The Changing Face of Education

Students and Classrooms Evolve to Meet the Needs of the Field

Darcy Lewis

It is no secret that the biomedical world is changing quickly, from improvements in devices and equipment to the international standards that govern them. Where can a new generation of medical technology professionals be trained? And what can you do to stay up to speed with industry changes?

AAMI recently surveyed educators ranging from traditional classroom-based programs to graduate schools, continuing education, and certification. A sampling of responses is presented here, along with profiles the students—traditional and non-traditional—from some of these programs. Regardless of your position or your current level of education, training never ends. “Expect to be a lifetime learner and continually update your technical skills, knowledge, and education,” advises Roger Bowles, the department chair and professor of biomedical equipment technology at Texas State Technical College in Waco, TX.

Program Overview

Those who are just getting started in the field often decide on a two-year associate’s degree program. Because these programs tend to be very hands-on, expect the training to be classroom-based. Community colleges and technical schools throughout the country offer an Associate of Science (AS) or Associate of Applied Science (AAS) degree in biomedical equipment technology; some have distance-learning components as well.

A Bachelor of Science (BS) degree is an option for those looking to go beyond the two-year program. These programs may also include combinations of classroom and distance learning. One such program is available through DeVry University in Phoenix, AZ (and other cities); another is offered through Indiana University Purdue University Indianapolis in Indiana (IUPUI). Air Force Staff Sergeant
Martin Castillo realized IUPUI’s program fit well with the military lifestyle: “If you’ve got a family or work a very demanding job, it’s going to be hard to get to class,” he says. “Distance education might be the way to go because you can do the work in the evenings and on weekends.”

Continuing education and certification are still important once you’re on the job. “It’s easy to get trapped into the routine of just doing the job and getting through the day,” says Glenn Scales, patient safety specialist at Duke University Health System in Durham, NC. “The profession also needs people who are willing to learn more than just the device they’re repairing that day.”

Medical technology professionals should be prepared to convince management that additional training is worthwhile. “Some people feel like their manager is going to approach them and offer training, but it doesn’t really work like that,” says Tim O’Neill, CRES, from Our Lady of Lourdes Hospital in Binghamton, NY. “Training dollars are limited and the manager wants to see the best return on investment. Show your manager in writing what that training will do for the organization. You need to sell your manager on it, not the other way around.”

---

**Editor’s Note:** What follows is a sampling of educational programs. This is not a comprehensive list, nor does AAMI endorse any particular program.

**Indiana University Purdue University Indianapolis**
799 W. Michigan St.
Indianapolis, IN 46202

**Program highlights:** Offers AS and BS degrees. BS degree can be earned at a distance. Also offers substantial transfer credit for Department of Defense (DoD) or certified biomedical equipment technician (CBET) training. Students earn a Purdue University degree.

**Target Audience:** High school graduates, CBET or DoD trained, AS holders.

**Frequency:** Semester calendar.

**Length of Program:** AS requires two years of full-time study, BS requires four years of full-time study or transfer credit.

**Cost:** Tuition is set by the state of Indiana and is available at www.iupui.edu.

**Certifications/degrees:** AS, BS.

**Contact Information**
Barbara Christe
bchrist2@iupui.edu
317-274-7591
www.iupui.edu

Texas State Technical College
Biomedical Equipment Technology Program
3801 Campus Dr.
Waco, TX 76705

**Program highlights:** AAS programs in biomedical equipment technology and medical imaging systems. Customized training upon request. All faculty members are former biomedical equipment technicians or medical imaging specialists with an average of 15 years of experience in the field. The program has well-equipped laboratories and onsite magnetic resonance imaging (MRI) and computed tomography (CT) equipment.

**Target Audience:** People wanting to enter the field of biomedical equipment technology.

**Frequency:** Semester starts in January, May, and August.

**Length of Program:** About two years.

**Cost:** Approximately $10,000 total program cost (tuition, fees, books, and tools) for an in-state student. $182 per semester credit hour for non-Texas residents.

**Certifications/degrees:** AAS.

**2006 enrollment:** 80 new students; approximately 155 students total.

**Contact Information**
Roger A. Bowles, EdD, CBET
Roger.Bowles@tstc.edu
254-867-2669
http://waco.tstc.edu/bet
Caldwell Community College and Technical Institute
Biomedical Equipment Technology Program
2855 Hickory Blvd.
Hudson, NC 28638

Program highlights: Course covers basic and advanced electronics, digital electronics, and medical instrumentation classes. Beginning in fall 2008, new courses in networking, wireless networking, and wireless security issues will be offered.
Target Audience: Anyone interested in a career in the healthcare industry.
Frequency: Every year.
Length of Program: 18 months.
Cost: Approximately $4,500.
Certifications/degrees: AAS (accredited by the Southern Association of Colleges and Schools).
2006 enrollment: 20

Contact Information
John Noblitt, BS, CBET
jnoblitt@cccti.edu
828-726-2263
www.cccti.edu

Dakota County Technical College
Biomedical Equipment Technology Program
1300 145th Street E.
Rosemount, MN 55068

Program highlights: This program seeks to develop the student into a technician who is a self-learner and troubleshooter. An emphasis is

Gaining Specialty Pays off for Biomed

For Tim O’Neill, education has been the key to achieving a change in career focus. For 20 years, he had worked in biomedical engineering at Our Lady of Lourdes Hospital in Binghamton, NY, but was eager to make the switch to radiology when the opportunity arose four years ago. “The biomedical side has an overwhelming number of pieces but their complexity isn’t that great. Radiology has fewer devices, but their complexity is amazing,” he says. “It seemed like a good progression in the field and I needed a new challenge.”

O’Neill knew he would need more education—and lots of it—to successfully make the transition. He completed x-ray basic training at DITEC in Solon, OH, and received additional training from equipment manufacturers and in-house training expert TriMedx, which shares the same parent organization, Ascension Health Co., as Our Lady of Lourdes.

How is the transition to radiology going? “There’s a steep learning curve. It takes two or more years until you start to feel calm and comfortable on a call,” O’Neill says.

In 2006, O’Neill earned the certified radiology equipment specialist (CRES) credential with the highest score in the country on the certification test for that year. “I got a call from AAMI and they mentioned it as if I knew I had done so well, but I had no idea,” he says, a little bemused by the ensuing attention. “I’m not better than the other guy, I’m better than I was. It’s the process of studying and training makes you better than you were.”

Still, O’Neill is proud of his accomplishment, even though his employer does not officially reward certification. “It’s really a personal thing because I knew going in that I wouldn’t see an immediate financial benefit to being certified,” he says. “Certification is the only objective method of proof in our field that you know what you’re doing. I did it for me.”
placed on research skills, teamwork, electronics, mechanics (hydraulics-pneumatics-motors), biomedical testing equipment, and networking. In addition it covers rules, regulations, record keeping, Joint Commission, National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA), Health Insurance Portability and Accountability Act (HIPAA), and work ethics in a healthcare environment. The program concludes with the student taking part in an internship at a local hospital. With the addition of the complete networking courses, students are eligible to take the CCNA (Cisco Certified Network Administrator) exam.

**Target Audience:** High school graduates; adults in career transition.  
**Frequency:** Fall start.  
**Length of Program:** Two years.

### DeVry University

**Biomedical Engineering Technology Program**  
2149 West Dunlap Ave.  
Phoenix, AZ 85021-2995

**Program highlights:** This program offers an accredited BS in biomedical engineering technology. It covers a comprehensive spectrum of medical, clinical lab, and biomedical imaging device theory, design, and function. It also encompasses a strong emphasis on electronics, telemedicine, anatomy, and physiology. The program incorporates a lot of hands-on training, which culminates in a senior design project and an internship with prospective employers. The percentage of graduates obtaining gainful employment in their chosen career is excellent.

**Target Audience:** Those wishing to become a BMET. Undergraduate students of all ages.  
**Frequency:** Continuous enrollment.

---

**Lifelong Learning: Certification Solidifies Career**

When Glenn Scales got his CBET certification in 1972, he didn’t have much say in the matter. “Essentially, it was thrust upon me,” he says. “I was in the Air Force and was selected to become an instructor at the Air Force’s School of Health Care Sciences, where you took the certification exam ASAP.”

Now, fast-forward all these years. Scales has continuously maintained his certification since 1972 and believes that it has helped him attain his current role, patient safety specialist at Duke University Health System in Durham, NC. “I serve on eight hospital-wide committees where my mission is to understand how technology is used by clinical practitioners and how it has the potential to be misused,” he says. “You could say I’m an expert on how people make mistakes.”

For example, when a medication error occurs, Scales works with both pharmacy and nursing staff to isolate exactly how the error occurred and, more importantly, how similar errors can be prevented in the future. “I think medical technology professionals can have a huge impact on patient safety,” he says. “Much of what I do really does make people safer. Technology is no longer an afterthought.”

Scales believes that his emphasis on continual learning has directly shaped his career. “Early on, I worked for a man who strongly impressed on me that my job included knowing the equipment, how it was designed, how it’s used, and the disease state it is involved with,” he says. “You need to be out there in the clinicians’ world, speaking their language. Otherwise, you’re just an interloper with a shop in the basement.”

For Scales, certification is the foundation of a solid career. “Many people see it as the ultimate goal, but it should be just the first step toward achieving a higher level,” he says. “For me, if I stopped learning, I would lose my ability to make an impact where I want to be, which is keeping patients safe.”
Length of Program: Three years.
Certifications/degrees: BS in biomedical engineering technology.
2006 enrollment: 9 for Arizona campus.

Contact Information
Ron Tinckham
ron.tinckham@sfcc.edu
352-395-5965
www.sfcc.edu

Santa Fe Community College
Biomedical Engineering Technology Program
3000 NW 83rd St.
Gainesville, FL 32606

Program highlights: AS and AAS in biomedical engineering technology. Two-year program with electronics courses, biomedical instrumentation courses, and a 300-contact-hour internship.
Target audience: High school students and non-traditional students (retraining adults).
Frequency: Program starts each fall.
Length of Program: Two years.
Cost: 61 hours @ $71.60/credit hour plus books and lab fees.
Certifications/degrees: AS, AAS.
2006 enrollment: 15.

Program highlights: The Healthcare Technologies Management Program is jointly offered by the Marquette University and the Medical College of Wisconsin. This graduate program leads to a masters in healthcare technologies management. It combines business, technology, and healthcare to prepare engineers and other technical personnel for advancement into management positions within clinical, industrial, and consulting environments.

Seeing it From Both Sides: The Teacher as Student
As a consultant and quality regulatory professional for medical devices for 25 years, Jack Ward has long seen the value of education as a way to keep current in industry trends. What’s more, he’s seen it from both sides of the desk: as a teacher and now, again, as a student.

After taking a number of AAMI courses over the years, Ward went through the qualification process to become an AAMI instructor about a year ago. “AAMI has been very good at developing specific courses to meet the marketplace’s needs,” he says. “Our field is evolving rapidly with both technology and the regulations. Even if the language of the regulations doesn’t change, the way they are interpreted by FDA evolves over time.”

Ward cites risk management as an example of this regulatory trend. “Recently there has been an upgraded international standard. Everyone needs to come up to speed on this new standard,” he says. “Another area involves the International Organization for Standardization standards for medical devices, where the interpretation continues to evolve due to globalization.”

Currently, Ward is taking additional AAMI courses as preparation for teaching them. “AAMI requires you to be a student in that course first, and I think that’s a beneficial approach,” he says. “That way, you’ll learn firsthand what kind of questions to ask your students and how to keep on pace to cover all the material.” He believes that AAMI’s approach condenses and standardizes the learning curve for both instructors and students.

Ward urges everyone in the field to continue pursuing educational opportunities. “Pace yourself and consider what types of training will bring the most benefit to you and your employer, based on the delivery method and the content,” he says. “This is true for people in their 20s, people in their 50s, and everyone in between.”
Minister Turned Imaging Specialist Preaches Educational Value

Don Gladden, a radiology imaging systems specialist at Barnes Jewish Hospital in St. Louis, MO, is not afraid to change careers. “I have a bachelor’s degree in electrical engineering and worked for 10 years as a design engineer. Then I was a minister for 19 years,” he says. “When I wanted a change again, I looked for fields where I could use my electronics and people skills and benefit the larger good.”

Job stability was important, too. “In the computer field, so many jobs can be outsourced, and that made me nervous,” Gladden says. “When you’re servicing radiology equipment, you have to be physically onsite, which was a big plus. This field uses all my skills and directly benefits people.”

Once he made the decision to become a biomedical equipment technician, Gladden knew education would be key—and that he would have to pay for it himself, since no employer was yet in the picture. “I initially considered attending a two-year program, but realized my engineering background gave me an advantage and that it would be feasible to have a brand-new career in just a couple months,” he says.

Instead, Gladden completed three two-week courses at DITEC during in 2007 before relocating from Oregon to Missouri. “I had my Barnes interview on August 1 and started there on August 28,” he says. “I started getting interest from employers even before I finished the third course, but I decided to hang on for just the right fit with an employer.”

So far, his training and new job have exceeded expectations. “My engineering background really helped and my training gave me an excellent foundation and the hospital has already sent me to two training courses,” he says. “The training I paid for was to get my foot in the door, and I could not be more pleased with the results.”

Instructors are CBETs employed in local hospitals and bring a real-world sense to lectures and labs.

Target Audience: Anyone interested in gaining employment as a BMET.
Frequency: Students can begin each quarter.
Length of Program: Six to seven quarters (approximately two years).
Cost: In-state tuition plus books and fees, approximately $1,500 per quarter.
Certifications/degrees: AAS.
2006 enrollment: 15 first year and 15 second year students, 30 total.

Contact Information
Lynda Wilkinson
lwilkins@sccd.ctc.edu
206-528-4588
www.sccd.ctc.edu
Southeast Technical Institute
Biomedical Equipment Technology Program
2320 N. Career Ave.
Sioux Falls SD 57107

Program highlights: Biomedical equipment technology is a continuation of an electronics degree and provides training in general biomedical equipment, clinical laboratory, x-ray, and ultrasonic equipment.

Target audience: Students interested in biomedical equipment maintenance.

Frequency: Fall start.

Length of Program: Two semesters.

Cost: $8,440.

Certifications/degrees: AAS.

2006 enrollment: 18.

Contact Information
Paul Syverson
paul.syverson@southeasttech.com
605-367-5512
www.southeasttech.com

Cincinnati State Technical and Community College
Biomedical Equipment and Information Systems Technology
3520 Central Pky.
Cincinnati, OH 45223

Program highlights: The Biomedical Equipment and Information Systems Technology graduate will make use of a technical degree that is both broad-based and highly specialized. This graduate is welcome wherever electronic equipment is designed, tested, installed, and operated because of the strong basic coursework in electronics. Biomedical studies open doors to hospitals where the graduate assumes the challenging task of maintaining multi-million dollar equipment such as machines used for MRI and CT scans, sonogram, and x-ray equipment. The graduate will also have a strong background in information systems and electronics. Graduates will be prepared to troubleshoot and repair equipment and instrumentation; calibrate instrumentation; work on computer networks; work in technical sales; use measuring and software tools to test/maintain equipment; become certified technicians and advance to senior level positions; and design and repair computers.

Target audience: High school graduates, career changers, and people who wish to upgrade their skills.

Frequency: Quarter.

Length of Program: Two years including one full year of full-time paid cooperative education. Alternating terms of school and work.

Cost: Ohio resident $80.20/credit hour; non-resident $160.40/credit hour (total program is 120 credit hours).

Certifications/degrees: AAS.

Contact information
Steven J. Yelton, PE
steven.yelton@cincinnatistate.edu
513-569-1768
www.cincinnatistate.edu

Sonora Service Training Institute
1751 S. Fordham St., Ste. 100
Longmont, CO 80503

Program highlights: Sonora holds general ultrasound service training and MRI classes. In addition to...
general training, Sonora offers system-specific training classes on GE, Toshiba, and Philips for MRI, and Philips (Agilent/HP) Sonos 4500/5500/7500 and ATL HDI 3000/5000; Siemens Aspen, Sequoia, and Acuson 128XP-10; and GE Vivid 5 and 7, Voluson, and Logiq 7 and 9, and the Philips iU22 and iE33 ultrasound machines. Sonora has recently partnered with Front Range Community College and the Colorado Community College System to offer accreditation for ultrasound service training courses.

**Target Audience:** Biomedical and clinical engineering professionals.

**Frequency:** Monthly.

**Length of Program:** Three to five days.

**Cost:** $2,500–$2,900.

**2006 enrollment:** 60.

**Contact Information**
Eddie Henry
training@4sonora.com
888-476-6672
www.4sonora.com

---

**Online Training Proves Key for BMET in Iraq**

Martin Castillo may be only 26, but he’s faced more professional challenges as a BMET for the Air Force than many of his more experienced peers. “I’m happy to be stationed at the Air Force Academy in Colorado Springs, CO, now, but I’m just back from 130 days in Iraq,” says the Southern California native. “I worked 12 to 16 hour days all through my last deployment.”

While in Iraq, Castillo worked on a variety of equipment, from ventilators to centrifuges, x-rays to anesthesia machines. “Being part of the military, we can’t really specialize like civilians do,” he says. “We have to be able to do it all, sometimes under difficult conditions.”

Castillo, who has been a BMET for four years and plans to make the Air Force his career, is looking ahead by enrolling in the bachelor’s degree program at Indiana University Purdue University Indianapolis (IUPUI). For him, distance learning was a crucial factor: “With the war, we’re looking at more deployments,” he says. “Even when we don’t deploy, people in the shop do, so we’re all taking on more responsibilities and longer hours.”

Castillo already has an associate’s degree from the Community College of the Air Force. IUPUI’s program requires him to complete some classroom-based courses; they just don’t have to be in IUPUI’s classrooms. “Classes like calculus I can take at the local community college and transfer the credit to IUPUI,” says Castillo. “Then the main courses will be done online. I can even do the coursework when I’m deployed, which is important to me.”

In fact, Castillo started his program during his recent Iraq deployment. “We did have some downtime, so I logged in to view course content,” he says. “Having this outlet was very welcome to me, especially after [working in] the traumas, and it allowed my mind to go somewhere else.”

Castillo believes completing the IUPUI program will allow him to achieve his career goals. “Getting a bachelor’s degree is a promise I made to myself in high school, and later in my career, I know having the degree will help me stand out,” he says. “But for now, being in Iraq made me really appreciate the value of the work we do. Every trauma there was, I was next to the trauma bed, helping the doctors every way I could. It made me realize how much we can help patients.”

---

**Penn State University**

Penn State New Kensington Biomedical Engineering Technology Program
3550 7th Street Road, RT 780
New Kensington, PA 15068

**Program highlights:** Penn State University offers an AS in biomedical engineering technology that is general education core with a 71-credit curriculum. The program includes courses in electricity and electronics, physiology, chemistry, mathematics, information sciences, computer networking, physiological transducers, biomedical equipment, and medical equipment troubleshooting. Within this curriculum, students learn operation, inspection procedures, preventive maintenance, and troubleshooting of most of the standard types of medical instrumentation. The curriculum culminates in a 400-hour (40 hours/week for 10 weeks) clinical internship at one of more than 50 approved healthcare facilities throughout Pennsylvania, Ohio, West Virginia, Maryland, and
many other states. This curriculum not only prepares students for entry into the biomedical field, but also gives them the education necessary to sit for the CBET exam or pursue a BS in engineering technology.

**Target Audience:** High school graduates and returning adult students.

**Frequency:** Fall semester to begin the program in sequence.

**Length of Program:** Five semesters or 2.5 years.

**Cost:** Current Penn State tuition rates.

**Certifications/degrees:** AS in biomedical engineering technology.

**2006 enrollment:** 11 second year and 15 first year students.

**Contact Information**
Myron Hartman
mdh15@psu.edu
724-334-6712
www.psu.edu

---

**DITEC**
6864 Cochran Rd.
Solon, OH 44139

**Program highlights:** Medical equipment service and management training in fundamentals and advanced specific products for biomedical and imaging.

**Target Audience:** Biomedical service professionals.

**Frequency:** Throughout the year.

**Length of Program:** Varies by course.

**Cost:** Varies by course.

**Certifications/degrees:** Applied engineering diploma, diagnostic radiology systems specialist.

**2006 enrollment:** 700.

---

**Schoolcraft College**
Biomedical Engineering Technologist Program
18600 Haggerty Rd., AS-587
Livonia, MI 48152

**Program highlights:** The biomedical engineering technologist program is designed to develop technicians able to maintain and service medical electronic equipment in hospitals, and industries engaged in the manufacture and sale of medical electronic equipment. As part of the BMET program, students are required to complete two 15-week internships. After successfully completing the first two semesters, students are qualified to take the first internship course.

**Target Audience:** Someone who has outstanding electronic, mechanical, and verbal skills; wants to work in the healthcare field; and is looking for a challenge.

**Frequency:** Fall, winter, and spring/summer semesters.

**Length of program:** 2.5 years.

**Cost:** $70.00 per credit hour to $154 per credit hour.

**Certifications/degrees:** AAS.

**2006 enrollment:** 200.

**Contact Information**
Chris Peters, CBET
cpeters@schoolcraft.edu
734-462-4400 ext. 5162
www.schoolcraft.edu

---

**Milwaukee Area Technical College**
Biomedical Electronics Technology Program
700 West State St.
Milwaukee, WI 53089

**Program highlights:** Theory, operation, hands-on laboratory applications of medical instrumentation and medical imaging, with two semesters of internship at local hospitals. Instructor has worked in the biomedical field in both general biomed and imaging for 20 years. Internship program gets students on-the-job training.

**Target Audience:** High school graduates; unemployed and under-employed men and women.

**Frequency:** The program is a continuous process.

**Length of Program:** 70 credits.

**Cost:** Wisconsin residents pay about $110 per credit plus books.

**Certifications/degrees:** Advanced biomed elective prepares student for CBET exam.

**2006 enrollment:** 24.

**Contact Information**
Edward Stanclik, PE, CBET
stanclie@matc.edu
414-297-6749
www.matc.edu

---

Biomedical Instrumentation & Technology
University of Vermont
Online Medical Technology Courses (English and Spanish)
280 East Ave. ST2
Burlington, VT 05401

Program highlights: Online training in medical equipment technology—principles, application, safety, common problems/solutions, maintenance, and technology management. Advanced course includes healthcare technology management and clinical engineering principles. Collaborator universities in Colombia and Peru are offering the same courses in Spanish in 2008. Course development is supported by grant from the Pan American Health and Education Foundation through a fund created through the people of Taiwan. The program includes one- and two-week hands-on onsite courses in development; certificate program being pursued; clinical engineering internship programs in place for 30+ years serving U.S. and international students.

Target Audience: Technical staff in hospitals, BMETs, nurses, healthcare administrators.

Frequency: Summer session runs May 19–August 5, 2008.

Length of Program: Two six-week courses online.

Cost: $1,045 per course in-state; $2,637 per course out of state (subject to change).

Certifications/degrees: 3 university credits for each course; 6 credits total.

2006 enrollment: 16.

Contact Information
Tobey Clark
tobey.clark@uvm.edu
802 656-0069
www.uvm.edu

Tulsa Community College
Electronics-Biomedical Technology Program
3727 E. Apache
Tulsa, OK 74115

Program highlights: Electronics with focus in biomedical electronics and nanotechnology. The program offers both day and night classes.

Target Audience: Anyone.

Frequency: Every semester.

Length of Program: Two years.

Cost: $1,500 per semester.

Certifications/degrees: AASET.

2006 enrollment: 10.

Contact Information
Tom Henderson
thenders@tulsacc.edu
918-595-7000
www.tulsacc.edu

Megadyne Medical
Basics of Electrosurgery and Preventing Surgical Fires Courses
11506 S. State St.
Draper, UT 84020

Program highlights: Basics of Electrosurgery covers electrosurgical safety, including the history of electrosurgery from ground referenced generators to the latest in patient safety technology. Preventing Surgical Fires covers fire safety practices and prevention. Both courses incorporate the Association of periOperative Registered Nurses’ (AORN) recommended practices.

Target Audience: Surgical team members.

Frequency: As needed.

Length of Program: One hour.

Cost: No charge to Megadyne customers.

Certifications/degrees: One CEU.

2006 enrollment: 1,200+.

Contact Information
Customer Service
mfischer@megadyne.com
800-747-6110
www.megadyne.com

Add Your Program!

This directory of education programs is available online at www.aami.org/BIT.

To add information about a program not listed here, please e-mail a program description to sgillespie@aami.org. Photos of your students in action are always welcome, too!