

Demographics and Diversity of Mercer University's Graduate Engineering Programs

Richard O. Mines, Jr.¹ and Greg Lofton²

Abstract – The purpose of this paper was to investigate the demographics and diversity of the student-body within the Mercer University Graduate School of Engineering. Data used in developing this paper were based on the academic years beginning 2002-03 and ending 2008-09. The major findings of this study are summarized as follows: 1837 students were enrolled in graduate engineering programs during these 7 academic years; the average percentage of students enrolled by race was 4% Hispanic, 9% African American, 11% Asian, 17% unknown, and 59% White; the gender of our students earning master's degrees was 25% female and 75% male; the grade point average of all graduate students was 3.74 on a 4-point scale; and the overall graduation rate of our graduate students was 55.8%.

Keywords: demographics, diversity, ethnicity, gender, graduation rates.

INTRODUCTION

Mercer University, founded in 1833, is a faith-based, comprehensive university with campuses in Macon and Atlanta, Georgia. The Mercer University School of Engineering (MUSE) located in Macon was founded in 1985. The Accreditation Board for Engineering and Technology (ABET) accredited their General Engineering Degree Program in 1990 which offers specializations in biomedical, computer, electrical, environmental, industrial, and mechanical engineering. In the 1990s, MUSE began to offer graduate degrees in electrical engineering. Presently, the School of Engineering offers a Master of Science in engineering degree in seven engineering disciplines: biomedical (GBE), computer (GCE), electrical (GEE), engineering management (EGM), environmental (GEV), mechanical (GME), and software (SFE). These programs are designed for students with an undergraduate degree in engineering. A dual-degree program is available for outstanding junior engineering undergraduates who receive both the Bachelor of Science and Master of Science at the end of their 5th year of study. A Master of Science degree is awarded in four other associated engineering programs: environmental systems (GES), Software Systems (SFS), Technical Communication Management (TCC) and Technical Management (TCM). Students that do not have an undergraduate degree in engineering pursue these associated programs. Both the environmental engineering and environmental systems graduate programs were started in Fall 2009.

The graduate programs in engineering are not accredited by ABET; however, they are reviewed by the Southern Association of Colleges (SACs) on a ten year cycle. In addition to the importance of maintaining SACs accreditation, the graduate programs division was interested in knowing the demographics and diversity of the students in the graduate programs; especially with regard to women and minorities. Butler and Hicks [1] published their study on diversity within the School of Engineering and found that African Americans and women comprise approximately 18% and 32%, respectively, of the incoming freshman class of undergraduate engineering students. Many other colleges and universities have placed emphasis on recruiting women and minority engineering students in addition to retaining students in the engineering profession and improving graduation rates. Morley et al. [5] allude to the dramatic changes taking place in the ethnicity of the U.S. workforce. They also purport that to remain

¹ Mercer University, School of Engineering, 1400 Coleman Ave. Macon, GA 31207, mines_ro@mercer.edu

² Mercer University, School of Engineering, 1400 Coleman Ave. Macon, GA 31207, lofton_g@mercer.edu

competitive in the fields of engineering and science, traditionally underrepresented groups including African American, Hispanic American, and Native Americans will have to be inculcated into the workforce. These groups will require advanced training in engineering and science. Purdy and Wasburn [6] identify five areas of concern that warrant further study to enhance and increase diversity in engineering education. Salient points made in their paper include the under-representation of women and minorities in both undergraduate and graduate engineering programs, the negative impact on diversity due to declining enrollment of international students, and the elimination of diversity programs at state-supported universities having tight budgets. The disparity between underrepresented minority groups (URM) in all segments of science and engineering education was examined by Reichert and Absher [7]. They advocate the recruitment of URM students into graduate engineering programs and greater institutional commitment to draw URM students to campuses.

The purpose of this paper was to investigate the demographics and diversity of the student-body at the Mercer University Graduate School of Engineering. Data used in developing this paper is based on the academic years beginning 2002-03 and ending 2008-09. In the sections below, more details and data are provided and discussed in an effort to characterize the attributes of Mercer engineering graduate students.

Student Grade Point Average

Academic performance based on overall student grade point average (GPA) is presented in Figure 1. The overall GPA of MUSE graduate students averaged 3.74 for the time frame evaluated. Mercer graduate students appear to be performing quite well. Students in the Software Engineering and Systems programs had the highest overall GPA, 3.87 versus 3.53 for Biomedical Engineering.

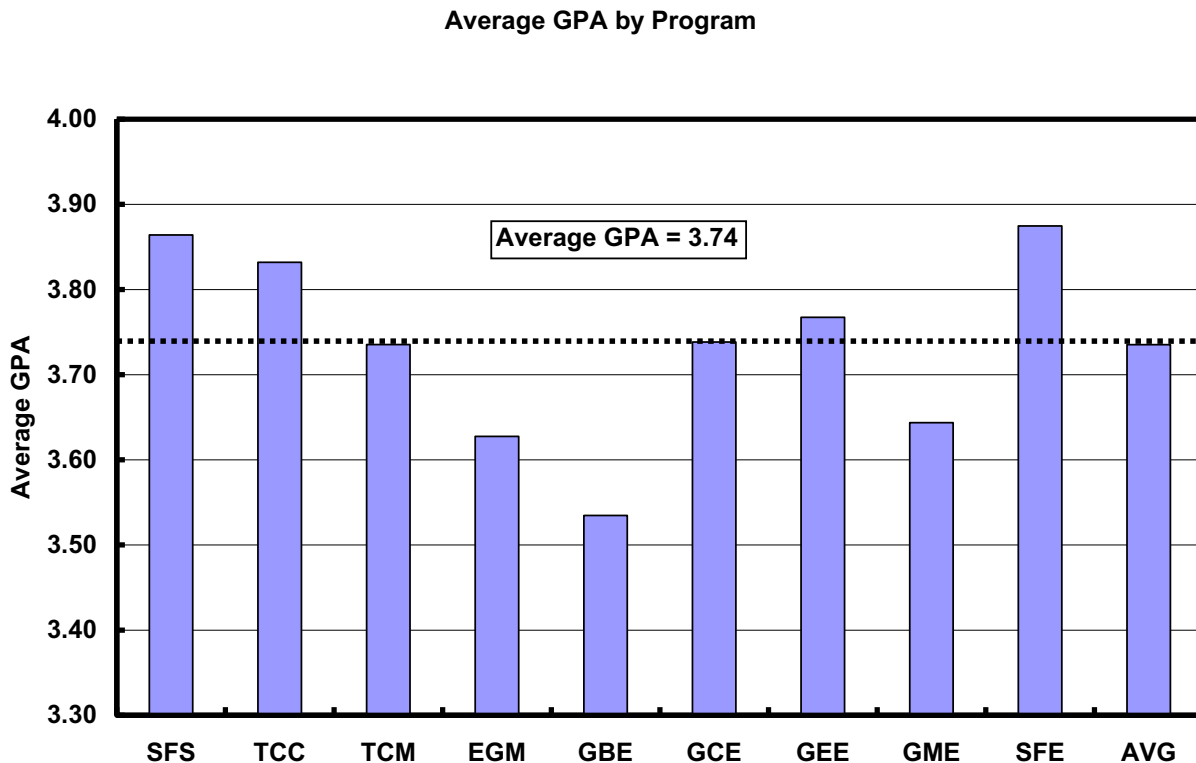


Figure 1. Overall student grade point average by program fall 2002 through spring 2009.

Academic Action

Academic action i.e. placing students on probation or dismissal from the School of Engineering was taken against 16 students during the 17 semesters evaluated (F03-S09). Only one of the students was dismissed for failure to meet academic requirements. The other students received grades less than “B” placing them on academic warning. The percentage of students upon which academic action was taken by gender and ethnicity is presented in Figure 2. Fourteen of the sixteen students (87.5%) that were having academic difficulty were male. By ethnicity, the percentage of students that had academic action taken against them was 50% White, 12.5% Asian, 25% African American, and 12.5% Hispanic.

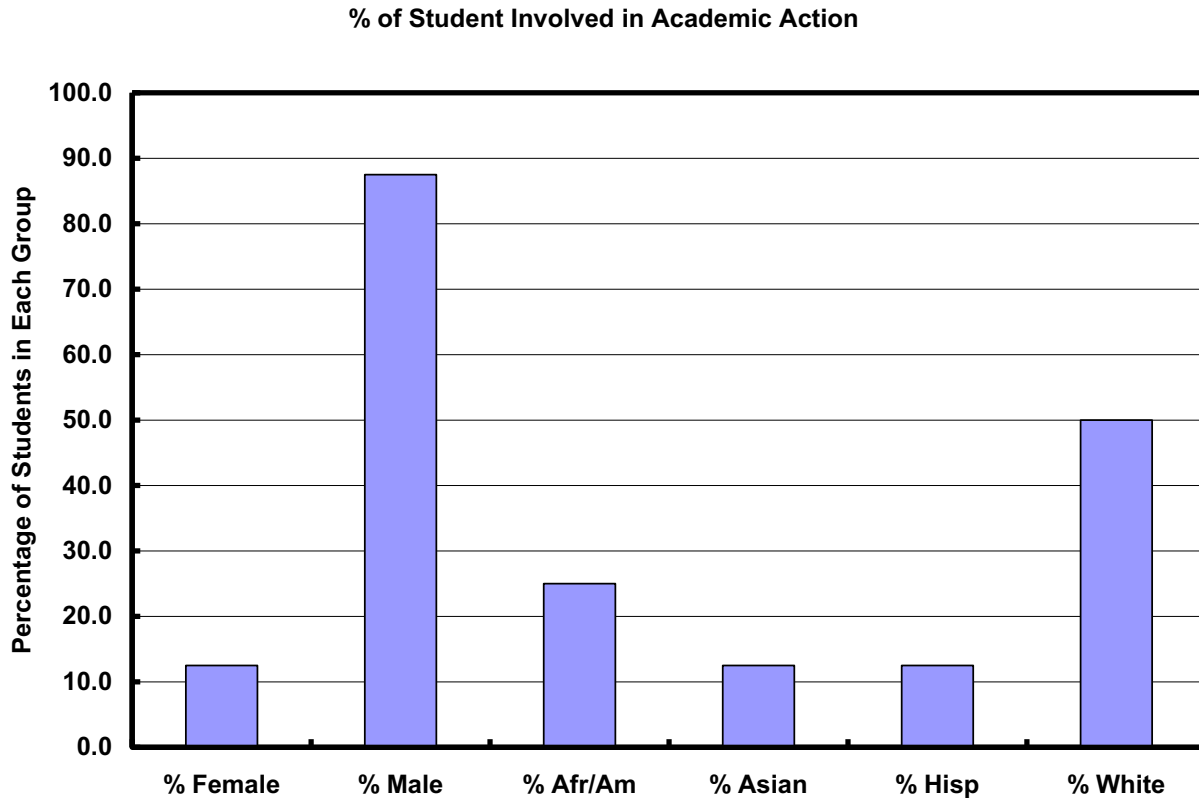


Figure 2. Percentage of students by gender and ethnicity which received academic action.

Student Enrollment

One thousand eight hundred and thirty seven students were enrolled in graduate engineering programs at MUSE during the 7 academic years evaluated. Figure 3 indicates that the graduate enrollment during this time frame was 25% female and 75% male.

Figure 4 shows the percentages of students by ethnicity enrolled each term. The overall averages by ethnicity were: 4% Hispanic, 9% African American, 11% Asian, 17% unknown, and 59% White (Caucasian). Nationally, Fall 2008 master's enrollment data indicated that 22% of the students were female and 78% male [Gibbons, 3]. Enrollment by ethnicity for the same period was 5.3% African American, 6.0% Hispanic, 14.1% Asian American, 15.3% Other, and 59.3% Caucasian.

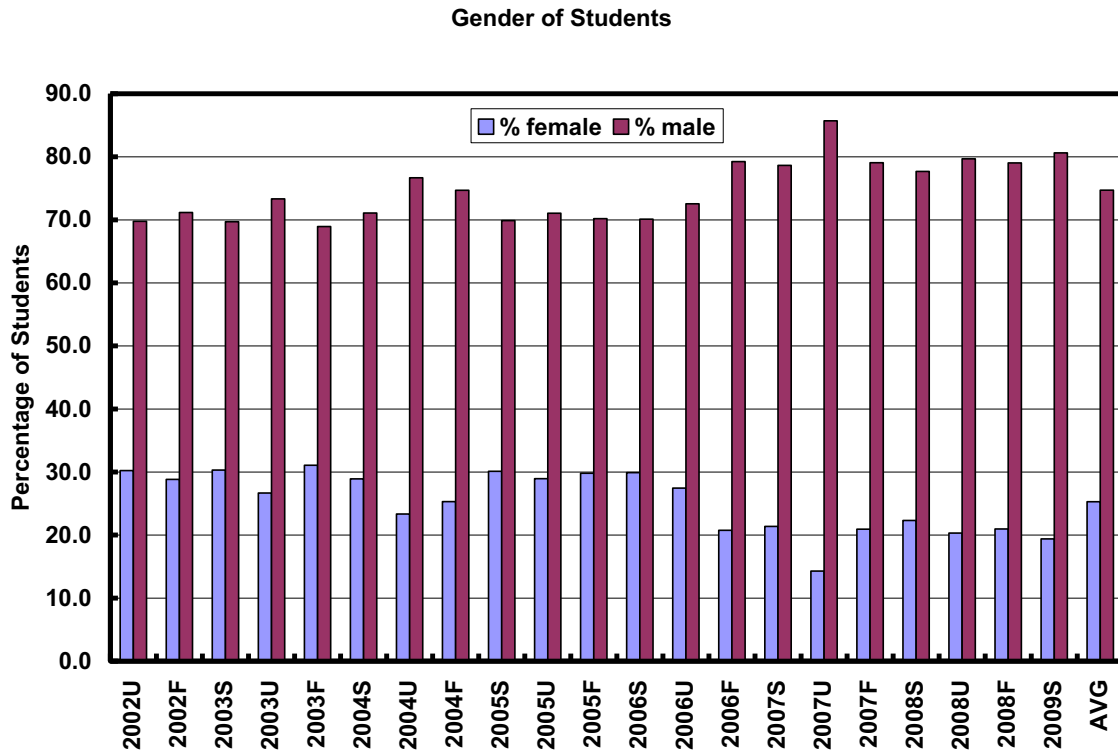


Figure 3. Enrollment of graduate students by gender.

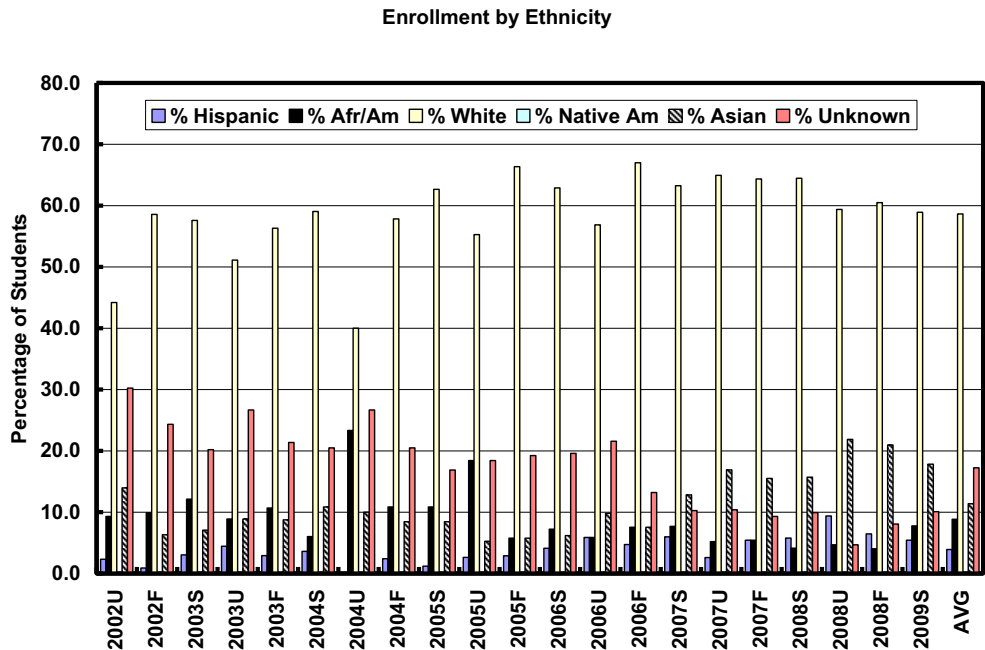


Figure 4. Enrollment of graduate students by ethnicity.

Gender and Ethnicity of Students Earning Graduate Degrees

The percentage of females and males graduating from the Mercer University School of Engineering was 25% and 75%, respectively (Figure 5), which was identical to the enrollment percentages. Nationally, the percentage of females and males completing graduate degrees in engineering averaged 22.4% and 77.6%, respectively, based on data from 1999 through 2008 [Gibbons, 3].

Ethnicity and Gender of Students

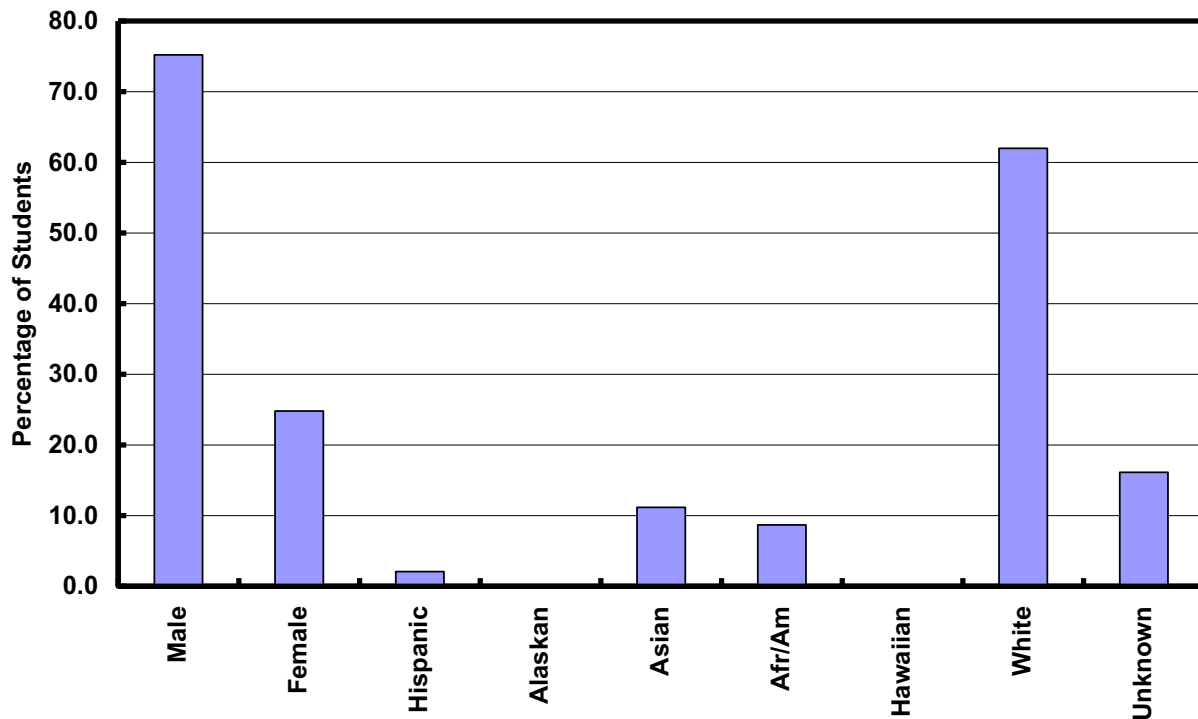


Figure 5. Ethnicity and gender of students earning master's degrees.

The ethnicity of our students earning master's degrees was similar to the average percentages for enrollment: 2% Hispanic, 9% African American, 11% Asian, 16% unknown, and 62% White. Gibbons [3] reported the following percentages for Master's degrees awarded by ethnicity from 1999 through 2008: 4.6% Hispanic, 4.5% African American, 15.9% Asian American, 13.3% Other, and 61.7% Caucasian. According to Gibbons [3], Asian Americans represented 15.4% of the students earning a master's degree in 2007-08, while the combined groups of African American and Hispanic students accounted for 9.1% of the master's degrees for the same period.

Graduation Rates

The overall graduation rates for students entering MUSE's master's programs averaged 55.8% for the time frame evaluated. Students enrolled in the graduate mechanical engineering program had the highest graduation rate with 62.5% and biomedical had the lowest at 40% (Figure 6). Students enrolled in the 5th year integrated Masters and Bachelors Program had an overall graduation rate of 75%. The highest graduation rates were observed for the mechanical engineering program (82%) whereas the engineering management program had the lowest rate at 50% (Figure 7). There were no students that graduated with a degree in technical management (TCM).

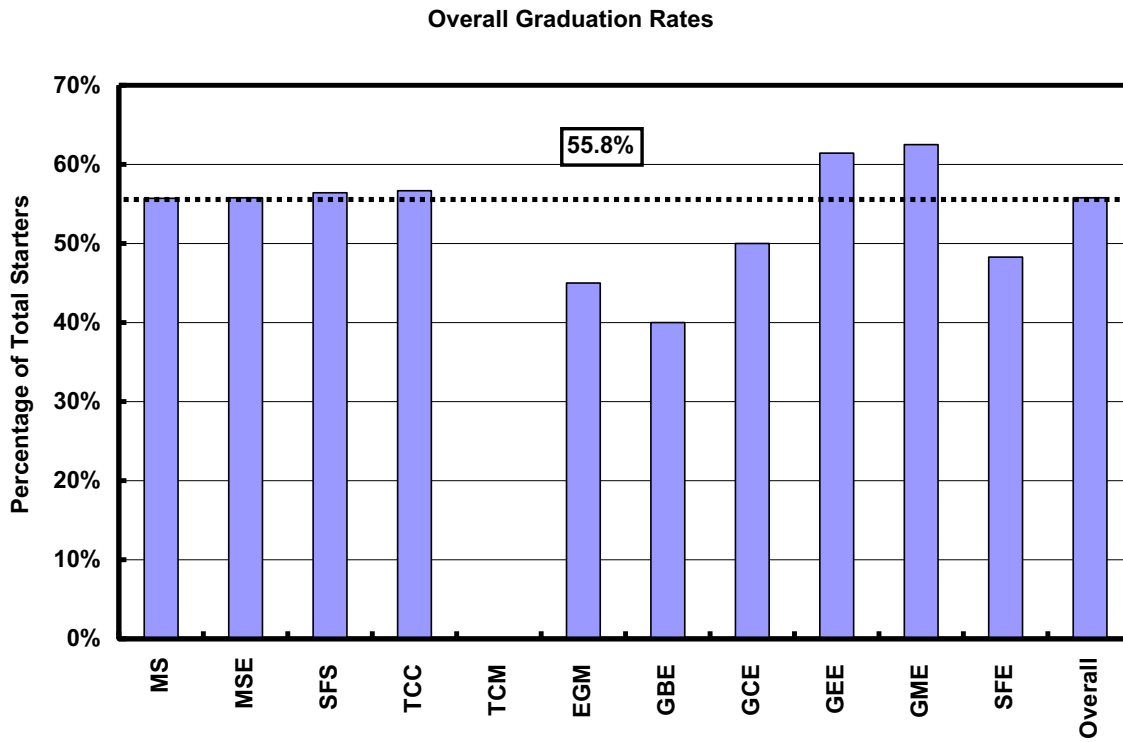


Figure 6. Overall graduation rates of regular engineering graduate students.

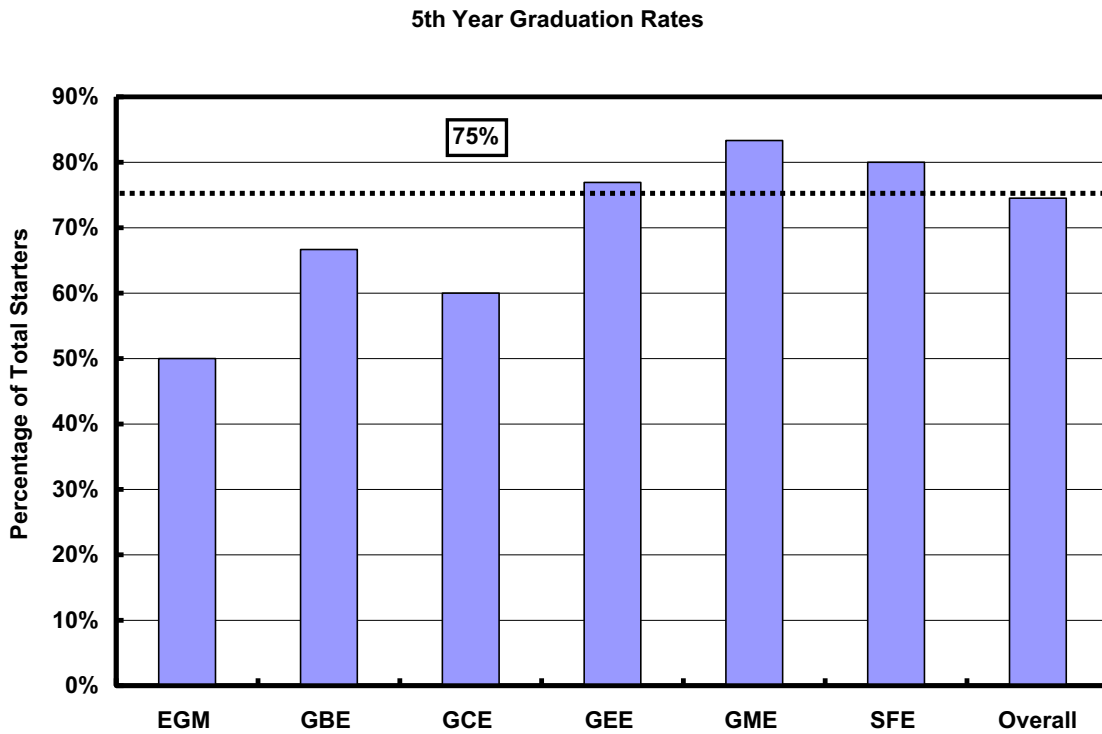


Figure 7. Graduation rates for students enrolled in 5th year integrated program.

The six year graduation rate for all undergraduate students at Mercer University according to the Integrated Postsecondary Education Data System (IPEDS) Graduation Rate Survey definition is 63.2% [4]. Six year graduation rates for all undergraduate students at Georgia Tech [2] and Virginia Tech [8] averaged 73.1% and 78.3%, respectively. We believe that our low graduation rate at the graduate level may be attributed to the majority of our students being employed as civil servants or military personnel stationed at Robins Air Force Base in Warner Robins, Georgia. More often than not, military personnel are relocated to other bases every two to three years and often go on temporary duty assignments (TDY) for extended periods causing them to drop out of the graduate program. Also, only five of our eleven graduate programs are full-time which may cause some students to transfer to other universities to complete their studies in a more timely manner.

Degrees Awarded and Term to Graduate

For the 7 academic years studied, there were 71 Master of Science degrees and 171 Master of Science in Engineering degrees awarded. Figure 8 shows the number of master's degrees awarded by degree program and the number of terms it took students to graduate. The overall number of terms to graduate for all programs was 7.

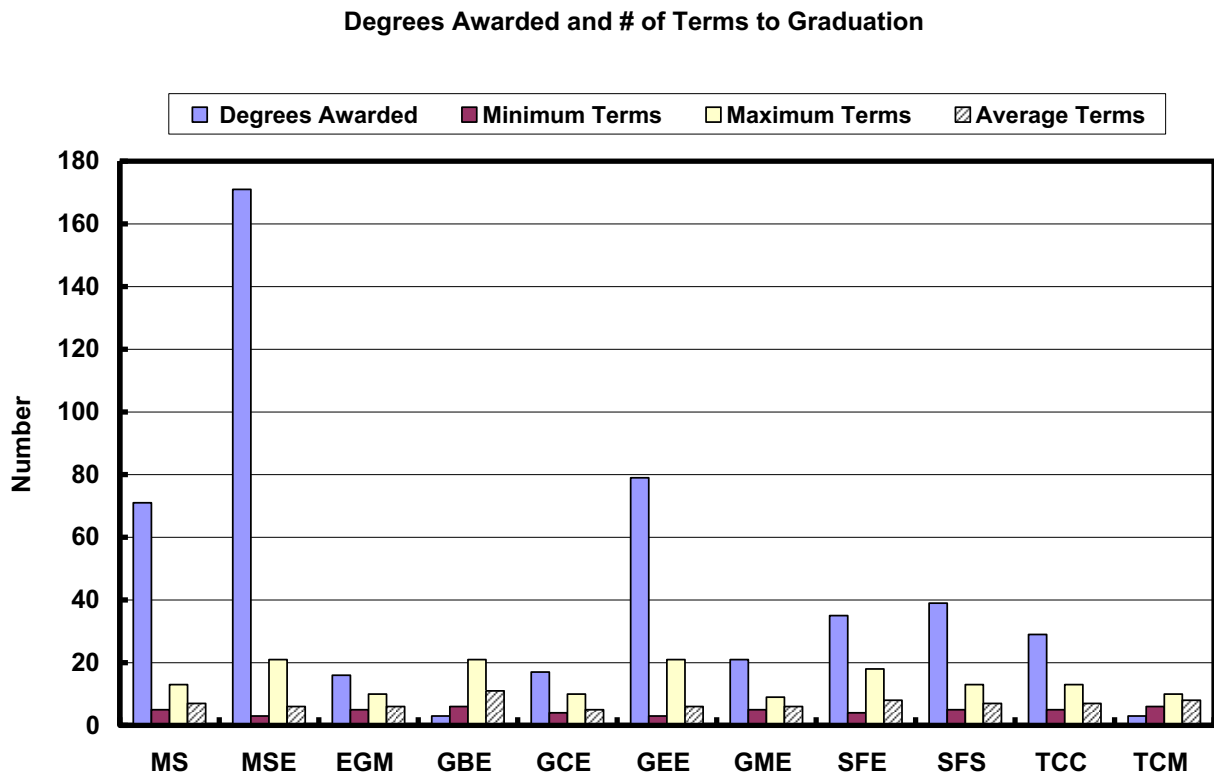


Figure 8. Number of degrees awarded and terms taken to graduate by students in each program.

SUMMARY

The major findings of this study are summarized below.

1. 1837 students were enrolled in graduate engineering programs during these 7 academic years with the following average percentage of students by ethnicity: 4% Hispanic, 9% African American, 11% Asian, 17% unknown, and 59% White.
2. 75% of students enrolled were male and 25% female. For each academic term there were approximately 22 females and 66 males enrolled.

3. The ethnicity of our students earning master's degrees was similar to the average percentages for enrollment: 2% Hispanic, 9% African American, 11% Asian, 16% unknown, and 62% White.
4. During the 7 academic years, 71 MS degrees and 171 MSE degrees were awarded.
5. The overall graduation rate of our graduate students was 55.8%. For students enrolled in the dual-degree program, 75% of those that started the program earned their degrees.
6. The gender of our students earning master's degrees was 25% female and 75% male.
7. The overall grade point average of all graduates students was 3.74 on a 4-point scale. Students enrolled in the software engineering and software systems programs had the highest overall GPA, averaging 3.87; while graduate students enrolled in biomedical engineering had the lowest overall GPA, averaging 3.53.

RECOMMENDATIONS

- We plan to conduct exit surveys for students that drop out of our graduate program to determine what factors led them to their decision to leave.
- It is our desire to form a focus group to study ways that we can better interact with the educational office at Robins AFB to promote, recruit, and retain qualified graduate students.

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Richard O. Mines, Jr.

Dr. Mines is Professor of Environmental Engineering and Director of MSE and Associated MS Engineering Programs at Mercer University in Macon, GA. He holds a BSCE from VMI, an ME degree in CE from UVA, and PhD in CE from VPI. Dr. Mines has over 6 years of consulting experience with CH₂M Hill and BLACK & VEATCH, and has taught over 20 years at VMI, USF, and Mercer. He is a registered PE in FL, NM, and VA. Dr. Mines has authored/co-authored over 100 technical and educational papers and is the primary author of *Introduction to Environmental Engineering* published by Prentice-Hall. His research interests are in water and wastewater

treatment, modeling of bionutrient removal systems, and innovative techniques to enhance learning in the classroom. Dr. Mines is an active member of ASEE and ASCE; and Past-president of ASEE SE Section 2002-03.

Greg Lofton

Greg Lofton is the Graduate Program Coordinator for the School of Engineering at Mercer University in Macon, Georgia. Mr. Lofton graduated from Macon State College in 1998 with a Bachelor of Science degree in Public Service-Human Services. He served twenty years in the U.S. Air Force and began serving as a Pastor in 1989. In 1995, Mr. Lofton founded the chaplaincy program for Georgia's nationally ranked Lowndes High School Football team. He was inducted into the Golden Key International Honor Society in 2003. Mr. Lofton serves as a mentor for education to community youth and young adults.