

Sanitary Engineering Degrees Awarded in 1959

Institution	Doc- tor's	Mas- ter's	Bach- elor's	Institution	Doc- tor's	Mas- ter's	Bach- elor's
Alabama Polytechnic Institute		2	(1)	New Hampshire, University of		(1)	
Alabama, University of		0	0	New Mexico College of Agricul- ture and Mechanic Arts		0	2
Arkansas, University of		0		New York University	0	2	4
Arizona, University of ²	0	0	1	North Carolina State College	0	2	
Brooklyn, Polytechnic Institute of		0		North Carolina, University of	0	³ 7	
California Institute of Tech- nology	0	0	2	North Dakota, University of		0	
California, University of	³ 2	³ 8	0	Northeastern University		5	0
Case Institute of Technology	0	³ 2		Northwestern University	0	³ 7	
Cincinnati, University of		0	1	Ohio State University	0	³ 1	2
Colorado, University of		0	0	Oklahoma State University	0	0	4
Connecticut, University of		0		Oklahoma, University of	0	³ 16	0
Cornell University	1	0	0	Oregon State College	0	2	9
Florida, University of	0	6	9	Pennsylvania State University	1	2	1
Georgia Institute of Technology	0	1	5	Pittsburgh, University of ²	1	³ 8	0
Harvard University	1	³ 11	0	Puerto Rico, University of			0
Idaho, University of		0	0	Purdue University	0	5	³ 4
Illinois Institute of Technology	0	0		Rensselaer Polytechnic Institute		9	4
Illinois, University of	0	³ 3	3	Rhode Island, University of ²		0	
Iowa State University	0	³ 3	0	Rice Institute		(1)	
Iowa, State University of	1	3	11	Rutgers University	1	2	4
Johns Hopkins University	2	³ 8		South Dakota State College		1	2
Kansas, University of		1	4	Southern California, University of		5	
Kentucky, University of		0	0	Southern Methodist University		0	
Maine, University of		1	4	Stanford University ²	1	³ 6	2
Manhattan College ²			16	Syracuse University		(1)	(1)
Marquette University			12	Tennessee, University of		0	
Maryland, University of		(1)	(1)	Texas Agricultural and Me- chanical College	0	³ 1	3
Massachusetts Institute of Tech- nology	³ 3	³ 9		Texas Technological College		0	12
Massachusetts, University of		0	0	Texas, University of	1	³ 4	0
Michigan College of Mining and Technology		0	14	Tulane University of Louisiana		1	0
Michigan State University	0	1		Utah, University of	0	0	1
Michigan, University of	0	³ 23	1	Virginia Polytechnic Institute	0	2	6
Minnesota, University of	0	³ 10	0	Washington State University		1	0
Mississippi State College		0	0	Washington University	0	3	³ 21
Missouri School of Mines and Metallurgy		2	³ 8	Washington, University of	0	1	0
Missouri, University of		³ 4	0	West Virginia University		0	0
Nebraska, University of		0		Wisconsin, University of	1	³ 5	1
Newark College of Engineering		1	9	Wyoming, University of ²		0	0
				Total	16	197	182

¹ Data not available for 1959.

² Schools reporting for the first time in recent years.

³ Includes foreign nationals.

NOTE: Leaders (-----) indicate no specialization offered at this level.

Educational activity in sanitary engineering, as measured by the number of degrees awarded, showed a strong upward surge in the academic year ending June 1959 and approached the 1951 peak for the first time. In particular, the number of graduate degrees conferred reached a new high. Data on degrees given during the period July 1958 through June 1959 are presented in the table (see above). Similar data for the

period since 1889 appear in the literature (1-4) or have been distributed by the Public Health Service. The data for 1958-59 are more complete than in past years in that nearly all schools offering a program in sanitary engineering at any level are represented.

Briefly, there were 213 graduate degrees in sanitary engineering conferred by institutions in the United States during the 1958-59 aca-

Engineering degrees awarded annually, by type of degrees, 1951-59

Year	Number sanitary engineering degrees	Schools awarding sanitary engineering degrees	Schools offering sanitary engineering curriculums	Total number engineering degrees ¹	Number sanitary engineers per 1,000 engineering degrees
Bachelor's degrees					
1959	182	32	54	38, 134	4. 8
1958	148	33	45	35, 332	4. 2
1957	145	31	43	27, 748	5. 2
1956	208	32	53	23, 547	8. 8
1955	141	32	44	20, 200	7. 0
1954	164	32	40	19, 707	8. 3
1953	216	36	41	21, 642	10. 0
1952	216	36	41	27, 155	8. 0
1951	244	35	39	37, 904	6. 4
Master's degrees					
1959	197 (52)	43	69	6, 615	29. 6
1958	128 (29)	35	61	5, 788	22. 1
1957	152 (39)	41	64	5, 203	29. 2
1956	124 (31)	33	67	4, 678	26. 5
1955	134 (34)	33	53	4, 444	30. 2
1954	120 (25)	30	56	4, 130	29. 1
1953	102 (20)	25	57	3, 726	27. 4
1952	105 (22)	29	57	4, 132	25. 4
1951	152	26	57	5, 134	29. 6
Doctor's degrees					
1959	16 (2)	12	37	714	22. 4
1958	16 (4)	12	36	647	24. 7
1957	11 (1)	6	32	596	18. 5
1956	9 (1)	7	27	610	14. 8
1955	11 (2)	4	28	599	18. 4
1954	9	5	26	590	15. 3
1953	5	4	24	592	8. 4
1952	9	5	23	586	15. 4
1951	7	4	25	586	11. 9

¹ See Tolliver, W. E., and Armsby, H. H.: Engineering enrollments and degrees in ECPD-accredited institutions, 1959. *Journal of Engineering Education* 50: 450-467, Feb. 15, 1960.

NOTE: Figures in parentheses represent nationals of other countries included in larger figure.

ademic year. Of these, 197 were master's degrees and 16 were doctor's degrees. This is an increase of 69 over the 144 such degrees reported for the 1957-58 academic year. The entire increase, about 48 percent, was in the master's

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degree category, as the same number of doctor's degrees were conferred. Five of the schools appearing on the graduate listing this year for the first time reported a curriculum at the master's degree level. Three of these schools conferred 14 master's degrees. The 69 institutions which reported in the master's degree category both this year and last awarded 55 more master's degrees this year.

Awards of bachelor's degrees also rose this year, but the total was smaller than has been

reported in some previous years. In the 1958-59 academic year, 182 bachelor's degrees were awarded to students who had completed undergraduate programs emphasizing sanitary engineering. This was an increase of 34 degrees over the 148 conferred for the academic year 1957-58. Five schools appear on the undergraduate listing this year for the first time, and 19 bachelor's degrees were awarded by three of them. The 49 schools which reported in the bachelor's degree category both this year and last awarded 15 more degrees this year, an increase of about 10 percent.

A more detailed discussion of each degree category follows. It refers both to the table giving 1959 graduates by school and to the table which shows a comparison of degree statistics for the period 1951-59.

Bachelor's Degrees

Fifty-four schools reported a sanitary engineering option or equivalent electives in their undergraduate curriculums. Of these, 22 conferred no bachelor's degrees in this field for the academic year 1958-59 (see table on p. 1147). The 32 schools awarding degrees conferred a total of 182, of which 4 were awarded to foreign students. As in past years there was fairly heavy concentration in a few schools. Ten schools awarded 121 degrees or nearly 66.5 percent of the total. The level of bachelor's degrees awarded in 1958-59 was the highest in the last 3 years, exceeding the average of 165 for the past 5 years, but falling below the average of 195 for the past 10 years.

It is difficult to judge how accurate these figures are. Sanitary engineering at the undergraduate level has rarely been organized in the form of a separate department. More often sanitary engineering courses comprise an option in the civil engineering curriculum. Because of this, there is no consistent pattern for the reporting of baccalaureate degrees in sanitary engineering. Some institutions offer a concentration of sanitary engineering courses such as might be found in an elective sanitary engineering option of a civil engineering curriculum. Others are reporting students who may have taken several elective courses in sanitary engineering beyond the few such courses required of

all registrants in the civil engineering curriculum. A few of the figures may indicate civil engineering students who have taken only the required courses which fall under the general heading of sanitary engineering. In such situations it would be difficult to say that the figures in this report indicate a particular trend in sanitary engineering manpower. The reporting of them, however, provides continuity in the record of this information and at least a rough measure of the direction of activity in sanitary engineering at the undergraduate level.

Master's Degrees

Of the 69 schools reporting a curriculum in sanitary engineering at the master's level, 26 did not confer any master's degrees in the field of sanitary engineering. The 43 schools which did confer degrees awarded a total of 197, of which 52 were awarded to foreign students. A large proportion of the master's degrees were conferred by a fairly small group of the schools. Nine schools awarded 102 degrees, or about 51.8 percent of the total. The total of 197 degrees was the highest ever recorded for the sanitary engineering field at the master's degree level, and indicates a sharp rise over the prevailing level of past years. Some of the increase reflects the inclusion in the compilation for 1958-59 of more schools than were represented in past surveys. For the 10-year period 1950-59, the average number of master's degrees awarded in sanitary engineering was 136. Over the past 5 years this average was about 147 degrees.

There is an increasing trend to consider the master's degree to be the qualifying level of training for work in the sanitary engineering field. This was brought out in the "Conference Report of the 1957 Conference on Education, Training and Utilization of Sanitary Engineers," and adds significance to the substantial increase in the number of master's degrees awarded in the academic year 1958-59. The total of 197 degrees is so far above the relatively stable level of recent years that there is reluctance to use this as a firm base for predictions on the future of sanitary engineering training at this level. It is interesting to note the increase in both the number of schools offering the sanitary engineering curriculum and those award-

ing degrees during the 1958-59 academic year. This situation indicates that interest in the field is being sustained and perhaps heightened.

A major problem in such an evaluation has been those schools which offer a master's program in sanitary engineering but have not had students completing this program. Twenty-six schools which reported no degree awards during 1958-59 have conferred a total of only 57 master's degrees since 1950, an average of slightly more than 2 degrees per school over the entire 10-year period. The percentage of schools actually granting master's degrees has been on an upward trend, however, indicating an increased interest on the part of both schools and students.

Doctor's Degrees

There were 37 schools reporting a program in sanitary engineering leading to the doctor's degree. Of these, 25 granted no degrees during the 1958-59 academic year. The remaining 12 schools reporting degree awards conferred a total of 16, of which 2 went to foreign students. As might be expected, all of the schools having a doctoral program also have a master's program. In the last 10 years a total of 97 doctor's degrees have been awarded to students specializing in sanitary engineering. Over that same period of time, the 12 schools which reported degree awards for 1958-59 accounted for 81, about 83 percent of the total. Again, this indicates the concentration of activity in the field of sanitary engineering training. The number of doctor's degrees awarded in 1958-59 was the same as for 1957-58, remaining at a high level compared with earlier years. The average number of doctor's degrees awarded per year over the 10-year period 1950-59 was 9.7. The 5-year average now stands at 12.6 degrees.

Since the past 5 years have seen a relatively high level of doctor's degree awards, and since there appears to be an increase in the number of master's degrees conferred, it would seem likely that the number of doctor's degrees will continue as high as or higher than it has been in the past several years. It should be noted that the concentration of degree-awarding institutions is greater at the doctoral level than at

either the bachelor's or master's level. While this situation indicates a present lack of students, the schools which now have no doctoral students represent a future potential source of teaching and research personnel. This could be particularly significant if activity at the bachelor's and master's levels is to increase, for if more students are enrolled at these lower levels, there will be a greater demand for teaching and research personnel. There is an increasing demand that such personnel hold the doctorate.

Current Graduate Enrollment

For the first time since this survey was started, figures have been collected which indicate the current enrollment of students in sanitary engineering programs leading to master's and doctor's degrees.

The figures for the 1959-60 academic year are gross figures showing simply those students enrolled in any form of graduate program in sanitary engineering. There is no breakdown as to length of program and no breakdown as to the concentration of study. In other words, the figures do not indicate how many students are studying full time, how many are studying half time while teaching or doing research, or how many students are enrolled in evening study programs.

Nevertheless, these enrollment figures are the beginning of what will become a regular part of this annual report. They will be so collected in the future that the groups noted above can be broken out and analyzed. It is hoped that such figures will form the basis for yearly predictions of graduate degree awards. During the coming year, schools offering sanitary engineering graduate programs will be contacted in an effort to obtain enrollment figures for the past several years. Such a statistical history will more quickly provide a basis for analyses of training capacity.

For the 1959-60 academic year, there are 413 students enrolled in master's degree programs and 118 enrolled in doctoral programs. The master's degree students are enrolled in a total of 58 schools, while the doctoral candidates are studying in 33 schools. These latter figures show the high percentage of engineering schools

now actively engaged in graduate programs. While 43, or about 62 percent of the schools offering master's programs, granted degrees in 1958-59, there are students enrolled in 58, or about 84 percent of these schools, in the 1959-60 academic year. This indicates heightened activity and means that there will be less concentration of students than in the past several years. The same is true of the doctoral candidates. While only 12, or about 32 percent of schools offering doctoral programs, granted degrees in 1958-59, there are students enrolled in 33, or more than 89 percent of these schools, in the 1959-60 academic year.

With information on only 1 year, it would not be wise to make any predictions or to cite any trends in activity or future degree awards.

However, the high level of enrollment in the various schools certainly indicates a healthy situation and an increased interest in the field of sanitary engineering study and instruction.

REFERENCES

- (1) Miller, A. P. : Graduates from undergraduate sanitary engineering courses in the United States. Pub. Health Rep. 66 : 369-374, Mar. 23, 1951.
- (2) Miller, A. P. : Sanitary engineering degrees given in 1954. Pub. Health Rep. 70 : 1039-1040, October 1955.
- (3) Laubusch, E. J., and Ludwig, H. F. : Sanitary engineering degrees awarded in 1955. Pub. Health Rep. 71 : 945-946, September 1956.
- (4) Erickson, F. K., and Butrico, F. A. : Sanitary engineering degrees awarded in 1958. Pub. Health Rep. 75 : 60-62, January 1960.

PUBLICATION ANNOUNCEMENTS

Facts About Strokes. 1960; leaflet. American Heart Association, 44 East 23d Street, New York 10.

Report on Employment of Mature Workers. September 1960; 36 pages; \$1. Industrial Relations Division, National Association of Manufacturers, 2 East 48th Street, New York 17.

Handbook of Aging and the Individual. Edited by James E. Birren. 1959; 939 pages; \$12.50. University of Chicago Press, Chicago.

Report on Rehabilitation of Chronically Ill and Disabled Persons in San Francisco. By Irving Babow, Ph.D. April 1960; 161 pages; \$2.50. United Community Fund of San Francisco, 2015 Steiner Street, San Francisco 15.

The Canadian Homemaker. A survey of agency personnel practices. May 1960; 28 pages; 50 cents. *Wanted—Homemaker Services.* 1958; 6-page folder; 10 cents. *Homemaker Services to Meet New Needs.* 1957; 20 pages; 30 cents. Publications Section, Canadian Welfare Council, 55 Parkdale Avenue, Ottawa 3, Ont.

Fellowships for Health Research. A report on a meeting of the Committee on Research of the National Health Council, April 21, 1960. 31 pages; \$1. National Health Council, 1790 Broadway, New York 19.

Our Puerto Rican Fellow Citizens. Report of a National Conference sponsored by AFL-CIO Community Service Activities, New York City, January 15, 1960. 44 pages. AFL-CIO Community Service Activities, 9 East 40th Street, New York 16.

Steps in the Development of Integrated Psychiatric Services. Report of the third meeting of the Advisory Council on Mental Health Demonstrations. 1960; 146 pages; \$1. Milbank Memorial Fund, New York.

Handbook of Social Gerontology; Societal Aspects of Aging. Edited by Clark Tibbitts. 1960; 770 pages; \$10. University of Chicago Press, Chicago.

Aging—Public Welfare's Role. 1960; 20 pages; 50 cents (discounts on large orders). American Public Welfare Association, 1313 East 60th Street, Chicago 37.

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Air Pollution in South Carolina. Technical Report A60-6. By Paul A. Kenline. 1960; 26 pages.

Treatment of Wastes From Coffee Processing in Costa Rica. Technical Report W60-2. By Herbert R. Pahren and Rudolfo F. Saenz. 17 pages.

Biological Problems in Water Pollution. Transactions of the 1959 seminar. Technical Report W60-3. Compiled by C. M. Tarzwell. 1960; 285 pages.

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