

BIOMEDICAL ENGINEERING TECHNOLOGY, A.ENG.T.

Begin Campus: Wilkes-Barre, Altoona, Berks, DuBois, Erie, Fayette, New Kensington, York

End Campus: New Kensington

Program Description

The medical community has grown to depend on medical devices and systems to diagnose, treat and monitor patients in health care. These medical devices have become very complex systems, as they are becoming microprocessor controlled, PC based, and networked to share information. Biomedical Equipment Technicians (BETs) are specialized individuals who are educated and trained on the methods of: physiological measurement; equipment application and operation; safety, performance and preventive maintenance testing; calibration; problem solving; and troubleshooting. In addition, BETs may be involved in equipment and technology management programs, selection and installation of medical equipment, manufacturer and FDA recalls of medical devices, quality improvement programs, and training programs for hospital personnel in the safe and proper use of medical equipment. The classroom and laboratory portions of this major focus on electronically and PC based medical devices for patient monitoring and life-support equipment. The student is exposed to a much broader spectrum of medical equipment through a 400-hour (ten-week) practical internship in an approved health care facility.

Students completing the 2BET degree need only complete several additional courses to obtain the Associate in Engineering Technology degree in Electrical Engineering Technology. Graduates of the program may qualify for admission to the baccalaureate degree major in Electrical Engineering Technology offered at Penn State Harrisburg, Electrical and Computer Engineering Technology offered at Penn State Erie, and Electro-Mechanical Engineering Technology offered at Penn State Altoona, Berks, New Kensington and York.

What is Biomedical Engineering Technology?

Technicians in the biomedical engineering technology field are highly skilled, trained professionals who are responsible for functional and safety inspections, preventive maintenance, calibration, troubleshooting, equipment repair, and the training of hospital personnel in the safe and proper use of medical equipment.

You Might Like This Program If...

- You are interested in the healthcare industry.
- You are passionate about technology and electronics.
- You enjoy working both in a team and individually.
- You know you want to work in a setting in which you operate, install, test, maintain and inspect mechanical and electronic equipment.

Entrance to Major

Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

Degree Requirements

For the Associate in Engineering Technology degree in Biomedical Engineering Technology, a minimum of 71 credits is required:

| Requirement | Credits |
|----------------------------|---------|
| General Education | 21 |
| Requirements for the Major | 62-65 |

12 of the 21 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

| Code | Title | Credits |
|---|--|---------|
| Prescribed Courses | | |
| BE_T 101 | Introduction to Medical Equipment Maintenance | 1 |
| CMPET 117 | Digital Electronics | 3 |
| CMPET 120 | Digital Electronics Laboratory | 1 |
| EET 105 | Electrical Systems | 3 |
| IST 220 | Networking and Telecommunications | 3 |
| PHYS 150 | Technical Physics I | 3 |
| RADSC 230 | Radiographic Physics | 3 |
| <i>Prescribed Courses: Require a grade of C or better</i> | | |
| BE_T 201 | Medical Equipment & Systems I | 5 |
| BE_T 203 | Biomedical Equipment Laboratory (Internship) (must be the last course taken for the degree) ¹ | 4 |
| BE_T 204W | Medical Equipment and Systems II | 5 |
| BE_T 205 | Medical Electronics | 4 |
| BE_T 206 | Medical Computers and Networks | 4 |
| CAS 100 | Effective Speech | 3 |
| ENGL 15 | Rhetoric and Composition | 3 |
| SRA 111 | Introduction to Security and Risk Analysis | 3 |
| Additional Courses | | |
| CHEM 110 | Chemical Principles I | 3 |
| | or CHEM 130 Introduction to General, Organic, and Biochemistry | |
| Select Sequence A or Sequence B: | | 6-8 |
| <i>Sequence A:</i> | | |
| BIOL 161 | Human Anatomy and Physiology I - Lecture | |
| BIOL 162 | Human Anatomy and Physiology I - Laboratory | |
| BIOL 162 | Human Anatomy and Physiology I - Laboratory | |
| BIOL 163 | Human Anatomy and Physiology II - Lecture | |
| BIOL 164 | Human Anatomy and Physiology II - Laboratory | |
| <i>Sequence B:</i> | | |
| BISC 4 | Human Body: Form and Function | |
| Select 3 credits of technical list: | | |
| BE_T 210 | Troubleshooting Medical Equipment | |
| BE_T 296 | Independent Studies | |
| BE_T 297 | Special Topics | |
| BIOL 129 | Mammalian Anatomy | |

| | | |
|---|--|-----|
| CMPET 211 | Embedded Processors and DSP | |
| CMPSC 101 | Introduction to Programming | |
| EDSGN 100 | Cornerstone Engineering Design | |
| EET 213W | Fundamentals of Electrical Machines Using Writing Skills | |
| EET 297 | Special Topics | |
| EGT 201 | Advanced Computer Aided Drafting | |
| MET 111 | Mechanics for Technology: Statics | |
| <i>Additional Courses: Require a grade of C or better</i> | | |
| MATH 22 & MATH 26 or MATH 40 | College Algebra II and Analytic Geometry and Plane Trigonometry ² Algebra, Trigonometry, and Analytic Geometry | 5-6 |

¹ BE_T 203 must be the last course taken for the degree.

² A grade of C or better is required for either MATH 22 or MATH 26.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all associate degree students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/associate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)

- **Quantification (GQ):** 3 credits
- **Writing and Speaking (GWS):** 3 credits

Knowledge Domains

- **Arts (GA):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Note: Up to six credits of Inter-domain courses may be used for any Knowledge Domain requirement, but when a course is used to satisfy more than one requirement, the credits from the course can be counted only once.

Foundations or Knowledge Domains

- **Any General Education course:** 3 credits

University Degree Requirements

Cultures Requirement

3 credits of United States (US) or International (IL) cultures coursework are required and may satisfy other requirements

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 60 degree credits must be earned for an associates degree. The requirements for some programs may exceed 60 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Biomedical Engineering Technology program is designed to provide a curriculum that prepares students to pursue a career in the evolving healthcare technology management (HTM) field and to develop in their profession. Due to their experience in our program, within few years of graduation, we expect our graduates to have the ability to:

1. Apply knowledge, standards, regulations, and quality improvement plans to install, perform acceptance testing and preventive maintenance (PMs) inspections, troubleshoot, and repair a wide variety of medical devices.
2. Work in the healthcare technology management (HTM) field.
3. Engage in continuous learning through CBET certification and/or other professional training programs and independent study.
4. Work both independently and collaboratively in multi-disciplinary teams, communicating effectively with relevant healthcare related professionals.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Biomedical Engineering Technology program is designed to enable students to:

1. Apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering and technology to solve well-defined engineering problems appropriate to the discipline.
2. Design solutions for well-defined technical problems and assist with engineering design of systems, components, or processes appropriate to the discipline.
3. Apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results.
5. Function effectively as member of technical team.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of

both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

New Kensington

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2022-23 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

Biomedical Engineering Technology, A.ENG.T. at New Kensington Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

| Fall | Credits Spring | Credits |
|--------------------------------|----------------------------------|-----------|
| BE_T 101 | 1 CMPET 117 | 3 |
| EET 105 | 3 CMPET 120 | 1 |
| SRA 111* | 3 IST 220 | 3 |
| MATH 26 | 3 MATH 22 (GQ)* | 3 |
| ENGL 15* | 3 CHEM 110 or 130 (GN) | 3 |
| General Education Course | 3 General Education Course | 3 |
| | 16 | 16 |

Second Year

| Fall | Credits Spring | Credits Summer | Credits |
|-----------|----------------|----------------|---------|
| BE_T 201* | 5 BE_T 206* | 4 BE_T 203* | 4 |
| BE_T 205* | 4 BE_T 204W* | 5 | |

| | | |
|--------------------------|---|-----------|
| BISC 4 (GN) [†] | 3 Technical Elective (See Adviser for list) | 3 |
| PHYS 150 (GN) | 3 CAS 100 | 3 |
| RADSC 230 | 3 General Education Course | 3 |
| | 18 | 18 |
| | | 4 |

Total Credits 72

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GN, GA, GH, and GS). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

Students with a degree in biomedical engineering technology are well positioned for careers at hospitals, clinics, medical practice offices, surgical centers, nursing homes, and rehabilitation centers.

Penn State students with an A.S. in Biomedical Engineering Technology have been successful in pursuing various careers within the Healthcare Technology Management field.

Careers

- Biomedical Engineering Technician/Clinical Engineer in a Hospital
- Field Service Technician
- Repair Technician for a Medical Device Company

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE BIOMEDICAL ENGINEERING TECHNOLOGY PROGRAM (<http://career.engr.psu.edu/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.engr.psu.edu/students/grad-prospective/default.aspx>)

Accreditation

This program is accredited by the Engineering Technology Accreditation Commission of ABET, www.abet.org (<http://www.abet.org>).

MORE INFORMATION ABOUT ABET ACCREDITATION (<http://www.abet.org>)

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a

licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://psu.edu/state-licensure-disclosures/>) interactive map.

The BET program fully prepares students for employment as a biomedical engineering technician as well as for CBET certification. A PE license is not required for employment.

Contact

University Park

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