CRITERIA FOR ACCREDITING ENGINEERING TECHNOLOGY PROGRAMS

Effective for Evaluations During the
2005-2006 Accreditation Cycle

Incorporates all changes
approved by the
ABET
Board of Directors
as of
November 1, 2004

Technology Accreditation Commission

ABET, Inc.
111 Market Place, Suite 1050
Baltimore, MD 21202

Telephone: 410-347-7700
Fax: 410-625-2238
E-mail: accreditation@abet.org
Website: www.abet.org

TABLE OF CONTENTS

Requests for further information about ABET, its accreditation process, or other activities may be addressed to the Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202 or to accreditation@abet.org .

Criteria for Accrediting Engineering Technology Programs

Effective for Evaluations during the 2005-2006 Accreditation Cycle

It is the responsibility of the institution seeking accreditation of an engineering technology program to demonstrate clearly that the program meets the following criteria.

Criterion 1. Program Educational Objectives

Although institutions may use different terminology, for purposes of Criterion 1, *program educational objectives* are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve during the first few years following graduation.

Each engineering technology program must have in place:

a. published educational objectives that are consistent with the mission of the institution and applicable ABET criteria,
b. a documented process by which the objectives are determined and periodically evaluated based on the needs of constituencies served by the program, and
c. an educational program, including a curriculum, that enables graduates to achieve the educational objectives.

Criterion 2. Program Outcomes

Although institutions may use different terminology, for purposes of Criterion 2, *program outcomes* are statements that describe what units of knowledge or skill students are expected to acquire from the program to prepare them to achieve the program educational objectives. These are typically demonstrated by the student and measured by the program at the time of graduation.

An engineering technology program must demonstrate that graduates have:

a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,
b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,
c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,
e. an ability to function effectively on teams,
f. an ability to identify, analyze and solve technical problems,
g. an ability to communicate effectively,
h. a recognition of the need for, and an ability to engage in lifelong learning,
i. an ability to understand professional, ethical and social responsibilities,
j. a respect for diversity and a knowledge of contemporary professional, societal and global issues, and
k. a commitment to quality, timeliness, and continuous improvement.

Criterion 3. Assessment and Evaluation

Each program must utilize multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met.

Assessment measures typically consist of, but are not limited to, student portfolios, student performance in project work and activity-based learning; results of integrated curricular experiences; relevant nationally-normed examinations; results of surveys to assess graduate and employer satisfaction with employment, career development, career mobility, and job title; and preparation for continuing education.

Each program must demonstrate that the results of the assessment of program objectives and outcomes are being used to improve and further develop the program in accordance with a documented process.

Criterion 4. Program Characteristics

The program must provide an integrated educational experience that develops the ability of graduates to apply pertinent knowledge to solving problems in the engineering technology specialty. The orientation of the technical specialization must manifest itself through program objectives, faculty qualifications, program content, and business and industry guidance.

CURRICULUM

These criteria specify subject areas and minimum total credit hours essential to all engineering technology programs. The curriculum must appropriately and effectively develop these subject areas in support of program and institutional objectives.

Total Credits Baccalaureate programs must consist of a minimum of 124 semester hours or 186 quarter hours of credit. Associate degree programs must consist of a minimum of 64 semester hours or 96 quarter hours of credit.

Communications The communications content must develop the ability of graduates to:

a. plan, organize, prepare, and deliver effective technical reports in written, oral, and other formats appropriate to the discipline and goals of the program,
b. incorporate communications skills throughout the technical content of the program,
c. utilize the appropriate technical literature and use it as a principal means of staying current in their chosen technology, and
d. utilize the interpersonal skills required to work effectively in teams.

Mathematics The level and focus of the mathematics content must provide students with the skills to solve technical problems appropriate to the discipline and the program objectives. Algebra, trigonometry, and an introduction to mathematics above the level of algebra and trigonometry constitute the foundation mathematics for an associate degree program. Integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry, constitutes the foundation mathematics for baccalaureate programs.

Physical and Natural Science The basic science content can include physics, chemistry, or life and earth sciences that support program objectives. This component must include laboratory experiences which develop expertise in experimentation, observation, measurement and documentation.

Social Sciences and Humanities The social sciences and humanities content must support technical education by broadening student perspective and imparting an understanding of diversity and the global and societal impacts of technology.

Technical Content The technical content of a program must focus on the applied aspects of science and engineering in that portion of the technological spectrum closest to product improvement, manufacturing, construction and engineering operational functions. The technical content must develop the skills, knowledge, methods, procedures, and techniques associated with the technical discipline and appropriate to the goals of the program.

The technical content develops the depth of technical specialty and must represent at least 1/3 of the total credit hours for the program. In order to accommodate the essential mathematics, sciences, communications, and humanities components, the technical content is limited to no more than 2/3 the total credit hours for the program.

a. The technical content of the curriculum consists of a technical core and the increasingly complex technical specialties found later in the curriculum. The technical core must provide the prerequisite foundation of knowledge necessary for the technical specialties.
b. Laboratory activities must develop student competence in the use of analytical and measurement equipment common to the discipline and appropriate to the goals of the program.
c. Technical courses must develop student knowledge and competence in the use of standard design practices, tools, techniques, and computer hardware and software appropriate to the discipline and goals of the program.
d. Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and nontechnical skills in solving problems.

Cooperative Education Cooperative education credit used to satisfy prescribed elements of these criteria must include an appropriate academic component evaluated by the program faculty.

Criterion 5. Faculty

Overall competence of the faculty will be evaluated through such factors as formal education, balance of academic experience and professional practice, industrial experience, professional certification, teaching experience, teaching effectiveness, technical currency, scholarly activity, professional society participation, communication skills, extracurricular support for student activities, and similar attributes appropriate to the program objectives.

Individual faculty members must have educational backgrounds, industrial experience, professional practice, communication skills, and technologically current knowledge that support the field of instruction and program objectives. Collectively, the faculty must be capable of providing students an appropriate breadth of perspective and effective instruction in the use of modern technical and non-technical methodologies in careers appropriate to the program objectives.

The program must have an effective professional development plan for its faculty.

The number of faculty members must be sufficient to provide program continuity, proper frequency of course offerings, appropriate levels of student-faculty interaction, and effective student advising and counseling.

Each program must have effective leadership through a full-time faculty member with defined leadership responsibilities for the program.

The program faculty must have sufficient responsibility and authority to define, revise, implement, and achieve program objectives.

Criterion 6. Facilities

Adequate facilities and financial support must be provided for each program in the form of:

a. suitable classrooms, laboratories, and associated equipment necessary to accomplish the program objectives in an atmosphere conducive to learning,
b. laboratory equipment characteristic of that encountered in the industry and practice served by the program,
c. modern computing equipment and software, characteristic of that encountered in the industry and professional practice served by the program, and
d. Internet and information infrastructures, including electronic information repositories, equipment catalogs, professional technical publications, and manuals of industrial processes and practices adequate to support the educational objectives of the program and related scholarly activities of students and faculty.

Criterion 7. Institutional and External Support

ADMINISTRATION

The administration must be effective in the:

a. selection, supervision and support of the faculty,
b. selection and supervision of the students,
c. operation of support facilities for faculty and students, and
d. interpretation of the college to members of engineering and technical professions and the public.

INSTITUTIONAL SUPPORT

Institutional support must include:

a. adequate financial resources and constructive leadership to assure the quality and continuity of the engineering technology program
b. resources sufficient to attract, retain and provide for the continued professional development of a well-qualified faculty
c. sufficient financial and human resources to acquire, maintain, update and operate facilities and equipment appropriate for the program,
d. procedures for selecting students, advising students , and assuring that all graduates have met all curricular requirements, and
e. services to assist students in finding employment upon graduation.

PROGRAM ADVISEMENT

An advisory committee representing the organizations that employ graduates must be utilized to advise the program in establishing, achieving, and assessing its goals. The committee must periodically review program curricula, and provide advisement on current and future needs of the technical fields in which graduates are employed.

Criterion 8. Program Criteria

Where applicable, each program must satisfy program criteria that amplify these general criteria and provide the specifics needed for a given discipline. A program must satisfy all program criteria applicable to the technical specialties implied in the program title.

PROGRAM CRITERIA

PROGRAM CRITERIA FOR AIR CONDITIONING ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Heating, Refrigeration and Air-Conditioning Engineers

Applicability

These program criteria apply to engineering technology programs that include air conditioning and similar modifiers in their titles.

Objective

An accreditable program in Air Conditioning Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the design, application installation, manufacturing, operation, marketing and maintenance of heating, ventilating, air-conditioning, and refrigeration (HVAC&R) systems. Graduates of associate degree programs typically have competence in air-conditioning processes, heating/cooling load calculations, ventilation principles, pipe and duct design, system controls, system components, refrigeration, economic analysis and computerized energy evaluation methods. Baccalaureate degree graduates are well prepared for design and development of complex systems complementing and expanding on lower division work.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. utilizing air-conditioning processes, heating and cooling load calculations, ventilation principles, pipe and duct design, system controls, system components, refrigeration, economic analysis, and computerized energy evaluation methods in system design.
b. applying mathematics, physics or chemistry, thermodynamics, psychrometrics, and fluid mechanics to HVAC&R systems

Graduates of baccalaureate degree programs must demonstrate, in addition to outcomes expected of associate degree graduates, the ability to:

a. analyze and design complex HVAC&R systems.
b. apply project management to HVAC&R systems.
c. apply economic analysis and computerized energy evaluation methods to HVAC&R systems.

PROGRAM CRITERIA FOR ARCHITECTURAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Civil Engineers

Applicability

These program criteria apply to engineering technology programs that include architectural and similar modifiers in their title.

Objective

An accreditable program in Architectural Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation or maintenance of the built environment. Graduates of associate degree programs typically have strengths in their knowledge of the building, testing, operation, and maintenance of building systems with the ability to produce and utilize basic construction documents and perform basic analysis and design of system components, whereas baccalaureate degree graduates are prepared to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of architectural projects.

Outcomes

Associate degree programs must demonstrate that graduates are capable of:

a. employing concepts of architectural theory and design in a design environment;
b. utilizing modern instruments, methods and techniques to produce A/E documents and presentations;
c. conducting standardized field and laboratory testing on construction materials;
d. utilizing modern instruments and research techniques for site development and building layout;
e. determining forces and stresses in elementary structural systems;
f. estimating material quantities for technical projects;
g. calculating basic loads and demands in mechanical and electrical systems;
h. utilizing codes, contracts and specifications in design, construction and inspection activities; and
i. employing productivity software to solve technical problems;

Baccalaureate degree programs must demonstrate that graduates, in addition to the competencies above, are capable of:

a. creating, utilizing and presenting design, construction, and operations documents;
b. performing economic analyses and cost estimates related to design, construction, and maintenance of building systems in the architectural engineering technical specialties;
c. selecting appropriate materials and practices for building construction;
d. applying principles of construction law and ethics in architectural practice;
e. applying basic technical design concepts to the solution of architectural problems involving architectural history, theory and design; codes, contracts and specifications; electrical and mechanical systems, environmental control systems, plumbing and fire protection; site development; structures, material behavior, foundations; construction administration, planning and scheduling; and
f. performing standard analysis and design in at least one recognized technical specialty within architectural engineering technology that is appropriate to the goals of the program.

PROGRAM CRITERIA FOR AUTOMOTIVE ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Society of Automotive Engineers

Applicability

These program criteria apply to engineering technology programs that include automotive and similar modifiers in their title. The term "automotive" refers to land, sea, air or space mobility.

Objective

An accreditable program will prepare graduates with technical and managerial skills necessary to enter careers in design, manufacturing, marketing, operation, and maintenance in the field of automotive engineering technology. Graduates of associate degree programs are expected to have strengths in their knowledge of operations, maintenance, and manufacturing, while baccalaureate degree graduates are expected to be prepared for design and management in the automotive field.

Outcomes

The nature and level of proficiency demonstrated by graduates in the outcomes prescribed below must be appropriate to the program objectives.

The field of automotive engineering technology is dependent on the application of computers in analysis, design, manufacturing, and operation of facilities. The program must demonstrate that graduates are competent in the application of computer technologies commonly used in industry, governmental service, and private practice associated with land, sea, air, and space mobility.

Graduates must demonstrate proficiency in the application of probability and statistics to the solution of problems related to land, sea, air, and space mobility.

In the field of automotive engineering technology, management and technology are often inextricably intertwined. The program must demonstrate that graduates have acquired the ability to apply modern and effective management skills in identification and investigation of problems, analysis of data, synthesis and implementation of solutions, and operations of facilities related to land, sea, air, and space mobility.

The program must demonstrate that graduates have a working knowledge of the design, manufacture, and maintenance of major subsystems and technologies associated with land, sea, air and space mobility.

PROGRAM CRITERIA FOR BIOENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Biomedical Engineering Society

Cooperating Societies: American Institute of Chemical Engineers, American Society of Agricultural Engineers, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, and National Institute of Ceramic Engineers

Applicability

These program criteria apply to engineering technology programs that include bioengineering, biomedical, medical electronics, biomedical equipment and similar modifiers in their titles.

Objective

An accreditable program in Bioengineering Technology will prepare graduates with the technical skills necessary to enter careers in the design, application, installation, operation and/or maintenance of biomedical equipment. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing biomedical equipment or systems, whereas baccalaureate degree graduates are well prepared for development and implementation of biomedical equipment or systems.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of circuit analysis and design, analog and digital electronics, microcomputers, bioengineering systems, and safety in the building, testing, operation, and maintenance of biomedical equipment.
b. the applications of physics, chemistry, and biological sciences to building, testing, operation, and maintenance of biomedical equipment in a rigorous mathematical environment at or above the level of algebra and trigonometry.

In addition to the above, graduates of baccalaureate degree programs must demonstrate:

a. the ability to analyze, design, and implement bioengineering systems.
b. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of bioengineering systems.

PROGRAM CRITERIA FOR CHEMICAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Institute of Chemical Engineers

Applicability

These program criteria apply to engineering technology programs which include chemical and similar modifiers in their titles.

Objective

An accreditable program will prepare graduates with the technical and managerial skills necessary to enter careers in design, manufacturing, marketing, operation, and maintenance in the field of chemical engineering technology. Graduates of baccalaureate degree programs typically have strengths in their knowledge of laboratory applications, design, technical service and supervision. Graduates of associate degree programs typically have strengths in their knowledge of operations, maintenance, and manufacturing.

Outcomes

The field of chemical engineering technology is dependent upon the application of chemistry in an industrial setting. The program must demonstrate that graduates have a working knowledge and ability to solve technical problems by the industrial application of inorganic chemistry, organic chemistry, analytical chemistry; physics, and process stoichiometry. The program must also demonstrate that graduates of the baccalaureate program possess a deeper and broader knowledge which enables them to

solve technical and managerial problems of a more complex nature than those expected of graduates of associate degree programs.

In the field of chemical engineering technology, the operation of chemical processes is extremely important. The program must demonstrate that graduates have the ability to apply:

a. The concepts of chemical engineering unit operations such as mass transfer, heat transfer, distillation, and evaporation to the design, operation, and maintenance of chemical processes,
b. The principles of thermodynamics; process control and instrumentation, computer applications, and materials science to the design, operation, and maintenance of chemical processes.

The nature and level of proficiency must be appropriate to the program objectives.

In the field of chemical engineering technology, the various fields of the chemical sciences and the operation of industrial chemical process equipment are often inextricably intertwined. The program must demonstrate that graduates have the ability to operate, test, and check out chemical process equipment in accordance with appropriate safety, health and environmental considerations and regulations.

PROGRAM CRITERIA FOR CIVIL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Civil Engineers

Applicability

These program criteria apply to engineering technology programs that include civil and similar modifiers in their title.

Objective

An accreditable program in Civil Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the planning, design, construction, operation or maintenance of the built environment and global infrastructure. Graduates of associate degree programs typically have strengths in their knowledge of the building, testing, operation, and maintenance of infrastructure with the ability to produce and utilize basic construction documents and perform basic analysis and design of system components, whereas baccalaureate degree graduates are prepared to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil projects.

Outcomes

Associate degree programs must demonstrate that graduates are capable of:

a. utilizing graphic techniques to produce engineering documents;
b. conducting standardized field and laboratory testing on civil engineering materials;
c. utilizing modern surveying methods for land measurement and/or construction layout;
d. determining forces and stresses in elementary structural systems;
e. estimating material quantities for technical projects; and
f. employing productivity software to solve technical problems.

Baccalaureate degree programs must demonstrate that graduates, in addition to the competencies above, are capable of:

a. planning and preparing design and construction documents, such as specifications, contracts, change orders, engineering drawings, and construction schedules;
b. performing economic analyses and cost estimates related to design, construction, operations and maintenance of systems in the civil technical specialties;
c. selecting appropriate engineering materials and practices;
d. applying basic technical concepts to the solution of civil problems involving hydraulics, hydrology, geotechnics, structures, material behavior, transportation systems, and water and wastewater systems; and
e. performing standard analysis and design in at least three of the recognized technical specialties within civil engineering technology that are appropriate to the goals of the program.

PROGRAM CRITERIA FOR COMPUTER ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers
Cooperating Society: Institute of Industrial Engineers

Applicability

These program criteria apply to engineering technology programs that include computer and similar modifiers in their titles.

Objective

An accreditable program in Computer Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the design, application, installation, operation, and/or maintenance of computer systems. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing computer systems and their associated software systems, whereas baccalaureate degree graduates are well prepared for development and implementation of computer systems.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of electric circuits, computer programming, associated software applications, analog and digital electronics, microcomputers, operating systems, and local area networks to the building, testing, operation, and maintenance of computer systems and associated software systems.
b. the applications of physics or chemistry to computer systems in a rigorous mathematical environment at or above the level of algebra and trigonometry.

In addition to the above, graduates of baccalaureate degree programs must demonstrate:

a. the ability to analyze, design, and implement hardware and software computer systems.
b. the ability to apply project management techniques to computer systems.
c. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of computer systems and networks.

PROGRAM CRITERIA FOR CONSTRUCTION ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Civil Engineers

Applicability

These program criteria apply to engineering technology programs that include construction and similar modifiers in their title.

Objective

An accreditable program in Construction Engineering Technology will prepare graduates with the technical skills necessary to enter careers in construction, operation and/or maintenance of the built environment and global infrastructure. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of buildings and infrastructure with ability to utilize basic construction documents to participate in construction activities, whereas baccalaureate degree graduates are prepared to specify project methods and materials, perform cost estimates and analyses, and manage construction activities.

Outcomes

Associate degree programs must demonstrate that graduates are capable of:

a. utilizing modern instruments, methods and techniques to implement construction contracts, documents, and codes;
b. evaluating materials and methods for construction projects;
c. utilizing modern surveying methods for construction layout;
d. determining forces and stresses in elementary structural systems;
e. estimating material quantities and costs; and
f. employing productivity software to solve technical problems.

Baccalaureate degree programs must demonstrate that graduates, in addition to the competencies above, are capable of:

a. producing and utilizing design, construction, and operations documents;
b. performing economic analyses and cost estimates related to design, construction, and maintenance of systems in the construction technical specialties;
c. selecting appropriate construction materials and practices;
d. applying principles of construction law and ethics;
e. applying basic technical concepts to the solution of construction problems involving hydraulics and hydrology, geotechnics, structures, construction scheduling and management, and construction safety; and
f. performing standard analysis and design in at least one recognized technical specialty within construction engineering technology that is appropriate to the goals of the program.

PROGRAM CRITERIA FOR DRAFTING/DESIGN ENGINEERING TECHNOLOGY (MECHANICAL) AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Mechanical Engineers
Cooperating Society: Society of Manufacturing Engineers

Applicability

These program criteria apply to engineering technology programs with an emphasis on mechanical components and systems, that include drafting / design and similar modifiers in their titles.

Objective

An accreditable program in Drafting / Design Engineering Technology will prepare graduates with knowledge, problem solving ability, and hands on skills to enter careers in drafting and basic design of mechanical components and systems. Graduates of associate degree programs shall have competency in drafting, including at least one commercial CAD software package appropriate to the program objectives. Baccalaureate degree graduates are prepared with the knowledge, skills, and abilities to enter careers in applied mechanical design.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and technical competency appropriate to the objectives of the program in:

a. engineering materials, applied mechanics, and manufacturing methods.
b. applied drafting practice emphasizing mechanical components and systems, as well as fundamentals of descriptive geometry, orthographic projection, sectioning, tolerancing and dimensioning, and basic computer aided drafting and design with technical depth in at least one of these areas.
c. the application of physics and engineering materials having an emphasis in applied mechanics, or in-depth application of physics having emphasis in mechanical components and design.

Graduates of baccalaureate degree programs, in addition to outcomes required of associate degree graduates, must demonstrate competency in the application of manuals, handbooks, material and/or equipment specifications, and related software in advanced drafting/design. Competency in the application of current codes and standards must be demonstrated with open-ended design experiences that integrate materials, manufacturing, design analysis, or graphics. Understanding of concepts relating to the environmental and economic impacts of design must also be demonstrated. Graduates must also demonstrate competency in:

a. design of machine elements, advanced drafting including current three dimensional computer representations as related to mechanical design, and manufacturing methods. Advanced proficiency must be demonstrated in at least three drafting / design related areas, consistent with the technical orientation of the program.
b. the in-depth application of physics and engineering materials having emphasis in drafting, manufacturing, and design of mechanical components.

PROGRAM CRITERIA FOR ELECTRICAL/ELECTRONIC(S) ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers

Applicability

These program criteria apply to engineering technology programs that include electrical or electronic(s) and similar modifiers in their titles.

Objective

An accreditable program in Electrical/Electronic(s) Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the design, application, installation, manufacturing, operation and/or maintenance of electrical/electronic(s) systems. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing electrical systems, whereas baccalaureate degree graduates are well prepared for development and implementation of electrical/electronic(s) systems.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers to the building, testing, operation, and maintenance of electrical/electronic(s) systems.
b. the applications of physics or chemistry to electrical/electronic(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.

Given the breadth of technical expertise involved with electrical systems, and the unique objectives of individual programs, some baccalaureate programs may focus on preparing graduates with in-depth but narrow expertise, while other programs may choose to prepare graduates with expertise in a broad spectrum of the field. Therefore, the depth and breadth of expertise demonstrated by baccalaureate graduates must be appropriate to support the goals of the program. In addition to the outcomes expected of associate degree graduates, graduates of baccalaureate degree programs must demonstrate:

a. the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems.
b. the ability to apply project management techniques to electrical/electronic(s) systems.
c. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems.

PROGRAM CRITERIA FOR ENVIRONMENTAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Academy of Environmental Engineers
Cooperating Societies: American Institute of Chemical Engineers;
American Society of Civil Engineers;
American Society of Heating, Refrigerating, and Air Conditioning Engineers;
American Society of Mechanical Engineers;
Society of Automotive Engineers; and
Society of Mining, Metallurgy, and Exploration

Applicability

These program criteria apply to engineering technology programs that include environmental and similar modifiers in their title.

Objective

The field of environmental engineering technology is broad, ranging from laboratory measurements to field measurements to design and system operation. An accreditable Environmental Engineering Technology program will prepare graduates to work in one or more specialties as described by the program objectives. Graduates shall understand the concepts of professional practice and the roles and responsibilities of public institutions and private organizations pertaining to environmental engineering technology. Graduates of associate degree programs typically have competence in applied skills, while baccalaureate degree graduates have a deeper understanding and competence in the application of mathematics, physical sciences, and biological science to the field.

Outcomes

The field of environmental engineering technology includes environmental measurements and the design, management, and operation of environmental facilities. Associate degree programs must demonstrate that graduates are capable of applying mathematics and physical science appropriate to the program objectives. Baccalaureate degree programs must demonstrate that graduates, in addition to the outcomes expected of associate degree graduates, are capable of:

a. applying probability and statistics to data and risk analyses;
b. formulating material balances;
c. applying principles of biological science, chemistry, physics and calculus, to situations relevant to the program objectives.

PROGRAM CRITERIA FOR INDUSTRIAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Industrial Engineers

Applicability

These program criteria apply to industrial engineering technology programs and to those with similar modifiers in their titles, leading to either an associate or a bachelor's degree.

Objective

An accreditable program in Industrial Engineering Technology will prepare graduates with the technical and managerial skills necessary to develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy. Graduates at the associate level will be prepared for immediate employment, but will also be prepared to continue in baccalaureate studies in industrial engineering technology and related upper level studies. Graduates at the baccalaureate level will be prepared for careers in higher levels of system design, integration, and management.

Outcomes

Graduates must demonstrate the ability to accomplish the integration of systems using appropriate analytical, computational, and application practices and procedures.

Graduates at the baccalaureate level must demonstrate the ability to apply knowledge of probability, statistics, engineering economic analysis and cost control, and other technical sciences and specialties necessary in the field of industrial engineering technology.

Graduates must be able to accomplish the integration of systems using appropriate analytical, computational and application practices and procedures.

PROGRAM CRITERIA FOR INFORMATION ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers
Cooperating Society: CSAB

Applicability

These program criteria apply to engineering technology programs that include information and similar modifiers in their titles. The program title must include the words “engineering technology”.

Objective

An accreditable program in Information Engineering Technology will prepare graduates with the technical and project management skills necessary to enter careers in the design, application, installation, operation and/or maintenance of computer systems, networks, and telecommunications systems dedicated to the processing and transfer of information. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing hardware and software systems, whereas baccalaureate degree graduates normally are well prepared for design, development, and management.

Outcomes

The field of Information Engineering Technology depends heavily on the application of computer and network components for use in the processing, analysis, and transfer of information. Accordingly:

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of computer and network hardware, operating systems, system and network administration, programming languages, applications software, and databases in the building, testing, operation, and maintenance of hardware and software systems.

b. the application of electrical, electronic, telecommunications, and digital signal propagation fundamentals in the building, testing, operation, and maintenance of hardware and software systems.

Given the breadth of technical expertise involved with information systems, and the unique objectives of individual programs, some baccalaureate programs may focus on preparing graduates with in-depth but narrow expertise, while other programs may choose to prepare graduates with expertise in a broad spectrum of the field. Therefore, the depth and breadth of expertise demonstrated by baccalaureate graduates must be appropriate to support the goals of the program. In addition to outcomes expected of associate degree graduates, graduates of baccalaureate degree programs must demonstrate:

a. the ability to design, implement, maintain and provide for the security of facilities involved with the processing and transfer of information
b. the ability to apply project management techniques to facilities that process and transfer information
c. the ability to apply discrete mathematics, and probability and statistics in the support of facilities that process and transfer information.

PROGRAM CRITERIA FOR INSTRUMENTATION AND CONTROL SYSTEMS ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Instrumentation, Systems, and Automation Society

Applicability

These program criteria apply to engineering technology programs that include “instrumentation”, “measurement”, “metrology”, “control”, "robotics", “automation”, and similar modifiers in their titles.

Objective

An accreditable program in instrumentation and control systems engineering technology will prepare graduates with the technical and managerial skills necessary to enter careers in design, manufacturing, marketing, operations, and maintenance in the fields of measurement, control, robotics, and automation engineering technology. Graduates of associate degree programs, as a result of extensive laboratory experience in component/device operation, calibration and interconnection, have strengths in their knowledge of operations, maintenance, and manufacturing. Baccalaureate degree graduates are qualified to undertake the design and specification of control systems and for the subsequent management of their installation and operation.

Outcomes

The field of instrumentation and control systems engineering technology is heavily dependent on the application of computers in the analysis, design, and operation of manufacturing and processing facilities. The program must demonstrate that graduates have the ability to:

a. apply concepts of automatic control, including measurement, feedback and feedforward regulation for the operation of continuous and discrete systems,
b. design and implement systems utilizing analog and/or digital control devices,
c. apply the concepts of chemistry, physics, and electricity/electronics to measurement and control systems,
d. apply the concepts of digital and microprocessor systems and functionality of system components/devices for the automation of processes,

e. apply the concepts of measurements and sensor selection, and
f. communicate the technical details of control systems using current techniques and graphical standards.

In addition, baccalaureate graduates must demonstrate the ability to

a. apply the concepts of mechanics, fluid mechanics, and heat transfer to the design of process control systems, and
b. understand and utilize programmable logic controllers (PLC), distributed control systems (DCS) and supervisory control systems for control of manufacturing and processing systems.

Mathematics forms the basis for design, synthesis and analysis in the field of instrumentation and control engineering technology. Associate degree graduates must demonstrate the ability to apply algebra, trigonometry, and elementary calculus in the installation, calibration and trouble-shooting of control systems. Baccalaureate graduates must demonstrate proficiency in the utilization of differential and integral calculus and ordinary differential equations in the design, analysis, and performance assessment of control systems.

In the field of instrumentation and control engineering technology, management and technology are often inextricably intertwined. Therefore

a. associate degree graduates must demonstrate the ability to recognize and apply the fundamental concepts of economics and management to problems in automatic control systems, and
b. baccalaureate degree graduates must demonstrate the ability to utilize modern and effective management skills for performing investigation, analysis, and synthesis in the implementation of automatic control systems.

PROGRAM CRITERIA FOR MANUFACTURING ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Society of Manufacturing Engineers

Applicability

These program criteria apply to engineering technology programs that include "manufacturing" and modifiers in their titles.

Objective

An accreditable baccalaureate degree program in manufacturing engineering technology will prepare graduates with technical and leadership skills necessary to enter careers in process and systems design, manufacturing operations, maintenance, technical sales or service functions in a manufacturing enterprise. Graduates of associate degree programs typically have strengths in manufacturing operations, maintenance and service functions.

Outcomes

Programs must demonstrate that graduates are prepared for careers centered on the manufacture of goods. In this context, 'manufacturing' is a process or procedure through which plans, materials, personnel, and equipment are transformed in some way that adds value.

Graduates must demonstrate the ability to apply the technologies of materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to the solution of manufacturing problems.

Graduates must demonstrate the ability to successfully complete a comprehensive design project related to the field of manufacturing.

PROGRAM CRITERIA FOR MARINE ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Society of Naval Architects and Marine Engineering

Applicability

These program criteria apply to engineering technology programs that include marine and similar modifiers in their titles.

Objective

An accreditable program will prepare graduates with the technical and managerial skills necessary to enter a variety of different careers in the field of marine engineering technology. Graduates of associate degree programs must have strengths in their knowledge of operations, maintenance, and manufacturing, while baccalaureate degree graduates must also be well prepared for design and management in marine engineering technology.

Outcomes

The field of marine engineering technology is dependent on the application of the technical sciences to marine equipment, systems, and vehicles.

The program must demonstrate that the baccalaureate degree graduates are proficient in applying the principles of college-level physics and chemistry to problems associated with marine equipment, systems and vehicles. The program must demonstrate that associate degree graduates are proficient in applying the principles of college-level physics to problems associated with marine equipment, systems and vehicles. The nature and level of proficiency must be appropriate to the program objectives.

The program must demonstrate that graduates are proficient in applying the principles of fluid mechanics, hydrostatic stability, solid mechanics, materials, dynamics, and energy systems to marine equipment, systems and vehicles. The nature and level of proficiency must be appropriate to the program objectives.

Knowledge of modern instrumentation and proper laboratory practices is important in the field of marine engineering technology. The program must demonstrate that graduates are proficient in (a) the use and application of instrumentation for measuring physical phenomena related to naval architecture and/or marine engineering technology, and (b) the design of experiments, data collection, analysis, and formal report writing.

The program must demonstrate that graduates are proficient in the operation, maintenance, analysis, and management of modern marine power plants and associated marine auxiliary equipment and systems. The program must also demonstrate that graduates are proficient in the use of design manuals, material/equipment specifications, and industry regulations applicable to marine engineering technology. The nature and level of proficiency must be appropriate to the program objectives.

PROGRAM CRITERIA FOR MECHANICAL ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Society of Mechanical Engineers

Applicability

These program criteria apply to engineering technology programs that include mechanical and similar modifiers in their titles.

Objective

An accreditable program in Mechanical Engineering Technology will prepare graduates with knowledge, problem solving ability, and hands-on skills to enter careers in the design, installation, manufacturing, testing, evaluation, technical sales, or maintenance of mechanical systems. Level and scope of career preparation will depend on the degree level and specific program orientation. Graduates of associate degree programs typically have strengths in specifying, installing, fabricating, testing, documenting, operating, selling, or maintaining basic mechanical systems, whereas baccalaureate degree graduates typically have strengths in the analysis, applied design, development, implementation, or oversight of more advanced mechanical systems and processes.

Outcomes

Each program must demonstrate that the technical and scientific areas of expertise developed by graduates are appropriate to the technical orientation and goals of that program.

Associate degree programs must demonstrate that graduates can apply the following principles to the specification, installation, fabrication, test, operation, maintenance, sales, maintenance, or documentation of basic mechanical systems:

a. Technical expertise in a minimum of three subject areas chosen from - engineering materials, applied mechanics, applied fluid sciences, applied thermal sciences, and fundamentals of electricity.
b. Technical expertise in manufacturing processes, mechanical design, and computer-aided engineering graphics with added technical depth in at least one of these areas.
c. Expertise in applied physics having an emphasis in applied mechanics plus inorganic chemistry, or, if program objectives do not require chemistry, added technical topics in physics appropriate to the program objectives.

Baccalaureate degree programs must demonstrate that graduates can apply the following concepts to the analysis, development, implementation, or oversight of mechanical systems and processes:

a. Technical expertise in engineering materials, statics, dynamics, strength of materials, fluid power or fluid mechanics, thermodynamics, and either electrical power or electronics.
b. Technical expertise having added technical depth in a minimum of three subject areas chosen from: manufacturing processes, mechanical design, computer-aided engineering graphics, engineering materials, solid mechanics, fluids, thermal sciences, electro-mechanical devices and controls, and industrial operations.
c. Expertise in applied physics having an emphasis in applied mechanics, plus added technical topics in physics and inorganic chemistry principles appropriate to the program objectives.

PROGRAM CRITERIA FOR NUCLEAR ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: American Nuclear Society

Applicability

These program criteria apply to Nuclear Engineering Technology programs and those with similar modifiers in their titles, leading to either an associate or a bachelor's degree.

Objective

An accreditable program in Nuclear Engineering Technology will prepare graduates with knowledge, skills, and problem-solving abilities required to enter careers in those parts of the nuclear industry served by the program. Graduates of programs in nuclear engineering technology will have strengths in the areas of nuclear processes, nuclear systems, and radiological safety, developed from an understanding of the fundamental principles, conservation laws, and rate processes of the physical sciences.

Outcomes

The nature and level of competencies demonstrated by graduates must be appropriate to the goals of the program and the needs of those parts of the nuclear industry served by graduates of the program.

The ability to solve problems that arise in nuclear engineering technology requires a thorough understanding of nuclear systems and radiological safety. Graduates must demonstrate a comprehension of radiation protection procedures, currently applicable rules and regulations, maintenance, control, and quality assurance pertaining to the operation of nuclear systems. Graduates also must demonstrate an understanding of nuclear processes and operations, the human interface in operations, and the performance and maintenance of nuclear systems.

Much of Nuclear Engineering Technology involves the translation of engineering ideas and concepts into functioning nuclear devices, machines, structures, and systems. Graduates must demonstrate the ability to apply manuals, handbooks, material/equipment specifications, and computers in the solution of design problems related to current nuclear technology.

The basic sciences and mathematics are vital tools for problem solving in nuclear engineering technology. Graduates must demonstrate the ability to apply college-level algebra, trigonometry, introductory calculus, and the basic sciences (including physics) to the solution of problems commonly encountered in nuclear engineering technology.

The technical sciences provide the foundation for understanding the principles of nuclear technology. Graduates must demonstrate the ability to solve problems using the fundamental principles, conservation laws, and rate processes of the physical sciences that are applicable to nuclear systems.

A hallmark of Nuclear Engineering Technology education is the applications-oriented nature of the learned capabilities. Graduates must also be able to conduct, analyze, and interpret laboratory experiments related to the technical sciences and the appropriate technical specialties within the nuclear industry served by the program.

The learned capabilities in nuclear technology that are acquired in an upper-division program should either make use of and be built upon the learned capabilities acquired in the lower-division-program, or be new capabilities that were not developed in the lower-division-program. In addition, graduates of baccalaureate programs must demonstrate competence in applying the advanced mathematics, including differential/integral calculus, to the solution of problems commonly encountered in the nuclear industry

served by the program. In solving design problems related to nuclear technology, graduates should demonstrate the ability to balance effort, accuracy, and confidence limit estimates. Graduates also must demonstrate an understanding of the relationship between design and the operation of nuclear systems.

PROGRAM CRITERIA FOR TELECOMMUNICATIONS ENGINEERING TECHNOLOGY AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers

Applicability

These program criteria apply to engineering technology programs that include telecommunications and similar modifiers in their titles.

Objective

An accreditable program in Telecommunications Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the design, application, installation, management, operation, and/or maintenance of telecommunication systems. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing telecommunications systems, whereas baccalaureate degree graduates are well prepared for development and implementation of telecommunications systems.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

a. the application of electric circuits, computer programming, associated software, analog and digital electronics, voice and data communications, and the principles of telecommunications systems in the solution of telecommunications problems.
b. the applications of physics to telecommunications systems in a rigorous mathematical environment at or above the level of algebra and trigonometry.

In addition to the above, graduates of baccalaureate degree programs must demonstrate:

a. the ability to analyze, design, and implement telecommunications systems.
b. the ability to analyze and implement switching technologies, wide area networking technologies, and policy.
c. the ability to manage, design, and plan wide area networks.
d. the ability to utilize statistics/probability, transform methods, or applied differential equations in support of telecommunication systems and wide area networks.

PROPOSED CHANGES TO THE CRITERIA

The following section presents proposed changes to these criteria. These proposals were approved by the Technology Accreditation Commission (TAC) and were brought before the ABET Board of Directors on October 30, 2004 for preliminary approval. Before being approved for final implementation in the accreditation process, these proposals are published here for circulation among the institutions with accredited programs and other interested parties for review and comment.

Comments will be considered until June 15, 2005. The ABET Board of Directors will determine, based on the comments received and on the advice of the TAC, the content of the adopted criteria. The adopted criteria will then become effective following the ABET Board of Directors Meeting in the fall of 2005 and will first be applied by the TAC for accreditation actions during the 2006-2007 academic year and the following years.

Comments relative to the proposed general and program criteria changes should be addressed to: Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012.

PROPOSED
PROGRAM CRITERIA FOR
AERONAUTICAL ENGINEERING TECHNOLOGY
AND SIMILARLY NAMED PROGRAMS
Lead Society: American Institute of Aeronautics and Astronautics

Applicability

These program criteria apply to engineering technology programs that include aeronautical and similar modifiers in their titles.

Objectives

An accreditable program in Aeronautical Engineering Technology will prepare graduates with knowledge, problem solving ability, and hands-on skills to enter careers in the design, installation, manufacturing, testing, evaluation, technical sales, or maintenance of aeronautical/aerospace systems. Level and scope of career preparation will depend on the degree level and specific program orientation. Graduates of associate degree programs typically have strengths in specifying, installing, fabricating, testing, documenting, operating, selling, or maintaining basic support and manufacturing practices for aeronautical/aerospace vehicle and component support. Baccalaureate degree graduates typically have strengths in the analysis, applied design, development, implementation, or oversight of more advanced aeronautical/aerospace systems and process.

Outcomes

Each program must demonstrate that the technical, scientific, and managerial areas of expertise developed by graduates are appropriate to the technical orientation and goals of that program. Much of aeronautical/aerospace engineering technology involves the translation of engineering ideas and concepts into functioning vehicles, engines, and components. It is anticipated that the fundamental experiential skills may incorporate portions of the approved FAA Airframe and Powerplant curriculum.

Associate degree programs must demonstrate that graduates can apply the following principles to the specification, installation, fabrication, test, operation, sales, or documentation of basic aeronautical/aerospace systems:

a. Technical expertise in a minimum of three subject areas chosen from: engineering materials, applied structures, applied mechanics, applied aerodynamics, applied propulsion, and fundamentals of electricity.
b. Technical expertise in assembly and support processes, industry standards, regulations and documentation, and computer-aided engineering graphics with added technical depth in at least one of these areas.
c. Expertise in applied physics having an emphasis in applied mechanics and other technical topics in physics appropriate to the program objectives.

Baccalaureate degree programs must demonstrate that graduates can apply the following concepts to the analysis, development, implementation, or oversight of aeronautical/aerospace systems and processes:

a. Technical expertise in engineering materials, statics, strength of materials, applied aerodynamics, applied propulsion, and either electrical power or electronics.
b. Technical expertise having added depth in a minimum of three subject areas chosen from: manufacturing processes, vehicle design and modification, engineering materials, electro-mechanical devices and controls, industrial operations, and systems engineering including the

appreciation of the engineering design cycle and the system life cycle relating to the manufacture and maintenance of aeronautical/aerospace vehicles and their components.

c. Expertise in applied physics having an emphasis in applied mechanics, plus added technical topics in physics and other science principles appropriate to the program objectives.

PROPOSED
PROGRAM CRITERIA FOR
SURVEYING/GEOMATICS ENGINEERING TECHNOLOGY
AND SIMILARLY NAMED PROGRAMS
Lead Society: American Congress on Surveying and Mapping
Cooperating Society: American Society of Civil Engineers

Applicability

These program criteria apply to engineering technology programs that include surveying or geomatics and similar modifiers in their title.

Objective

An accreditable program in Surveying/Geomatics Engineering Technology will prepare graduates with the technical skills necessary to enter careers in boundary and/or land surveying, geographic and/or land information systems, engineering project surveying, photogrammetry, mapping and geodesy, remote sensing, or other related areas. The level and scope of career preparation will depend on the degree level and specific program orientation. Graduates of associate degree programs typically have strengths in utilizing measurement technologies and field mapping, and possess the ability to interpret basic land records and prepare maps and plats; whereas baccalaureate degree graduates possess a stronger background in geodetic science, photogrammetry and remote sensing, and data analysis, and are prepared to design and select appropriate measurement systems, analyze positional accuracy in conformance with appropriate standards, prepare land records and plats to meet legal requirements, and manage surveying/geomatics activities.

Outcomes

Associate degree programs must demonstrate that graduates are capable of:

a. Utilizing modern measurement technologies to acquire spatial data;
b. Employing industry-standard software to solve technical problems;

Baccalaureate degree programs must demonstrate that graduates, in addition to the competencies above, are capable of:

a. Applying technical concepts to the design of measurement systems to meet project requirements;
b. Analyzing data for conformance with precision and accuracy requirements;
c. Performing standard analysis and design in at least one of the recognized technical specialties within surveying/geomatics technology that are appropriate to the goals of the program. The specialties include boundary and/or land surveying geographic and/or land information systems, engineering project surveying, photogrammetry, mapping and geodesy, and other related areas.

PROPOSED
PROGRAM CRITERIA FOR
ELECTROMECHANICAL ENGINEERING TECHNOLGOY
AND SIMILARLY NAMED PROGRAMS
Lead Society: Institute of Electrical and Electronics Engineers
Cooperating Society: American Society of Mechanical Engineers
Cooperating Society: Instrument Society of America

Applicability

These program criteria apply to engineering technology programs that include electromechanical or similar modifiers in their title.

Objective

An accreditable associate degree program in electromechanical engineering technology will typically prepare graduates with the technical skills necessary to enter careers in the building, installation, application, and operation and/or maintenance of electromechanical hardware and software systems. An accreditable bachelor degree program in electromechanical engineering technology will typically prepare graduates for applied design, development, and management of electromechanical systems.

Outcomes

The field of electromechanical engineering technology depends heavily on the integration of electrical, mechanical, computer, and network components to the design, application, operation, and maintenance of electromechanical systems.

Accordingly:

Graduates of associate degree programs must demonstrate knowledge and technical competency, appropriate to the objectives of the program, to:

a. Use computer-aided drafting or design tools to prepare graphical representations of electromechanical systems.
b. Use circuit analysis, analog and digital electronics, basic instrumentation, and computers to aid in the characterization, analysis, and troubleshooting of electromechanical systems.
c. Use statics, dynamics (or applied mechanics), strength of materials, engineering materials, and manufacturing processes to aid in the characterization, analysis, and troubleshooting of electromechanical systems.

Graduates of baccalaureate degree programs, in addition to the outcomes required of associate degree graduates and appropriate to the objectives of the program, must also demonstrate competency to:

a. Use appropriate computer programming languages for operating electromechanical systems.
b. Use electrical/electronic devices such as amplifiers, motors, relays, power systems, and computer and instrumentation systems for applied design, operation, or troubleshooting electromechanical systems.
c. Use advanced topics in engineering mechanics, engineering materials, and fluid mechanics for applied design, operation, or troubleshooting of electromechanical systems.
d. Use basic knowledge of control systems for the applied design, operation. or troubleshooting of electromechanical systems.
e. Use differential and integral calculus, as a minimum, to characterize the static and dynamic performance of electromechanical systems.

f. Use appropriate management techniques in the investigation, analysis, and design of electromechanical systems.