



Graduate Enrollment in Science, Engineering, and Health Rose 3% in 2018

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The number of graduate students enrolled in science, engineering, and health (SEH) programs at U.S. academic institutions rose by 3% between 2017 and 2018, growing to 668,307. Of the 2018 students, 36% were in full-time doctoral programs and 37% were in full-time master's programs (figure 1).

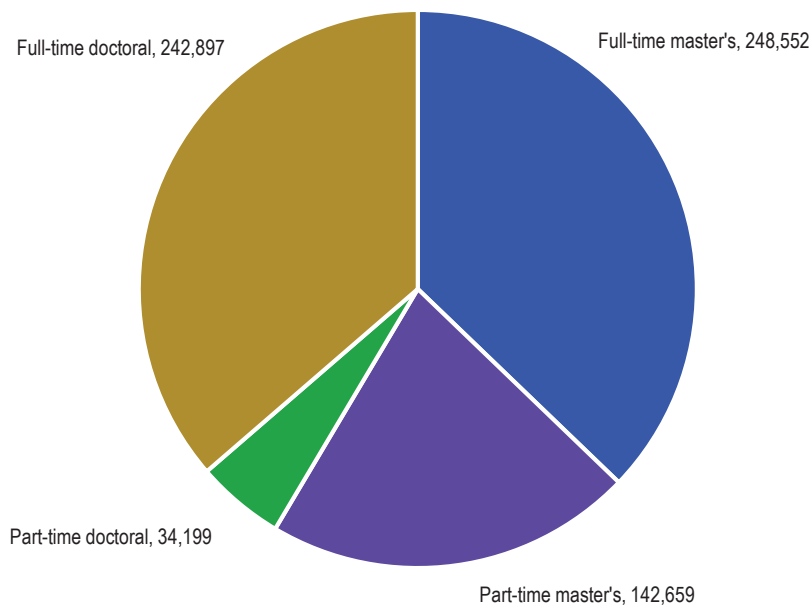
The increase in overall enrollment was driven by increases in part-time master's, full-time doctoral, and full-time master's students (increases of 9,082, 7,119, and 3,542 students, respectively). Part-time doctoral enrollment declined by 548 students (figure 2, table 1, and table 2).

These and other findings are from the 2018 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS). Data from the GSS provide insight into the composition of the current and future science and engineering (S&E) workforce by collecting data on doctorate-holding nonfaculty researchers (NFRs), post-doctoral appointees (postdocs), and graduate students in SEH fields. Beginning in 2017, the GSS started collecting information on master's and doctoral students separately in order to look at differences in enrollment patterns and financial support. This 2018 report is the first to show trend data by graduate degree type. The GSS is sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) and by the National Institutes of Health (NIH).

Doctoral Degree Enrollment

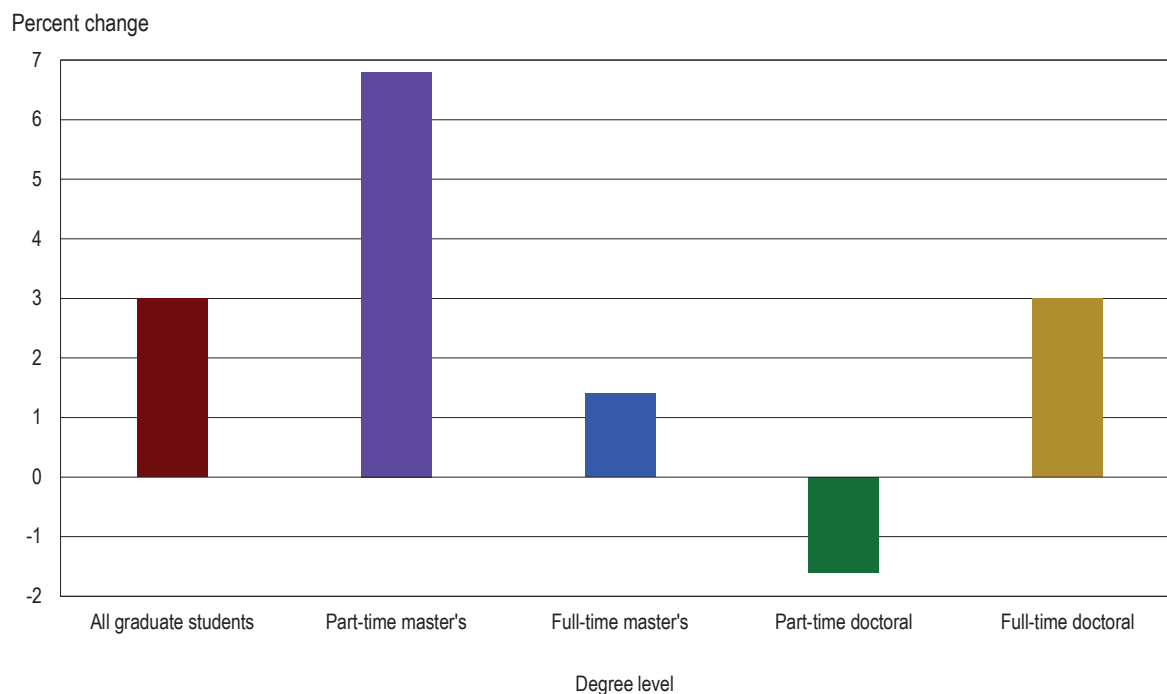
Counts of doctoral students receiving training in SEH are a key indicator of the vitality of the research and development enterprise in the United States. Between 2017 and 2018, doctoral program enrollment increased by 6,571 students, or 2%. This includes a 3% increase in the number of full-time doctoral students but also a 2% decline in part-time doctoral students (table 1).

FIGURE 1. Enrollment, by degree level and enrollment intensity: 2018



SOURCE: National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering, 2018.

FIGURE 2. Enrollment, by degree level and enrollment intensity: 2017–18



SOURCE: National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Data on the doctoral enrollment population provide information on the demographic composition of the students, their fields of study, and changes over time. Between 2017 and 2018, doctoral enrollment increased by 2,706 students (2%) among U.S. citizens and permanent residents and increased by 3,865 students (4%) among temporary visa holders. In 2018, 88% of doctoral students were enrolled full-time (table 1).

Doctoral enrollment for several historically underrepresented groups also grew between 2017 and 2018. Specifically, doctoral enrollment among women grew at more than twice the rate of male enrollment (4% vs. 2%). Also, doctoral enrollment among Hispanics or Latinos and among blacks or African Americans grew by 8% and 6%, respectively, compared to an increase of less than 1% among whites (table 1).

Across the SEH fields of study, full-time doctoral enrollment rose in 20 of the 22 fields of study between 2017 and 2018. Computer and information sciences had the largest increase in full-time students, rising by 1,710 students (14%), while the field of psychology and the field of engineering mechanics, physics, and science saw the only declines in full-time enrollment, falling by 79 students (-1%) and 37 students (-3%), respectively. Part-time doctoral enrollment fell in 13 of the 22 fields. Physical sciences saw the largest decline in part-time doctoral students, falling by 263 (-11%), and other health saw the largest increase, rising by 178 part-time students (6%) (table 1).

Master's Degree Enrollment

Master's degree holders are an essential part of the highly skilled S&E workforce, with nearly one-quarter of

non-academic S&E workers holding a master's degree (24%).² Between 2017 and 2018, enrollment in master's degree programs grew by 12,624 students (3%). This includes a rise in both full- and part-time enrollment, which increased by 3,542 students (1%) and 9,082 students (7%), respectively. In 2018, 64% of master's students were enrolled full time (table 2).

Between 2017 and 2018, enrollment in SEH master's programs among U.S. citizens and permanent residents increased by 19,394 students (8%), which included an increase of 8,212 enrolled full time (6%) and an increase of 11,182 enrolled part time (10%). Overall, there was a 5% decline in temporary visa holders (6,770 students) enrolled in master's-level SEH programs (table 2).

TABLE 1. Doctoral enrollment by enrollment status, sex, citizenship, ethnicity, race, and selected fields: 2017–18

Characteristic	All		Full time		Part time		Percent change		
	2017	2018	2017	2018	2017	2018	All	Full time	Part time
All surveyed fields	270,525	277,096	235,778	242,897	34,747	34,199	2.4	3.0	-1.6
Male	155,699	158,019	136,596	139,257	19,103	18,762	1.5	1.9	-1.8
Female	114,826	119,077	99,182	103,640	15,644	15,437	3.7	4.5	-1.3
U.S. citizens and permanent residents ^a	164,585	167,291	139,077	142,158	25,508	25,133	1.6	2.2	-1.5
Male	86,517	86,601	73,517	73,849	13,000	12,752	0.1	0.5	-1.9
Female	78,068	80,690	65,560	68,309	12,508	12,381	3.4	4.2	-1.0
Hispanic or Latino	14,999	16,161	12,935	14,009	2,064	2,152	7.7	8.3	4.3
Not Hispanic or Latino									
American Indian or Alaska Native	714	713	546	580	168	133	-0.1	6.2	-20.8
Asian	15,952	16,750	13,992	14,789	1,960	1,961	5.0	5.7	0.1
Black or African American	9,483	10,065	7,343	7,866	2,140	2,199	6.1	7.1	2.8
Native Hawaiian or Other Pacific Islander	235	233	190	189	45	44	-0.9	-0.5	-2.2
White	109,271	109,725	92,215	93,243	17,056	16,482	0.4	1.1	-3.4
More than one race	5,420	5,744	4,816	5,047	604	697	6.0	4.8	15.4
Unknown race and ethnicity	8,511	7,900	7,040	6,435	1,471	1,465	-7.2	-8.6	-0.4
Temporary visa holders	105,940	109,805	96,701	100,739	9,239	9,066	3.6	4.2	-1.9
Male	69,182	71,418	63,079	65,408	6,103	6,010	3.2	3.7	-1.5
Female	36,758	38,387	33,622	35,331	3,136	3,056	4.4	5.1	-2.6
Science and engineering	255,224	261,165	224,695	231,297	30,529	29,868	2.3	2.9	-2.2
Science	186,399	190,928	165,120	170,004	21,279	20,924	2.4	3.0	-1.7
Agricultural sciences	3,744	3,880	3,157	3,273	587	607	3.6	3.7	3.4
Biological and biomedical sciences	51,291	52,627	47,977	49,254	3,314	3,373	2.6	2.7	1.8
Computer and information sciences	14,291	16,127	11,886	13,596	2,405	2,531	12.8	14.4	5.2
Geosciences, atmospheric sciences, and ocean sciences	6,539	6,704	5,797	5,950	742	754	2.5	2.6	1.6
Mathematics and statistics	13,101	13,388	11,903	12,248	1,198	1,140	2.2	2.9	-4.8
Multidisciplinary and interdisciplinary studies	2,931	2,924	2,320	2,388	611	536	-0.2	2.9	-12.3
Natural resources and conservation	3,568	3,716	2,831	2,962	737	754	4.1	4.6	2.3
Physical sciences	35,461	36,000	32,954	33,756	2,507	2,244	1.5	2.4	-10.5
Psychology	20,395	20,303	16,617	16,538	3,778	3,765	-0.5	-0.5	-0.3
Social sciences	35,078	35,259	29,678	30,039	5,400	5,220	0.5	1.2	-3.3
Engineering	68,825	70,237	59,575	61,293	9,250	8,944	2.1	2.9	-3.3
Aerospace, aeronautical, and astronautical engineering	2,386	2,506	2,078	2,173	308	333	5.0	4.6	8.1
Bioengineering and biomedical engineering	6,845	7,278	6,103	6,564	742	714	6.3	7.6	-3.8
Chemical engineering	6,874	6,950	6,451	6,583	423	367	1.1	2.0	-13.2
Civil engineering	7,626	7,732	6,529	6,573	1,097	1,159	1.4	0.7	5.7
Electrical, electronics, and communications engineering	17,936	18,119	15,263	15,473	2,673	2,646	1.0	1.4	-1.0
Engineering mechanics, physics, and science	1,457	1,428	1,333	1,296	124	132	-2.0	-2.8	6.5
Industrial and manufacturing engineering	3,633	3,598	2,841	2,901	792	697	-1.0	2.1	-12.0
Mechanical engineering	11,149	11,159	9,744	9,898	1,405	1,261	0.1	1.6	-10.2
Metallurgical and materials engineering	4,426	4,610	4,071	4,284	355	326	4.2	5.2	-8.2
Other engineering ^b	6,493	6,857	5,162	5,548	1,331	1,309	5.6	7.5	-1.7
Health	15,301	15,931	11,083	11,600	4,218	4,331	4.1	4.7	2.7
Clinical medicine	4,410	4,508	3,260	3,423	1,150	1,085	2.2	5.0	-5.7
Other health	10,891	11,423	7,823	8,177	3,068	3,246	4.9	4.5	5.8

^aRace and ethnicity data are available for U.S. citizens and permanent residents only.

^bOther engineering includes Agricultural engineering, Biological and biosystems engineering, Mining engineering, Nanotechnology, Nuclear engineering, Petroleum engineering, and Engineering not elsewhere classified.

SOURCE: National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

TABLE 2. Master's enrollment by enrollment status, sex, citizenship, ethnicity, race, and selected fields: 2017–18

Characteristic	All		Full time		Part time		Percent change		
	2017	2018	2017	2018	2017	2018	All	Full time	Part time
All surveyed fields	378,587	391,211	245,010	248,552	133,577	142,659	3.3	1.4	6.8
Male	200,748	201,314	125,897	123,457	74,851	77,857	0.3	-1.9	4.0
Female	177,839	189,897	119,113	125,095	58,726	64,802	6.8	5.0	10.3
U.S. citizens and permanent residents ^a	251,896	271,290	141,321	149,533	110,575	121,757	7.7	5.8	10.1
Male	119,906	126,552	60,203	62,052	59,703	64,500	5.5	3.1	8.0
Female	131,990	144,738	81,118	87,481	50,872	57,257	9.7	7.8	12.6
Hispanic or Latino	29,622	32,923	17,316	19,011	12,306	13,912	11.1	9.8	13.1
Not Hispanic or Latino									
American Indian or Alaska Native	1,136	1,219	706	685	430	534	7.3	-3.0	24.2
Asian	26,093	28,557	14,825	15,882	11,268	12,675	9.4	7.1	12.5
Black or African American	23,266	25,878	11,846	13,294	11,420	12,584	11.2	12.2	10.2
Native Hawaiian or Other Pacific Islander	468	497	240	269	228	228	6.2	12.1	0.0
White	148,031	156,010	83,943	86,699	64,088	69,311	5.4	3.3	8.1
More than one race	8,119	9,120	4,996	5,455	3,123	3,665	12.3	9.2	17.4
Unknown race and ethnicity	15,161	17,086	7,449	8,238	7,712	8,848	12.7	10.6	14.7
Temporary visa holders	126,691	119,921	103,689	99,019	23,002	20,902	-5.3	-4.5	-9.1
Male	80,842	74,762	65,694	61,405	15,148	13,357	-7.5	-6.5	-11.8
Female	45,849	45,159	37,995	37,614	7,854	7,545	-1.5	-1.0	-3.9
Science and engineering	325,925	334,391	209,221	210,287	116,704	124,104	2.6	0.5	6.3
Science	229,169	241,327	145,689	151,059	83,480	90,268	5.3	3.7	8.1
Agricultural sciences	5,603	5,658	3,609	3,626	1,994	2,032	1.0	0.5	1.9
Biological and biomedical sciences	33,926	35,306	23,889	24,759	10,037	10,547	4.1	3.6	5.1
Computer and information sciences	75,618	77,351	44,320	44,193	31,298	33,158	2.3	-0.3	5.9
Geosciences, atmospheric sciences, and ocean sciences	6,006	5,629	4,107	3,820	1,899	1,809	-6.3	-7.0	-4.7
Mathematics and statistics	16,568	18,073	11,551	12,707	5,017	5,366	9.1	10.0	7.0
Multidisciplinary and interdisciplinary studies	6,923	7,414	4,038	4,268	2,885	3,146	7.1	5.7	9.0
Natural resources and conservation	7,311	7,691	4,866	5,072	2,445	2,619	5.2	4.2	7.1
Physical sciences	6,368	6,075	4,197	3,915	2,171	2,160	-4.6	-6.7	-0.5
Psychology	29,638	35,404	19,318	21,987	10,320	13,417	19.5	13.8	30.0
Social sciences	41,208	42,726	25,794	26,712	15,414	16,014	3.7	3.6	3.9
Engineering	96,756	93,064	63,532	59,228	33,224	33,836	-3.8	-6.8	1.8
Aerospace, aeronautical, and astronautical engineering	3,322	3,342	2,183	2,128	1,139	1,214	0.6	-2.5	6.6
Bioengineering and biomedical engineering	4,037	4,202	3,234	3,369	803	833	4.1	4.2	3.7
Chemical engineering	3,292	3,061	2,396	2,220	896	841	-7.0	-7.3	-6.1
Civil engineering	13,506	12,729	9,084	8,289	4,422	4,440	-5.8	-8.8	0.4
Electrical, electronics, and communications engineering	29,816	28,108	20,941	19,341	8,875	8,767	-5.7	-7.6	-1.2
Engineering mechanics, physics, and science	679	729	428	472	251	257	7.4	10.3	2.4
Industrial and manufacturing engineering	12,272	12,389	7,212	6,492	5,060	5,897	1.0	-10.0	16.5
Mechanical engineering	16,279	15,434	10,778	10,178	5,501	5,256	-5.2	-5.6	-4.5
Metallurgical and materials engineering	2,115	2,079	1,587	1,539	528	540	-1.7	-3.0	2.3
Other engineering ^b	11,438	10,991	5,689	5,200	5,749	5,791	-3.9	-8.6	0.7
Health	52,662	56,820	35,789	38,265	16,873	18,555	7.9	6.9	10.0
Clinical medicine	25,283	27,494	15,043	16,233	10,240	11,261	8.7	7.9	10.0
Other health	27,379	29,326	20,746	22,032	6,633	7,294	7.1	6.2	10.0

^a Race and ethnicity data are available for U.S. citizens and permanent residents only.

^b Other engineering includes Agricultural engineering, Biological and biosystems engineering, Mining engineering, Nanotechnology, Nuclear engineering, Petroleum engineering, and Engineering not elsewhere classified.

SOURCE: National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

Overall, enrollment in master's programs increased by 12,058 women (7%) and by 566 men (less than 1%) between 2017 and 2018. Among U.S. citizens and permanent residents, enrollment among women rose by 12,748 (10%), of which 6,363 were enrolled full time (8% increase) and 6,385 were enrolled part time (13% increase). Among temporary visa holders, enrollment declined by 6,080 men (-8%) and 690 women (-2%) (table 2).

Between 2017 and 2018, enrollment in master's programs grew at a larger rate for part-time students than for full-time students for all racial and ethnic groups except black or African American students and Native Hawaiian or Pacific Islander students. Enrollment in part-time master's program increased by 10% or more for the following racial and ethnic categories: American Indians or Alaska Natives, Asians, Hispanics or Latinos, blacks or African Americans, and more than one race. The racial and ethnic groups with the largest percent change in total master's enrollment were more than one race and blacks or African Americans, which grew by 12% and 11%, respectively. The percent change for whites was 5% (table 2).

An examination of enrollment by field of study shows that 8 out of 22 fields, including 6 engineering fields, had overall declines in master's enrollment. Electrical, electronics, and communications engineering showed the largest decline in the number of students (-1,708 students), and mechanical engineering had the second largest decline (-845 students). The fields of study with the largest increase in the number of master's students enrolled were psychology and clinical medicine, which rose by 5,766 and 2,211 students, respectively. Both of these fields

of study also had large percentage increases in part-time enrollment, rising by 30% and 10%, respectively (table 2).

Postdoctoral Appointees and Nonfaculty Researchers in SEH Fields

Postdocs are recent doctorate or doctorate-equivalent recipients pursuing additional training to prepare for an independent career in research. The GSS is the primary source of data on postdoc employment and funding in the United States. The number of postdocs in SEH fields of study rose slightly from 64,733 in 2017 to 64,783 in 2018. However, despite the minimal change in the total number of postdocs, there were noticeable changes in the postdoc distribution by field of research. Geosciences, atmospheric sciences, and ocean sciences saw the largest decrease in the number of postdocs (decline of 363 students, or -17%), while clinical medicine saw the largest increase in number of postdocs (rising by 463 students, or 3%). Biological and biomedical sciences remains the largest SEH field of research accounting for one-third of all postdocs (table 3).

Another important component of the academic research and development workforce are nonfaculty researchers (NFRs) who have doctorate degrees. As with postdocs, the GSS is the primary source of data on this population. As schools improve their administrative data systems to accurately reflect all faculty, the number of NFRs continues to increase. In 2018, 1,104 more NFRs were working at U.S. academic institutions than there were in 2017. Most of these 1,104 NFRs were in science fields of research. Between 2017 and 2018, there was a small decrease of 289 NFRs in clinical medicine (5%), which is the second largest field of study for

NFRs behind biological and biomedical sciences (table 3).

Data Source and Limitations

Conducted since 1966, the GSS is an annual survey of all academic institutions in the United States that grant research-based master's or doctoral degrees in SEH fields. The 2018 GSS collected data from 19,592 organizational units (departments, programs, affiliated research centers, and health care facilities) at 715 eligible institutions and their affiliates in the United States, Puerto Rico, and Guam. The unit response rate was 98.9%, which is an improvement over 2017's rate of 97.6%. An overview of the survey is available at <https://www.nsf.gov/statistics/srvygradpostdoc/>.

In 2017, the GSS was redesigned to collect demographic and financial support data separately for master's and doctoral students, to prioritize electronic data interchange as the primary means of data submission,³ and to utilize the U.S. Department of Education's Classification of Instructional Programs (CIP) codes to report fields of study for graduate student enrollment data.⁴ More information regarding the 2017 GSS redesign is available in the technical notes for the 2018 data tables (<https://ncesdata.nsf.gov/gradpostdoc/2018/gss18-tech-notes.pdf>). Further, in 2017, NSF updated the GSS fields of study to align with the NCSES Taxonomy of Disciplines to increase comparability to other NCSES surveys and more accurately reflect how disciplines are currently organized.

Due to these changes, the 2017 and 2018 data are not directly comparable to previously collected GSS data. Trend comparisons can be made using the "2017old" estimates in the

TABLE 3. Postdoctoral appointees and nonfaculty researchers in science, engineering, and health fields of research in all institutions, by sex and field: 2017–18
(Number)

Sex and field	Postdoctoral appointees				Nonfaculty researchers			
	2017	2018	Change	Percent change	2017	2018	Change	Percent change
All surveyed fields	64,733	64,783	50	0.1	28,180	29,284	1,104	3.9
Male	38,870	38,661	-209	-0.5	16,580	17,468	888	5.4
Female	25,863	26,122	259	1.0	11,600	11,816	216	1.9
Science and engineering	46,080	45,478	-602	-1.3	20,542	21,848	1,306	6.4
Science	38,241	37,564	-677	-1.8	17,268	18,278	1,010	5.8
Agricultural sciences	1,024	1,072	48	4.7	496	565	69	13.9
Biological and biomedical sciences	21,781	21,533	-248	-1.1	8,203	8,250	47	0.6
Computer and information sciences	854	879	25	2.9	476	515	39	8.2
Geosciences, atmospheric sciences, and ocean sciences	2,089	1,726	-363	-17.4	1,794	2,106	312	17.4
Mathematics and statistics	991	982	-9	-0.9	240	266	26	10.8
Multidisciplinary and interdisciplinary studies	1,131	980	-151	-13.4	806	832	26	3.2
Natural resources and conservation	731	764	33	4.5	364	580	216	59.3
Physical sciences	7,211	6,976	-235	-3.3	2,871	3,056	185	6.4
Psychology	1,082	1,145	63	5.8	494	507	13	2.6
Social sciences	1,347	1,507	160	11.9	1,524	1,601	77	5.1
Engineering	7,839	7,914	75	1.0	3,274	3,570	296	9.0
Bioengineering and biomedical engineering	1,398	1,433	35	2.5	415	440	25	6.0
Chemical engineering	1,197	1,142	-55	-4.6	281	257	-24	-8.5
Civil engineering	804	739	-65	-8.1	422	414	-8	-1.9
Electrical, electronics, and communications engineering	1,170	1,197	27	2.3	557	588	31	5.6
Engineering mechanics, physics, and science	316	354	38	12.0	200	220	20	10.0
Industrial and manufacturing engineering	127	156	29	22.8	119	105	-14	-11.8
Mechanical engineering	1,089	1,069	-20	-1.8	458	489	31	6.8
Metallurgical and materials engineering	550	549	-1	-0.2	181	215	34	18.8
Other engineering ^a	1,188	1,275	87	7.3	641	842	201	31.4
Health	18,653	19,305	652	3.5	7,638	7,436	-202	-2.6
Clinical medicine	16,100	16,563	463	2.9	6,448	6,159	-289	-4.5
Other health	2,553	2,742	189	7.4	1,190	1,277	87	7.3

^a Includes Aerospace, aeronautical, and astronautical engineering; Agricultural engineering; Biological and biosystems engineering; Mining engineering; Nanotechnology; Nuclear engineering; Petroleum engineering; and Engineering not elsewhere classified.

NOTE: "Field" refers to the field of the unit that reports postdoctoral appointees and nonfaculty researchers.

SOURCE: National Center for Science and Engineering Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

2017 data tables, available at <https://ncesdata.nsf.gov/gradpostdoc/2017/>.

GSS health fields are collected under the advisement of NIH. These GSS fields are about one-third of all health fields in the U.S. Department of Educa-

tion's CIP taxonomy. NIH information on trends seen within these selected health fields can be found at <https://report.nih.gov/nihdatabook/>.

The full set of data tables from the 2018 survey are available at <https://www.nsf.gov/statistics/srvygradpostdoc/>.

Data are also available in NCSES's interactive data tool (<https://ncesdata.nsf.gov/ids/gss>). For more information about the survey, contact the GSS project officer, Michael Yamaner.

Notes

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2. National Science Board, National Science Foundation. 2019. Science and

Engineering Indicators 2020: Science and Engineering Labor Force. *Science and Engineering Indicators 2020*. NSB-2019-8. Alexandria, VA. Available at <https://nces.nsf.gov/pubs/nsb20198/>.

3. Electronic data interchange is a method for transferring data between computer systems or networks using a standardized format.

4. CIP is a taxonomy used for reporting postsecondary fields to the U.S. Department of Education (ED) for the

Integrated Postsecondary Education Data System, a mandatory survey for institutions receiving federal financial aid. Thus, most of institutions in the GSS already use CIP codes to report data on graduate students. The CIP taxonomy was developed by the National Center for Education Statistics (within ED), which updates the taxonomy about once a decade; CIP was last revised in 2010. For more information, see <http://nces.ed.gov/ipeds/cipcode/>.