

## Audio Technology as a Gateway to Engineering

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### Abstract

The B.S. Audio Engineering Technology (AET) program at Ward College (University of Hartford) is attracting a great deal of interest by young people looking to enter the audio and music industry<sup>1</sup>. It has also turned into an excellent gateway for students to enter a variety of other engineering programs.

Many students initially attracted by the audio and music areas, become interested in the broader study of electronics as a discipline. Each semester, some students ask about pursuing an Electrical Engineering (EE) or Electronics Engineering Technology (EET) degree. This gateway led Professor Britt (one of the co-authors) to obtain separate four-year degrees in Electronics Engineering Technology and Electrical Engineering.

AET is a proven way to increase the number students that enroll and pursue careers in engineering and engineering technology. It has attracted the attention of the academic community looking to reverse enrollment declines. **A scan of ASEE member institutions shows that Ward College offers the only baccalaureate program in Audio Engineering Technology (AET).**

Our AET program has grown from five (5) students to seventy-five (75) in the eight-year life of the program. **Fall 2002 saw an increase of 17 % from the previous year.** These strong results more than offset declining enrollment in our B.S. Electronics Engineering Technology (EET) and B.S, Computer Engineering Technology (CET) programs. On a combined basis, fulltime enrollment is up 20% during the last three years.

### Introduction

The current academic climate for technology programs differs greatly from the 1980s. During that decade, interest in EET and CET was high. Computers and the Internet were not major factors, and their impact and influence on career choices of technically oriented students was minimal. Audio technology, as a component of the media industry, was also in its infancy.

In the 1990s, the Internet's media capabilities combined with advances in computers and software changed young people's attitudes towards electronics. Some pundits believe the rise of the PC has cast a shadow on the perception of electronics technology. It is no longer seen as the "cutting edge". Prospective students are able to gain skills and experience to a variety of

software using just PCs and the Internet well before entering college. As a result, many come to view Internet-related technologies as more interesting than electronics.

Prof. Louis Frenzel conducted an informal survey in December 2002.<sup>2</sup> Members of the ETD-L ListServ were asked several questions about EET enrollment trends. He received 49 responses; 25 from community colleges and 24 from 4-year technology schools. 77% of the respondents reported an EET enrollment decrease over the last ten years. The decrease averaged 50% with a range of 20% to 90%. Many respondents indicated that despite stepped up recruiting efforts, increased marketing and scholarships, little if any increase was observed.

### **Why is Audio Engineering Technology attractive?**

Audio Engineering Technology is an attractive career choice for young people partly because it has “sex appeal” as a career path. The music and film industry’s marketing strategy of choosing talent based on “sex appeal” contributes to this perception among young people.

Music itself is another reason audio appeals to students. Music continues to be a huge influence on the lives and leisure habits of young people. While this interest lessens in adulthood, decisions regarding college and major are made when music influence is highest.

Computers constitute the primary platform of media applications that young people use. The current video game boom is partly stimulated by the intense and realistic sounds experienced by players. Computers have also become the music device of choice for many young people to the extent that it is transforming the entire music industry.

The television broadcasting industry is exploding content and distribution via market segmentation. Hundreds of channels and programs now cater to specialized interests with everything from homebuilding to hip-hop. All of these media outlets use audio as part of the presentation. Coupled with the convergence of broadband Internet and entertainment, it is easy to see why the demand for audio technologists is on the rise.

### **What is Audio Engineering Technology?**

The audio industry is relatively new as are the majority of companies that make it up. Technology majors find a number of sectors where their skills are needed, and graduates with technology application skills are critical in an industry undergoing rapid growth and job specialization. A broad cross-section of the audio industry looks like this:

- Radio & television programming & broadcasting
- Live music events
- Music production and distribution
- Gaming and entertainment
- Streaming Internet audio content
- Audio content for multimedia integration
- Commercial audio systems design and services
- Audio equipment manufacturing

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Much of the work in the audio industry takes place in the field where hands on skills are required. The industry traditionally relies on graduates with EET and EE degrees to fuel its growth. However, by blending basic electronics with audio application expertise, an AET graduate is able to provide a more compelling skill match to employers.

**Where are the career opportunities?**

Our AET program concentrates on the technical support component of the industry including systems integration and electronics field support. Graduates are trained in the basics of music production and equipment. **The focus of the program is on system electronics and software to maximize career opportunities for our graduates.**

Ward College AET graduates now work in a variety of positions in the audio industry. Their positions range from audio electronic design and test engineers to stage monitor mixing engineers for touring. Some specific examples are:

<b>Position</b>	<b>Company</b>
Laboratory Design Engineer	Labtec Computer Audio
Audio Test Technologist and Article Author	Consumer Reports Magazine
Audio Systems Technologist	ESPN
Stage Monitor Mix Engineer	Webster Theatre
Concert System Engineer	New York Stage Parks and Recreation
Systems Support Technologist	Sony Music Studios , NYC
Systems Installation Technologist	North American Theatrx
Audio Engineering Technologist	Snow Sound Reinforcement
Audio for Video Engineer	Kaman Productions
Radio Technical Engineer	WCCC - Hartford
Graduate Student/Music Technology	New York University

These types of positions are not local to the East or West coast. They appear on job boards and advertisements nationwide. For example, a Systems Installation Technologist works in venues from the local school system to regional community theatres.

Contrary to popular belief, only a few positions involve direct contact with performing artists. Most positions are in companies that either design/manufacture or install audio equipment. Only 20% of our graduates have gone into music production positions, and most of these were in live sound operations or audio for video/television/radio.

**What is AET’s curriculum relationship to EET?**

AET is built on the Engineering Technology model and starts with algebra and algebra-based physics. This provides students with a less aggressive math and science challenge and gives them time to “ramp up.” AET is an applied study that relies heavily on the application and servicing of equipment so students spend equal time in the laboratory and lecture.

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AET is different from more established Recording Engineering programs where music production and composition are the focus. It is also distinct from a BSEE degree (with a concentration in Audio) and the BSME (with a concentration in Acoustics). These later programs fall into the traditional engineering category with a heavy emphasis math, science and theory<sup>3</sup>.

The audio field employs a number of electronic communication concepts for similar or other purposes. Table 1 below lists some of these concepts and how they are applied in the audio field. Coupled with a similar need for electronic fundamentals makes it possible to share a large portion of the curriculum with EET. Eighteen percent (18%) of the AET curriculum consists of required EET courses and another nine percent (9%) can be taken as technical electives.

<b>Concept</b>	<b>Audio Application</b>
Amplification	Voltage/power gain, phase reversal
Summing amplifiers	Mixers
A/D & D&A conversion	Digital conversion & formatting
Linear & nonlinear filtering	Equalizers, tone, control, effects generation
Modulation (AM/FM)	Tremelo, vibrato effects
Phase locked loops	Synthesizers
RF communications	Wireless microphones & instruments
Fiber optics	Point-to-point links
Digital signal processing	Acoustic space creation, delays, volume envelopes
Fourier spectral analysis	Instrument synthesis, time envelopes, additive and subtractive synthesis

Table 1. Engineering Concepts Applied to Audio Technology

The AET curriculum is particularly dependent on EET courses in the first two years. AET students take an eight-course track of fundamental electronics and simultaneously a five-course sequence in music and applied music production. At the end of this dual track, they are able to apply electronic fundamentals in the Studio/Sound System environment. Upper level courses focus on hardware and software to incorporate advanced concepts in audio applications.

Table 2 shows the breakdown of AET credit hours across all four years. In the first two years, AET and EET students share 70% of the same courses. This drops significantly in the last two years once basic Electronics, Math, Physics and English courses are out of the way. In the final two years, the percentage of courses shared drops to a maximum of 29% (if an AET student takes EET courses exclusively as their technical electives).

<b>AET Curriculum (credit hrs.)</b>	<b>Freshman</b>	<b>Sophomore</b>	<b>Junior</b>	<b>Senior</b>
Distinct to AET	12	6	22	25
Common with EET	17	26	11	8
Total Course Hours	29	32	33	33

Table 2. AET Credit Hours by Year

### **Enrollment growth trends**

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Since its inception in 1994, Ward's B.S. AET program has grown steadily. In eight (8) years, fulltime enrollment has gone from five (5) to seventy-seven (75). While our fulltime EET/CET enrollment mirrored nationwide trends and experienced a decline, the total number of fulltime students has increased. Table 3 below shows fulltime enrollment in the Fall and Spring semesters from 1999 to 2002 for AET and EET/CET.

<b><i>Program</i></b>	<b><i>Fall 1999</i></b>	<b><i>Fall 2000</i></b>	<b><i>Fall 2001</i></b>	<b><i>Fall 2002</i></b>
AET	40	37	51	75
EET/CET	61	63	55	50
Total	101	100	106	125

<b><i>Program</i></b>	<b><i>Spring 1999</i></b>	<b><i>Spring 2000</i></b>	<b><i>Spring 2001</i></b>	<b><i>Spring 2002</i></b>
AET	35	29	40	49
EET/CET	47	53	46	43
Total	82	82	86	92

Table 3. Fulltime AET Enrollment from 1999 to 2002

The number of AET graduates has increased in response to enrollment growth. Table 4 shows the number of AET graduates over the last four years. Retention levels in AET have tracked closely with other technology programs (i.e. electronics, computer and mechanical).

<b><i>Academic Year</i></b>	<b><i>1998-1999</i></b>	<b><i>1999-2000</i></b>	<b><i>2000-2001</i></b>	<b><i>2001-2002</i></b>
AET Graduates	0	5	7	4

Table 4. AET Graduates from 1998-99 to 2001-02

### **Cross-program benefits**

There are several ways Ward College benefits from having both AET and EET programs. First, EET faculty deliver 50% of the teaching load in the first two years of the AET program. This has helped offset the effect of enrollment loss in EET.

AET and EET students are co-mingled when they take EET courses. This raises lecture and lab enrollment for EET faculty and strengthens the viability of EET as a discipline. The college enjoys more efficient use of its lab and lecture facilities. Third, as the AET department grows, it leverages the resources from other departments, especially EET. This keeps the cost of faculty and facilities low in the early years of the AET program.

Once AET students become sophomores, they discover additional academic and career options previously unknown to them. Some switch to EET or Electrical Engineering, and there is some transfer into AET mostly from EET. Following graduation, some AET students return to school to pursue degree in other departments and disciplines.

### **Conclusions**

We believe the majority of AET students enrolled at Ward College would not have selected EET or Electrical Engineering had AET not been available. We view our AET enrollment as

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incremental to the overall college and to date, AET hasn't caused large defections of EET students.

Ward College has benefited greatly by offering both programs. Overall, technology enrollment is up, contrary to the national trend. Curriculum overlap between AET and EET has improved faculty utilization and strengthened the college's financial footing as a whole. AET has proven to be a gateway for many students to enter other engineering and technology programs that would otherwise not have entered the profession.

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### **Biographies**

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