	13	4
Civil Engineering	5	12	4
Computer Science	5	8	9
Electrical Engineering	19	10	8
Engineering Science	3	3	2
Materials Science and Engineerir	9	17	9
Mechanical Engineering	17	6	10
Total Doctorate degrees	**66**	**69**	**46**

Electrical Engineering at Bremerton & Software Engineering and Data Analytics

ESSB 6052 (2015) provided additional funding to WSU for creation of an Electrical Engineering program in Bremerton and Software Engineering and Data Analytics in Everett. The late enactment date of the budget (6/30/2015) prohibited WSU from enrolling students in these programs in AY 2015-16. Further, a change in policy by the Northwest Commission of Colleges and Universities (NWCCU), the agency that accredits Washington State University, forbade us from advertising or announcing these new degree programs until after NWCCU had granted permission to offer these programs. This did not occur until the summer of 2016.

Funding provided under ESSB 6052 and SSB 5883 (2015) brought with it the following expectation for the software engineering and data analytic programs: "At full implementation, the university is expected to enroll 50 students per academic year."

As reported in Table 1 of this report, following are total students enrolled for Fall 2023:

- Software Engineering: 132 (77 Pullman students and 55 Everett students)
- Data Analytics: 235 (84 Pullman students, 15 Everett students, 106 Global Campus students, and 30 Vancouver students).

Thus, WSU has significantly surpassed the target enrollment of 50 students per academic year. Funding provided under ESSB 6052 and SSB 5883 brought with it the following expectation for the electrical engineering program located in Bremerton: "At full implementation, the university is expected to increase degree production by 25 new bachelor's degrees per year."

During FY 2024, six bachelor's degrees were awarded from the electrical engineering program located in Bremerton. The effects of the pandemic have significantly affected this program. While this is relatively modest, the growth in this program is consistent with trends that have been experienced with the prior creation of new programs. Further, as described above, there is an expected lag in degree production due to the time between when students start the program and when they graduate.

Low income students enrolled in each program

Using Pell grant eligibility as an identifier of low-income students, approximately 19.2 percent of the Fall 2023 computer science and engineering students fit this category, which is lower than the 25 percent Pell Grant eligibility observed in Fall 2012 and lower than the 25 percent Pell grant eligibility observed in Fall 2022. The percentage of Pell Grant eligible undergraduate students broken down by major is shown in Table 7. The second column represents the total number of students in each program whereas the third column shows the percentage of students who are Pell eligible. These numbers could understate the actual number of low-income students owing to Pell eligibility being a discernable attribute only for those students who complete the Free Application for Federal Student Aid (FAFSA).

Table 7: Fall 2023 Pell Grant Eligibility by Degree Program

Program	Students in Program	% Pell Eligible
Bioengineering	117	20.5%
Chemical Engineering	131	18.3%
Civil Engineering	361	21.1%
Computer Engineering	92	23.9%
Cybersecurity	33	30.3%
Computer Science (BA and BS	1116	18.3%
Construction Engineering	32	15.6%
Data Analytics	235	25.1%
Electrical Engineering	404	24.8%
Engineering-Undecided	67	26.9%
Materials Science Engineering	49	14.3%
Mechanical Engineering	1002	14.2%
Software Engineering	132	24.2%
Total	3771	19.2%

Process changes and best practices implemented

In order to foster student success, we have implemented several best practices designed to increase student retention, including retention of members of underrepresented minority groups. One example is the NSF-funded Pacific Northwest Louis Stokes Alliance for Minority Participation (LSAMP) program, which aims to increase the recruitment, retention, and graduation rate of underrepresented students in STEM (Science, Technology, Engineering, and Mathematics) disciplines. The Voiland College of Engineering and Architecture (VCEA) is a dedicated supporter of this program that provides an array of academic, professional, and social programming. The LSAMP program conducts a) outreach to community colleges; b) offers financial support and mentoring for students by STEM Faculty Research Mentors; and c) offers fieldtrips, academic and career advising, support for conferences, and a series of STEM related workshops, such as graduate school preparation and undergraduate research information sessions, plus fun social activities to allow opportunities for students to network and meet peers.

Similar to the LSAMP program, VCEA partners with the College of Arts and Sciences, College of Veterinary Medicine, College of Agriculture, Human, and Natural Resource Sciences and the Office of Student Equity to support the Team Mentoring Program. TMP promotes underrepresented groups in the pursuit of STEM degrees through research opportunities and mentorship with faculty, connection with industry and alumni partners, and financial support for research, study abroad, and other academic endeavors. Included in the set of underrepresented student populations are females pursuing degrees in engineering or computer science. One of the key aspects of the TMP program is the peer to peer mentoring program which matches upper division student mentors with sophomore and junior-level mentees. VCEA has the largest number of mentors and mentees in this campus-wide program, with 10 mentors being matched to close to 200 sophomore and junior-level mentees.

VCEA continued to offer the Voiland Peer Network (VPN) program to students in 2023-2024. This program matches an upper division engineering or computer science peer mentor with an incoming first-year or transfer student. Students are paired based on their interests and background using a matching survey. New students build peer-to-peer relationships with mentors who help support them through their first year. In 2023-2024, 36 upper division student mentors were matched with 131 new students, for a total of 167 participants. Over 247 unique conversations occurred and over 2,300 text messages were exchanged between mentors and their mentees throughout the year. We are beginning to see evidence that participation in the Voiland Peer Network increases retention in VCEA, a goal of the program. VPN mentee participants from 2020-2022 were retained in VCEA to the start of their second year at a rate 8 percent higher than their peers who were not involved in the program.

For the past three years, VCEA has implemented a college-wide survey of first-year students in five of our introductory-level courses during the fall semester. This survey has allowed us to gain insight on how our new students engage with college events and student resources and how connected they are to their peers and professors, as well as evaluate their sense of belonging. Additionally, we have paired survey responses with demographic information such as race, gender, Pell-eligibility, first-generation status, degree program, and transfer status to evaluate and work to improve engagement across various student groups. In fall 2023, we collected 375 responses from first-year students pursuing VCEA majors. Analysis has shown that a majority of students engage with VCEA events, are aware of resources, feel welcome in VCEA, and feel connected to their peers and the university at-large.

Our introductory, multi-disciplinary engineering course, Innovation in Design, continues to evolve and provide a positive experience for incoming engineering students. In 2023-2024, 344 students completed the course and engaged in hands-on experiments to build basic conceptual knowledge, professional development assignments including resume creation and virtual mock interviews, and design projects and presentations. This course continues to be very well-received by students and introduces them to various career opportunities in engineering fields. The average one-year VCEA retention rate for ENGR 120 students was 78 percent for the 2018-2022 cohorts, higher than the VCEA-wide average of 71.1 percent. One-year retention of female and minority students was 77.1 percent and 78.6 percent, respectively.

Home to over 40 registered student organizations (RSOs), the Voiland College Club Hub provides training to the RSO to support various procurement needs and travel coordination, connecting to funding opportunities, guidance to complete professional development, and project goals. Club interests are extensive and unique across our clubs, with social networking and professional development at the base of every club. A portion of our clubs focus their goals on project design, building, and implementation for personal use or to compete for further prestige and/or awards. These “maker-clubs” mimic current industry processes to provide students with hands-on experience as they enter the work force. Our professional societies encourage in-person opportunities to network with industry representatives, as well as provide connections with peers that prove useful post-graduation. Travel to nationally organized conferences and competitions provides a platform for RSO members to gain real-life experience with travel and networking with those in relevant or similar fields. Opportunities for discovery and engaging in competition against other university chapters on unique projects benefits club members directly. This also places VCEA and WSU, into national spotlights, bringing attention to the outstanding work being done by our undergraduates. The VCEA Club Hub enhances interpersonal, communication, and team building skills that are immediately applicable to their academic experience, and translates into success in their engineering career. Paired with the technical knowledge gained through projects and classes, students are well-versed with a variety of professional skills to put them at the top of many industry hiring lists.

VCEA operates a managed-access fabrication space called the Frank Innovation Zone (The FIZ). The FIZ provides Engineering and Computer Science students the space, tools, materials, and equipment to gain valuable hands-on experience in ideation, design, and production. The space supports all undergraduate students, mainly through Engineering and computer science classes including the senior capstone design classes, Engineering Entrepreneurship, clubs, and personal projects. The Frank Innovation Zone’s mission is to provide students an opportunity to apply what they learn in their classes in a clean, safe, well-maintained, and inspiring space. Students with any level of knowledge and skills who successfully complete the well-structured safety and equipment/space use training can gain access to all FIZ resources.

VCEA Tutoring Services provide tutoring and other academic-engagement support in multiple locations around the Pullman campus. A full-time staff position oversees tutor hiring, scheduling, training for tutors to offer personalized attention through one-on-one and small group sessions. Last year, VCEA tutors provided over 130 hours of drop-in tutoring per week covering all disciplines in the college to provide students with almost limitless free tutorials each year. Our services focus heavily on foundational courses (100-200 level) in our disciplines, plus our team coordinates with tutoring services across campus (including math, chemistry, and physics). In addition, our team works closely with teaching assistants and faculty in all

engineering/computer science and School of Design courses to provide tutorials and other support resources for students in need. Tutors are also trained to refer students as needed to additional resources to further address specific academic needs.

VCEA Tutoring Services provide additional services to students such as workshops on the utilization of specific software they need for their disciplines, study skills and more. All tutors are trained in tutoring best practices, including information and resources about working with students from diverse backgrounds and abilities.

The Internships and Career Services office at VCEA plays a crucial role in preparing students for professional success through the Professional Practice & Experiential Learning (ProPEL) Program. Over the past seven years, ProPEL has mentored more than 900 students, helping them secure successful professional positions by the time they graduate.

The Career Services office also offers a wide range of professional development and industry engagement activities. These include the annual WSU Career Expo and Technical Fair each fall, professional development workshops throughout the year, industry tours across the Pacific Northwest, and the Boeing Mentorship Program. The office collaborates with over 1,000 employers to facilitate networking and recruitment opportunities for students.

According to the WSU First Destination Placement survey for 2023-2024, VCEA students had an average of 1.3 internships during their studies, with approximately 60 percent of graduates securing employment at the time of graduation. The average starting salary for these graduates was $81,000.

To support the growing number of VCEA students, the college has committed additional resources to hire more career professionals, graduate interns, and peer mentors. These efforts are aimed at helping VCEA students achieve their career aspirations.