

Practice of Increasing Enrollment and Retention of Electronics Engineering Technology Program

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Abstract – The student enrollment in engineering technology programs overall has experienced constant decline over decades. The electronics engineering technology program in the University of Southern Mississippi was previously a key part of one of the largest engineering technology programs in the country, with an undergraduate student body of about 140 at its prime. The enrollment and retention rates have been decreasing during the last decade. Many reasons contribute to the trend, one of which is the student misperception on engineering technology.

The University as well as the EET program analyzed the major issues that affected the enrolment and retention, and proposed plans to improve the situation. Methods that have been used include closer connection with industry, modification of core curriculum structure, introduction of emerging technologies, improved student advisement, sponsored programs to attract perspective students, summer camp activities, high school visits, better connections with students during school breaks, and more. Along with the strategies at the university level, the departmental plan works well. The program enrollment increases while the university enrollment breaks a record. This presentation introduces the various methods that have been adopted at the university level, the college level, the department level, and the program level. The paper also analyzes the effectiveness of the methods; compares advantages and disadvantages, and discusses plans that may be used in the future.

Keywords: Engineering Technology (ET), Electronics Engineering Technology (EET), Student enrollment and retention.

BACKGROUND

The EET program at the University of Southern Mississippi (USM) was previously a key part of one of the largest engineering technology programs in the country before it merged with Computer Science to form School of computing in 2005. The EET program at USM was originally established in 1968 as part of the original technology programs that Bobby Chain got approved. In the beginning EET was named electronics technology and was a 2+2 program. In 1980 it became a four-year program and was the first of all programs to receive ABET accreditation. The name was also changed to electronics engineering technology that year, per a requirement of TAC-ABET accreditation. Currently, the program is the only EET BS program in Mississippi. EET offers provides a curriculum in circuit analysis, electronics, microprocessor, instrumentation and control, signal processing, electric power, and applied electromagnetics. It integrates math through differential equations and engineering theory and extensive laboratory practice with a lab required for almost every course offered. In terms of unique diversity, the EET student body consists of some international students and over 50% (56.1% in 2005) of the undergraduates are African-American.

USM also has masters of engineering technology programs which were established in 1993 under a graduate degree with different emphasis areas to meet the needs of the undergraduate engineering technology programs. Due to

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reorganization in 2005, the degree became housed within the School of Construction, even though the Information Technology, Electronics Engineering Technology, and Computer Engineering Technology emphasis were taught in the School of Computing. Steps were taken late last year to remedy this problem and students within the School of Computing are currently being converted in the system from Construction. Currently, the ET MS degree is the only such degree in Mississippi. The ET MS with emphasis in Information Technology, Computer Engineering Technology, and Electronics Engineering Technology provides a specialized path for students with undergraduate degrees in many areas of engineering and engineering technology. In terms of diversity, the ET MS student body consists of many international students and underrepresented minorities.

The EET program offers opportunities for students to learn about the field of electronics, computers, electric power, instrumentation and controls, electromagnetics and antennas, signals processing, and other areas of engineering and technology. With access to an active research program, students are presented with a wealth of opportunity in terms of both undergraduate and graduate research and study.

ENROLLMENT TREND AND GRADUATION RATE

According to the Engineering Workforce Commission (EWC) data [1], engineering technology graduates with associate's degree steadily decreased from 51,579 to 31,557 between 1985 and 2002. The EWC data indicates that full-time undergraduate enrollment in engineering technology rose by 17% during 1996-2002, following a long-term steady decline of 31% during 1986-1996. Part-time enrollment in engineering technology has remained flat at 40K.

The EET program in USM that offers both Bachelor's and Master's degrees has shared this trend. From its peak of about 140 students two decades ago, the undergraduate enrollment decreased to about 80 in 2009. As an example, the variations of new-entering students, full-time enrollment, full-time equivalent, and graduates are plotted in Figure 1 for a five-year time period from 2005 to 2009. Analysis showed that the major causes for the declines in enrollment and retention are that, first, most engineering technology programs are facing image and visibility challenges; second, they are struggling with maintaining contemporary and relevant technology, equipment, and faculty; and third, the incoming students may have increasingly weakened academic skills. The ACT composite average score of incoming EET and computer engineering technology (CET) students are plotted in Figure 2 for duration from 2005 to 2009.

The graduation rate is relatively low. The reason is assumed to be that more and more students are seeking specific skills sets and have become less and less interested in degree attainment [2]. Individual technical courses in universities and colleges, certificate programs where students reach a standard of knowledge of a certain vocational subject and often do not have general educational requirements, are fast becoming the preference for technology trainees.

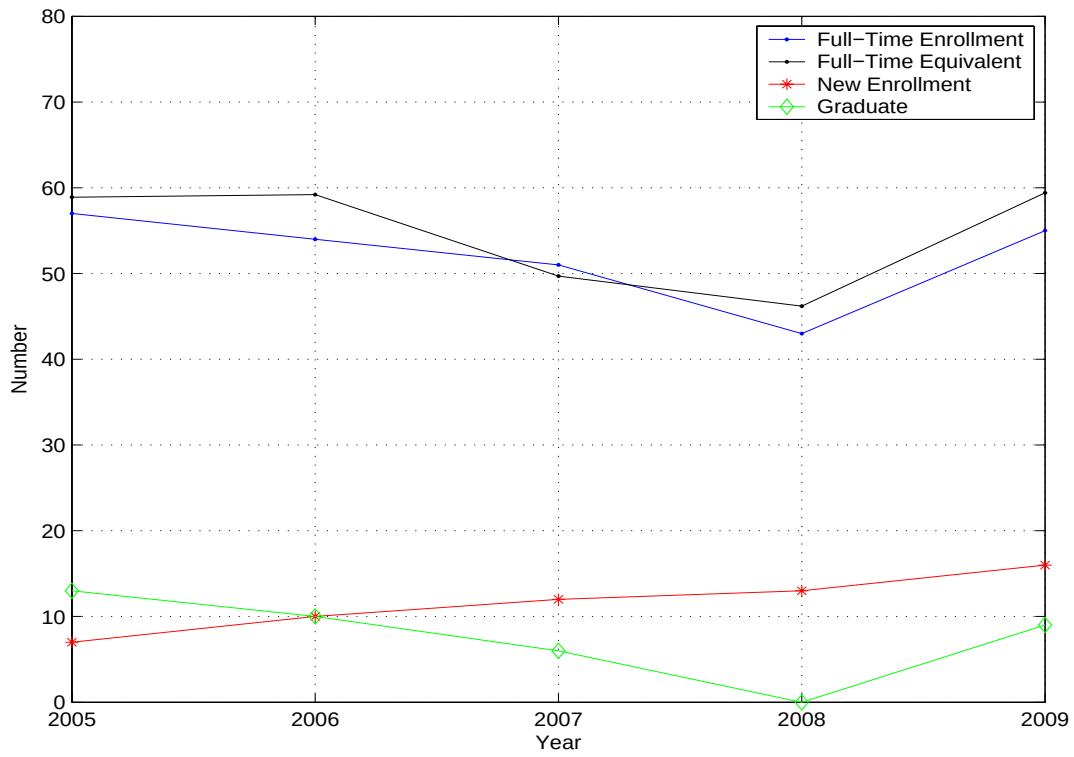


Figure 1: Enrollment and Graduate Trend within Recent Five Years

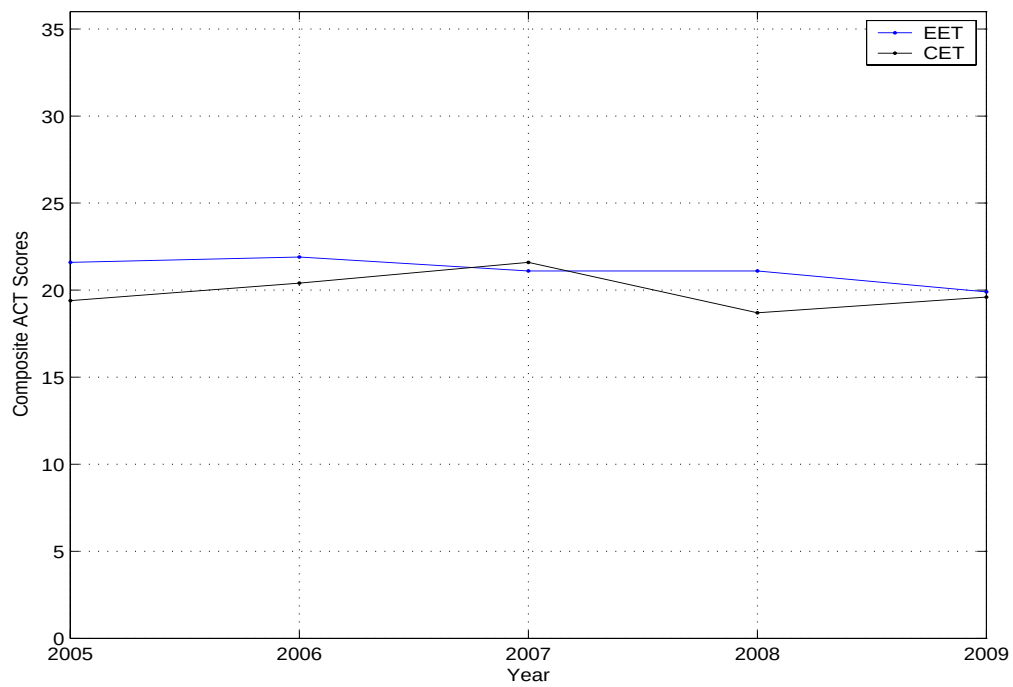


Figure 2: Composite ACT Scores for Incoming EET and CET Students within Recent Five Years

PRACTICE TO INCREASE ENROLLMENT AND RETENTION

Strategy Plans

Because of significant declines in the numbers of high school graduates in Mississippi and adjacent states, increased competition because of these declines; and an uncertain economy for the University, its students, and its prospective students, the University of Southern Mississippi has implemented Strategic Enrollment Plan (SEP) in the recently two years, with the consultation from outside resources. The SEP captured relevant environmental data, Southern Miss strengths, weaknesses, opportunities, and threats, and combined situation analysis with proven strategies and activities that have worked well in similar environments. After months of research and planning, five strategies were identified [3]:

- Immediate projects to increase fall 2009 retention rates for the current freshman class;
- Spring, summer, and fall projects to increase fall 2010 and beyond retention rates;
- Immediate projects to increase fall 2009 new student enrollment;
- Projects beginning in 2009-2010 to increase new student enrollments and market shares fall 2010 and beyond;
- Strategies that need further development in 2009.

Accompanying these strategy plans, actions plans have been implemented at three different levels.

Action Plans at the University Level

Some action plans need comprehensive coordination between colleges within the university; some need operational funds. These plans include

- Appoint an assistant provost to lead and coordinate all of the retention strategies and activities necessary to increase student success and retention rates;
- Provide training programs for faculty and advisors;
- Provide supplemental instruction for academically challenging courses.
- Enhanced telecounseling;
- SMART Approach for recruitment outreach;
- Transfer student advising software;
- Formalized predictive modeling to prioritize inquiries for personalization;
- Constituent relationship management system to support customization and personalization;
- Enrollment management revenue system to support strategic financial aid and scholarship policies.

Action Plans at the College Level

Some action plans need comprehensive coordination between departments within the college. These plans include

- Student Affairs will contact fall 2008 first-time freshmen who did not enroll spring 2009.
- Require students placed on probation to meet with the college.
- Early alert for GEC/ACC classes (not attending, not prepared, not academically prepared)
- Mid-term grades: Registrar will distribute non-reported mid-term grades
- Parent intervention: Letter to freshmen parents
- Analyze characteristics of fall 2008 freshmen who did not return spring 2009. Compare with last year, particularly out-of-state students.

Action Plans at the Department and Program Level

Some action plans need coordination between programs within the department, and sometimes, with other executive units, such as admissions, financial aid. These plans include

- Call all admitted students to build relationships, and capture important decision factors, concerns, latest academic and co-curricular interests, competing institutions, and level of interest in Southern Miss;
- Expert follow-up calls to address individual concerns and decision factors (usually admissions, financial aid, campus life issues, and academic opportunities).
- Customized written communications based on concerns and decision factors.
- Academic unit calling projects for those still deciding, and those “definitely enrolling.”

- Follow-up calls to those still deciding and definitely enrolling and who have not responded to reply requests from orientation, housing, etc.
- Conduct department level pre-advisement meetings with all fall 2008 freshmen. Follow up with a recruit back efforts for those who do not show up for pre-advisement.

Other Actions at EET Program Level

- The EET core curriculum has been modified frequently to satisfy the need from industry. The EET program has established an industry advisement committee (IAC) for seven years, with the purpose that the EET curriculum keeps in the trend to satisfy industry needs. Dozens of IAC members come from and represent industry, national labs. About twenty of the seventy members will come on campus each April to discuss with the EET faculty, meet students, tour the facilities, and evaluate student senior projects. IAC is a response to the booming research and economic activities of the “hub” city Hattiesburg. Several institutions and industrial companies that are located in Hattiesburg and nearby require a large engineering and technology workforce with higher education. Among the examples are NASA Stennis Space Center, Raytheon Inc., and Southern company. With the regular interactions with people in the industry, the EET faculty has an opportunity to be more progressive in responding to industry feedback.
- The EET has maintained a constantly updated website to improve the visibility of the program. Right after the merging into the School of Computing, the EET website was in a non-existent condition. Perspective students and parents, and even admissions staff did not even know the EET program. The website was established again with better looking and more helpful information. This explains well the 25% decrease in Figure 1 from 2005 to 2008 and contributed a part in the 25% increase of enrollment from 2008 to 2009.
- The EET faculty members strive to put students in internships, co-ops, or full-time employment positions. The EET program has maintained a list of potential employers, whom are frequently invited to visit the program.
- EET faculty members have constantly encouraged and sponsored undergraduate and graduate students to participate in academic conferences. The exposure to emerging technologies in the field of electronics engineering and technology is the most motivating and enriching experience for students.
- The EET faculty members are always active in sponsoring programs where middle school and high school students and undergraduate students come to campus and get exposed to and develop an interest in electronics engineering and technology. At various events such as science fairs, summer camps, open-house demonstrations, and preview interactions, faculty members explain daily electronic phenomena to various audiences. Some show-and-tell examples [4] are illustrated in Figure 3. Students who have experienced these devices showed more interest and appeared to be more aggressive about learning.
- The EET faculty members visit high school campuses and participate in career fairs to guide student career perception and clear misunderstandings of perspective students and parents about electronics engineering technology.

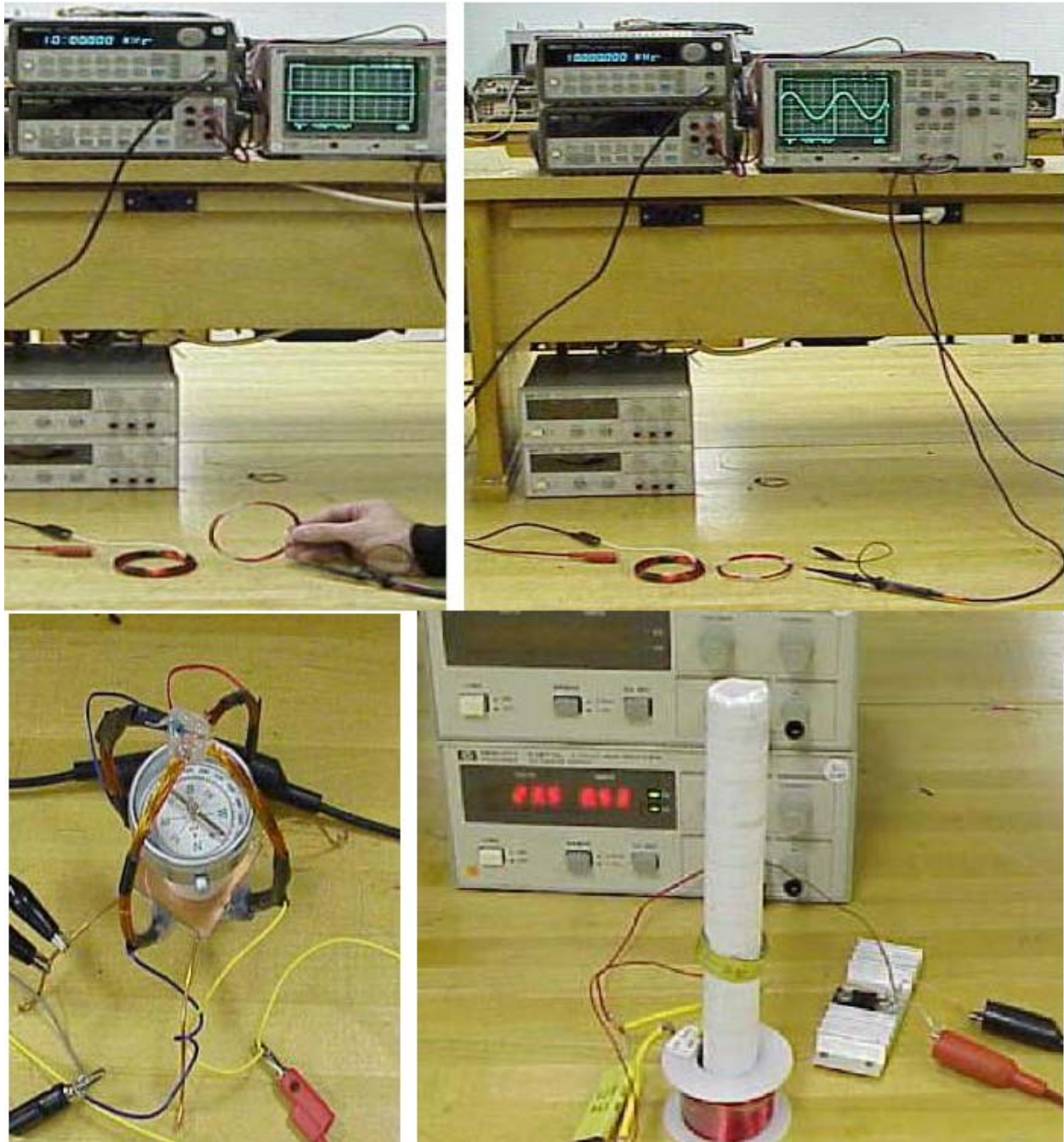


Figure 3: Examples of Show-and-Tell from EET Faculty [4]

DISCUSSIONS

The strategic plans discussed above are guidelines from the university level. A great many of resources are definitely needed. Any program like EET alone cannot afford a meaningful implementation. For example, when we discussed with perspective students and parents at preview events, or when we made follow-up calls to presently enrolled students, we found that financial aid is a major concern to many of them. Students tend to move to where

they can obtain financial assistantship. This will greatly affect the enrollment of economically disadvantaged students, first generation college students, and non-traditional students. From another point of view, the strategic and action plans at the university level may provide satisfactory returns on the overall enrollment and retention, it is doubtful that the effect to EET program will be significant. In this sense, departmental and program-level efforts are considered still the most significant factor.

As stated in [5], two key reasons enrollment in EET programs is decreasing are “students think of electronics as an outdated technology with limited employment opportunities” and “modernizing and revising old curricula is a slow and bureaucratic process”. Therefore, clearing the misperceptions of perspective students on the EET concept and constantly revising the core curriculum are two efficient strategies to improve enrollment and retention. Almost all of the efforts in improving enrollment and retention can be classified as one of the two. Examining carefully, we see that it is possible that if the second issue is solved, the first one may no longer be a problem. Constant revision of curriculum seems to be a burden to some educators, thus all EET programs do not act fast enough to make the revision to save themselves [6]. In fact, there is a correlation among curriculum revision and other methods to improve enrollment and retention:

- The purpose of establishing an IAC is to keep up the trend in the technical field, thus it makes sense to start revising the curriculum after IAC meetings.
- If one takes efforts in locating positions for students, one should easily sense the fast steps of the technology and in turn feel the urgency for curriculum revitalization.
- On the contrary, a contemporary core curriculum with courses on cutting-edge techniques guarantees an easy life when instructors put their students into a job, or when recruiters try to allure perspective students, or even webmasters struggle to make their pages tempting.

Based on aforementioned rationale, the EET program at USM are keeping revising its core curriculum. We have already modernized core components in analog and digital communications, modified contents in electric power, introduced a new circuit analysis course. A new course on renewable energy will be offered in spring, 2010.

SUMMARY

This paper briefly discussed the reasons for the decreasing enrollment and graduation rate in engineering technology programs, particularly, electronics engineering technology programs, then introduced in detail the University of Southern Mississippi’s strategic and action plans, at university level, at college level, and at department and program level, to improve student enrollment and retention. After some detailed activities are presented, the methods adopted at EET program are compared. It was concluded that maintaining a vital core curriculum is the most efficient way to improve enrollment and retention. While the USM hits record high in total enrollment in 2009, the EET program has moved out of the record low by a 25% enrollment increase and the enrollment of graduate students reaches record high of 14.

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