CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS

Effective for Evaluations During the
2009-2010 Accreditation Cycle

Incorporates all changes
approved by the
ABET
Board of Directors
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Engineering Accreditation Commission

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Criteria for Accrediting Engineering Programs

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Definitions

(From Section II.D.1. of the ABET *Accreditation Policy and Procedure Manual*)

While ABET recognizes and supports the prerogative of institutions to use and adopt the terminology of their choice, it is necessary for ABET volunteers and staff to have a consistent understanding of terminology. With that purpose in mind, the Commissions will use the following basic definitions:

Program Educational Objectives – Program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. Program educational objectives are based on the needs of the program's constituencies.

Student Outcomes – Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative, and qualitative measures as appropriate to the outcome or objective being measured. Appropriate sampling methods may be used as part of an assessment process.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes and program educational objectives are being attained. Evaluation results in decisions and actions regarding program improvement.

These criteria are intended to assure quality and to foster the systematic pursuit of improvement in the quality of engineering education that satisfies the needs of constituencies in a dynamic and competitive environment. It is the responsibility of the program seeking accreditation to demonstrate clearly that the program meets the following criteria.

I. GENERAL CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS

Criterion 1. Students

The program must evaluate student performance, advise students regarding curricular and career matters, and monitor student's progress to foster their success in achieving program outcomes, thereby enabling them as graduates to attain program objectives.

The program must have and enforce policies for the acceptance of transfer students and for the validation of courses taken for credit elsewhere. The program must also have and enforce procedures to assure that all students meet all program requirements.

Criterion 2. Program Educational Objectives

Each program for which an institution seeks accreditation or reaccreditation must have in place:

(a) published educational objectives that are consistent with the mission of the institution and these criteria

(b) a process that periodically documents and demonstrates that the objectives are based on the needs of the program's various constituencies
(c) an assessment and evaluation process that periodically documents and demonstrates the degree to which these objectives are attained.

Criterion 3. Program Outcomes

Engineering programs must demonstrate that their students attain the following outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program. Program outcomes must foster attainment of program educational objectives.

There must be an assessment and evaluation process that periodically documents and demonstrates the degree to which the program outcomes are attained.

Criterion 4. Continuous Improvement

Each program must show evidence of actions to improve the program. These actions should be based on available information, such as results from Criteria 2 and 3 processes.

Criterion 5. Curriculum

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

(a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline

(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative

application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

Criterion 6. Faculty

The faculty must be of sufficient number and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.

The program faculty must have appropriate qualifications and must have and demonstrate sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment, and continuing improvement of the program, its educational objectives and outcomes. The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching effectiveness and experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers.

Criterion 7. Facilities

Classrooms, laboratories, and associated equipment must be adequate to safely accomplish the program objectives and provide an atmosphere conducive to learning. Appropriate facilities must be available to foster faculty-student interaction and to create a climate that encourages professional development and professional activities. Programs must provide opportunities for students to learn the use of modern engineering tools. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the program and institution.

Criterion 8. Support

Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the program. Resources must be sufficient to attract, retain, and provide for the continued professional development of a well-qualified faculty. Resources also must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the program. In addition, support personnel and institutional services must be adequate to meet program needs.

Criterion 9. Program Criteria

Each program must satisfy applicable Program Criteria (if any). Program Criteria provide the specificity needed for interpretation of the baccalaureate level criteria as applicable to a given

discipline. Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications. If a program, by virtue of its title, becomes subject to two or more sets of Program Criteria, then that program must satisfy each set of Program Criteria; however, overlapping requirements need to be satisfied only once.

II. GENERAL CRITERIA FOR MASTERS LEVEL PROGRAMS

Masters level programs must develop, publish, and periodically review, educational objectives and program outcomes. The criteria for masters level programs are fulfillment of the baccalaureate level general criteria, fulfillment of program criteria appropriate to the masters level specialization area, and one academic year of study beyond the baccalaureate level. The program must demonstrate that graduates have an ability to apply masters level knowledge in a specialized area of engineering related to the program area.

III. PROGRAM CRITERIA

PROGRAM CRITERIA FOR AEROSPACE AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Institute of Aeronautics and Astronautics

These program criteria apply to engineering program including "aerospace," "aeronautical," "astronautical," and similar modifiers in their titles.

1. Curriculum

Aeronautical engineering programs must demonstrate that graduates have a knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control.

Astronautical engineering programs must demonstrate that graduates have a knowledge of orbital mechanics, space environment, attitude determination and control, telecommunications, space structures, and rocket propulsion.

Aerospace engineering programs or other engineering programs combining aeronautical engineering and astronautical engineering, must demonstrate that graduates have knowledge covering one of the areas -- aeronautical engineering or astronautical engineering as described above -- and, in addition, knowledge of some topics from the area not emphasized.

Programs must also demonstrate that graduates have design competence that includes integration of aeronautical or astronautical topics.

2. Faculty

Program faculty must have responsibility and sufficient authority to define, revise, implement, and achieve program objectives. The program must demonstrate that faculty teaching upper-division courses have an understanding of current professional practice in the aerospace industry.

PROGRAM CRITERIA FOR AGRICULTURAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society of Agricultural and Biological Engineers

These program criteria apply to engineering programs including “agricultural,” “forest,” and similar modifiers in their titles.

1. Curriculum

Programs must demonstrate that graduates have proficiency in mathematics through differential equations and in biological and engineering sciences consistent with the program educational objectives. Competence must be demonstrated in the application of engineering to agriculture, aquaculture, forestry, human, or natural resources.

2. Faculty

The program shall demonstrate that those faculty members teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of education and experience or professional licensure.

PROGRAM CRITERIA FOR ARCHITECTURAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society of Civil Engineers

Cooperating Society: American Society of Heating, Refrigerating, and Air-Conditioning Engineers

These program criteria apply to engineering programs including "architectural" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: proficiency in mathematics through differential equations, probability and statistics, calculus-based physics, and general chemistry; proficiency in statics, strength of materials, thermodynamics, fluid mechanics, electric circuits, and engineering economics; proficiency in a minimum of two (2) of the three (3) basic curriculum areas of structures, building mechanical and electrical systems, and construction/construction management; engineering design capabilities in at least two (2) of the three (3) basic curriculum areas of architectural engineering, and that design has been integrated across the breadth of the program; and an understanding of architectural design and history leading to architectural design that will permit communication, and interaction, with the other design professionals in the execution of building projects.

2. Faculty

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

The program must demonstrate that faculty teaching courses that are primarily engineering design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. It must also demonstrate that the majority of the faculty members teaching architectural design courses are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience.

PROGRAM CRITERIA FOR BIOENGINEERING AND BIOMEDICAL ENGINEERING AND SIMILARLY NAMED ENGINEERING PROGRAMS

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

These program criteria apply to bioengineering and biomedical engineering programs with the exception of agriculturally-based engineering programs.

1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

The program must demonstrate that graduates have: an understanding of biology and physiology, and the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology; the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.

PROGRAM CRITERIA FOR BIOLOGICAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society of Agricultural and Biological Engineers
Cooperating Societies: American Academy of Environmental Engineers, American Institute of Chemical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, Biomedical Engineering Society, CSAB, Institute of Electrical and Electronics Engineers, Institute of Industrial Engineers, Minerals, Metals, and Materials Society, National Institute of Ceramic Engineers

These program criteria apply to engineering programs including “biological,” “biological systems,” and similar modifiers in their titles with the exception of bioengineering and biomedical engineering programs.

1. Curriculum

Programs must demonstrate that graduates have proficiency in mathematics through differential equations, a thorough grounding in chemistry and biology and a working knowledge of advanced biological sciences consistent with the program educational objectives. Competence must be demonstrated in the application of engineering to biological systems.

2. Faculty

The program shall demonstrate that those faculty members teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of education and experience or professional licensure.

PROGRAM CRITERIA FOR CERAMIC AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: National Institute of Ceramic Engineers

These program criteria apply to engineering programs including "ceramic," "glass," and other similar modifiers in their titles. All programs in the materials related areas share these criteria, including programs with materials, materials processing, ceramics, glass, polymer, metallurgical, and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: the ability to apply advanced science (such as chemistry and physics) and engineering principles to materials systems; an integrated understanding of scientific and engineering principles underlying the four major elements of the field, viz. structure, properties, processing, and performance, related to the material systems appropriate to the field; the ability to apply and integrate knowledge from each of the above four elements of the field to solve material selection and design problems; and the ability to utilize experimental, statistical, and computational methods consistent with the program educational objectives.

2. Faculty

The faculty expertise for the professional area must encompass the above four major elements of the field.

PROGRAM CRITERIA FOR CHEMICAL, BIOCHEMICAL, BIOMOLECULAR, AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Institute of Chemical Engineers

These program criteria apply to engineering programs that include “chemical,” “biochemical,” “biomolecular,” and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: thorough grounding in the basic sciences including chemistry, physics, and biology appropriate to the objectives of the program; and sufficient knowledge in the application of these basic sciences to enable graduates to design, analyze, and control physical, chemical, and biological processes, consistent with the program educational objectives.

PROGRAM CRITERIA FOR
CIVIL
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: American Society of Civil Engineers

These program criteria apply to engineering programs including "civil" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates can: apply knowledge of mathematics through differential equations, calculus-based physics, chemistry, and at least one additional area of science, consistent with the program educational objectives; apply knowledge of four technical areas appropriate to civil engineering; conduct civil engineering experiments and analyze and interpret the resulting data; design a system, component, or process in more than one civil engineering context; explain basic concepts in management, business, public policy, and leadership; and explain the importance of professional licensure.

2. Faculty

The program must demonstrate that faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The program must demonstrate that it is not critically dependent on one individual.

PROGRAM CRITERIA FOR
CONSTRUCTION
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: American Society of Civil Engineers

These program criteria apply to engineering programs including "construction" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate the graduates have: proficiency in mathematics through differential and integral calculus, probability and statistics, general chemistry, and calculus-based physics; proficiency in engineering design in a construction engineering specialty field; an understanding of legal and professional practice issues related to the construction industry; an understanding of construction processes, communications, methods, materials, systems, equipment, planning, scheduling, safety, cost analysis, and cost control; and an understanding of management topics such as economics, business, accounting, law, statistics, ethics, leadership, decision and optimization methods, process analysis and design, engineering economics, engineering management, safety, and cost engineering.

2. Faculty

The program must demonstrate that the majority of faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The faculty must include at least one member who has had full-time experience and decision-making responsibilities in the construction industry.

PROGRAM CRITERIA FOR ELECTRICAL, COMPUTER, AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers
Cooperating Society for Computer Engineering Programs: CSAB

These program criteria apply to engineering programs that include electrical, electronic, computer, or similar modifiers in their titles.

1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives.

Programs containing the modifier “electrical” in the title must also demonstrate that graduates have a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

Programs containing the modifier “computer” in the title must also demonstrate that graduates have a knowledge of discrete mathematics.

PROGRAM CRITERIA FOR ENGINEERING, GENERAL ENGINEERING, ENGINEERING PHYSICS, AND ENGINEERING SCIENCE AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society for Engineering Education

These program criteria apply to engineering (without modifiers), general engineering, engineering physics, engineering science(s), and similarly named engineering programs.

There are no program-specific criteria beyond the General Criteria.

PROGRAM CRITERIA FOR ENGINEERING MANAGEMENT AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Institute of Industrial Engineers

Cooperating Societies: American Institute of Chemical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, Society of Manufacturing Engineers, and Society of Petroleum Engineers

These program criteria apply to engineering programs using management or similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: an understanding of the engineering relationships between the management tasks of planning, organization, leadership, control, and the human element in production, research, and service organizations; an understanding of and dealing with the stochastic nature of management systems. They must also be capable of demonstrating the integration of management systems into a series of different technological environments.

2. Faculty

The major professional competence of the faculty must be in engineering, and the faculty should be experienced in the management of engineering and/or technical activities.

PROGRAM CRITERIA FOR ENGINEERING MECHANICS AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society of Mechanical Engineers

These program criteria apply to engineering programs which include mechanics or similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have the ability to use mathematical and computational techniques to analyze, model, and design physical systems consisting of solid and fluid components under steady state and transient conditions.

2. Faculty

The program must demonstrate that faculty members responsible for the upper-level professional program are maintaining currency in their specialty area.

PROGRAM CRITERIA FOR ENVIRONMENTAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Academy of Environmental Engineers

Cooperating Societies: American Institute of Chemical Engineers, American Society of Agricultural and Biological Engineers, American Society of Civil Engineers, American Society of Heating, Refrigerating and Air-Conditioning Engineers, American Society of Mechanical Engineers, SAE International, and Society for Mining, Metallurgy, and Exploration

These program criteria apply to engineering programs including "environmental", "sanitary," or similar modifiers in their titles.

1. Curriculum

The program must demonstrate the graduates have: proficiency in mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, an earth science, e.g., geology, meteorology, soil science, relevant to the program of study, a biological science, e.g., microbiology, aquatic biology, toxicology, relevant to the program of study, and fluid mechanics relevant to the program of study; introductory level knowledge of environmental issues associated with air, land, and water systems and associated environmental health impacts; an ability to conduct laboratory experiments and to critically analyze and interpret data in more than one major environmental engineering focus areas, e.g., air, water, land, environmental health; an ability to perform engineering design by means of design experiences integrated throughout the professional component of the curriculum; proficiency in advanced principles and practice relevant to the program objectives; understanding of concepts of professional practice and the roles and responsibilities of public institutions and private organizations pertaining to environmental engineering.

2. Faculty

The program must demonstrate that a majority of those faculty teaching courses which are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and equivalent design experience.

PROGRAM CRITERIA FOR GEOLOGICAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society for Mining, Metallurgical, and Exploration

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

1. Curriculum

The program must demonstrate that graduates have:

(1) the ability to apply mathematics including differential equations, calculus-based physics, and chemistry, to geological engineering problems;

(2) proficiency in geological science topics that emphasize geologic processes and the identification of minerals and rocks;

(3) the ability to visualize and solve geological problems in three and four dimensions;

(4) proficiency in the engineering sciences including statics, properties/strength of materials, and geomechanics;

(5) the ability to apply principles of geology, elements of geophysics, geological and engineering field methods; and

(6) engineering knowledge to design solutions to geological engineering problems, which will include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including surface water, ground water (hydrogeology), and fluid hydrocarbons; the effects of surface and near-surface natural processes; the impacts of construction projects; the impacts of exploration, development, and extraction of natural resources, and consequent remediation; disposal of wastes; and other activities of society on these materials and processes, as appropriate to the program objectives.

2. Faculty

Evidence must be provided that the program's faculty members understand professional engineering practice and maintain currency in their respective professional areas. The program's faculty must have responsibility and authority to define, revise, implement, and achieve program objectives.

PROGRAM CRITERIA FOR INDUSTRIAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Institute of Industrial Engineers

These program criteria apply to engineering programs using industrial or similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have the ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy.

The program must include in-depth instruction to accomplish the integration of systems using appropriate analytical, computational, and experimental practices.

2. Faculty

Evidence must be provided that the program faculty understand professional practice and maintain currency in their respective professional areas. Program faculty must have responsibility and sufficient authority to define, revise, implement, and achieve program objectives.

PROGRAM CRITERIA FOR MANUFACTURING AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society of Manufacturing Engineers

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

1. Curriculum

The program must demonstrate that graduates have proficiency in materials and manufacturing processes: understanding the behavior and properties of materials as they are altered and influenced by processing in manufacturing; process, assembly and product engineering: understanding the design of products and the equipment, tooling, and environment necessary for their manufacture; manufacturing competitiveness: understanding the creation of competitive advantage through manufacturing planning, strategy, and control; manufacturing systems design: understanding the analysis, synthesis, and control of manufacturing operations using statistical and calculus based methods, simulation and information technology; laboratory experience: graduates must be able to measure manufacturing process variables in a manufacturing laboratory and make technical inferences about the process.

2. Faculty

The program must demonstrate that faculty members maintain currency in manufacturing engineering practice.

PROGRAM CRITERIA FOR MATERIALS[1], METALLURGICAL[2], AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Minerals, Metals & Materials Society

[1]Cooperating Societies for Materials Engineering Programs: National Institute of Ceramics Engineers, American Institute of Chemical Engineers, and American Society of Mechanical Engineers

[2]Cooperating Society for Metallurgical Engineering Programs: Society for Mining, Metallurgy, and Exploration

These program criteria apply to engineering programs including "materials," "metallurgical," "polymer," and similar modifiers in their titles. All programs in the materials related areas share these criteria, including programs with materials, materials processing, ceramics, glass, polymer, metallurgical, and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: the ability to apply advanced science (such as chemistry and physics) and engineering principles to materials systems implied by the program modifier, e.g., ceramics, metals, polymers, composite materials, etc.; an integrated understanding of the scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to material systems appropriate to the field; the ability to apply and integrate knowledge from each of the above four elements of the field to solve materials selection and design problems; the ability to utilize experimental, statistical and computational methods

consistent with the program educational objectives.

2. Faculty

The faculty expertise for the professional area must encompass the four major elements of the field.

PROGRAM CRITERIA FOR MECHANICAL AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Society of Mechanical Engineers

These program criteria will apply to all engineering programs including "mechanical" or similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have the ability to: apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyze, design, and realize physical systems, components or processes; and work professionally in both thermal and mechanical systems areas.

2. Faculty

The program must demonstrate that faculty members responsible for the upper-level professional program are maintaining currency in their specialty area.

PROGRAM CRITERIA FOR MINING AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society for Mining, Metallurgy, and Exploration

These program criteria apply to engineering programs including "mining" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: the ability to apply mathematics through differential equations, calculus-based physics, general chemistry, and probability and statistics as applied to mining engineering problems applications; fundamental knowledge in the geological sciences including characterization of mineral deposits, physical geology, structural or engineering geology, and mineral and rock identification and properties; proficiency in statics, dynamics, strength of materials, fluid mechanics, thermodynamics, and electrical circuits; proficiency in engineering topics related to both surface and underground mining, including: mining methods, planning and design, ground control and rock mechanics, health and safety, environmental issues, and ventilation; proficiency in additional engineering topics such as rock fragmentation, materials handling, mineral or coal processing, mine surveying, and valuation and resource/reserve estimation as appropriate to the program objectives.

The laboratory experience must lead to proficiency in geologic concepts, rock mechanics, mine ventilation, and other topics appropriate to the program objectives.

2. Faculty

Evidence must be provided that the program faculty understand professional engineering practice and maintain currency in their respective professional areas. Program faculty must have responsibility and authority to define, revise, implement, and achieve program objectives.

PROGRAM CRITERIA FOR NAVAL ARCHITECTURE, MARINE ENGINEERING, AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society of Naval Architects and Marine Engineers

These program criteria apply to engineering programs including "naval architecture" and/or "marine engineering" and with similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: the ability to apply probability and statistical methods to naval architecture and marine engineering problems; basic knowledge of fluid mechanics, dynamics, structural mechanics, materials properties, hydrostatics, and energy/propulsion systems in the context of marine vehicles; familiarity with instrumentation appropriate to naval architecture and/or marine engineering.

2. Faculty

Program faculty must have sufficient curricular and administrative control to accomplish the program objectives. Program faculty must have responsibility and sufficient authority to define, revise, implement and achieve the program objectives.

PROGRAM CRITERIA FOR NUCLEAR, RADIOLOGICAL, AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Nuclear Society

These program criteria apply to engineering programs including "nuclear," "radiological," or similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: the ability to apply advanced mathematics, science and engineering science, including atomic and nuclear physics, and the transport and interaction of radiation with matter, to nuclear and radiological systems and processes; ability to perform nuclear engineering design; ability to measure nuclear and radiation processes; ability to work professionally in one or more of the nuclear or radiological fields of specialization identified by the program.

2. Faculty

The program must demonstrate that faculty members primarily committed to the program have current knowledge of nuclear or radiological engineering by education or experience.

PROGRAM CRITERIA FOR OCEAN AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society of Naval Architects and Marine Engineers
Cooperating Societies: American Society of Civil Engineers
and Institute of Electrical and Electronics Engineers

These program criteria apply to engineering programs including "ocean" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have: knowledge and the skills to apply the principles of fluid and solid mechanics, dynamics, hydrostatics, probability and applied statistics, oceanography, water waves, and underwater acoustics to engineering problems; the ability to work in groups to perform engineering design at the system level, integrating multiple technical areas and addressing design optimization.

2. Faculty

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

PROGRAM CRITERIA FOR PETROLEUM AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: Society of Petroleum Engineers

These program criteria apply to engineering programs that include "petroleum," "natural gas," and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have competency in: mathematics through differential equations, probability and statistics, fluid mechanics, strength of materials, and thermodynamics; design and analysis of well systems and procedures for drilling and completing wells; characterization and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods; design and analysis of systems for producing, injecting, and handling fluids; application of reservoir engineering principles and practices for optimizing resource development and management; use of project economics and resource valuation methods for design and decision making under conditions of risk and uncertainty.

PROGRAM CRITERIA FOR SOFTWARE AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: CSAB

Cooperating Society: Institute of Electrical and Electronics Engineers

These program criteria apply to engineering programs that include “software” or similar modifiers in their titles.

1. Curriculum

The curriculum must provide both breadth and depth across the range of engineering and computer science topics implied by the title and objectives of the program.

The program must demonstrate that graduates have: the ability to analyze, design, verify, validate, implement, apply, and maintain software systems; the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems; and the ability to work in one or more significant application domains.

PROGRAM CRITERIA FOR SURVEYING AND SIMILARLY NAMED ENGINEERING PROGRAMS

Lead Society: American Congress on Surveying and Mapping

Cooperating Society: American Society of Civil Engineers

These program criteria apply to engineering programs including "surveying" and similar modifiers in their titles.

1. Curriculum

The program must demonstrate that graduates have competency in one or more of the following areas: boundary and/or land surveying, geographic and/or land information systems, photogrammetry, mapping, geodesy, remote sensing, and other related areas.

2. Faculty

Programs must demonstrate that faculty members teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure or by educational and design experience.

PROPOSED CHANGES TO THE CRITERIA

The following section presents two sets of proposed changes to these criteria. These proposals were approved by the Engineering Accreditation Commission (EAC) and were brought before the ABET Board of Directors on November 1, 2008 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.

For the first set of proposed changes, approved for a one-year first reading review and comment period, comments will be considered until June 15, 2009. The ABET Board of Directors will determine, based on the comments received and on the advice of the EAC, the content of the adopted criteria. The adopted criteria will then become effective following the ABET Board of Directors Meeting in the fall of 2009 and will first be applied by the EAC for accreditation actions during the 2010-11 academic year.

For the second set of proposed changes the ABET Board of Directors has approved a two-year first reading review and comment period for the EAC Harmonized Criteria. Comments will be considered until April 1, 2010. The ABET Board of Directors will determine, based on the comments received and on the advice of the EAC, the content of the adopted harmonized criteria in the fall of 2010 and will first be applied by the EAC for accreditation actions during the 2011-2012 academic year.

Comments relative to the proposed criteria changes should be addressed to: Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 or to accreditation@abet.org.

PROPOSED REVISION TO THE
PROGRAM CRITERIA FOR
BIOENGINEERING AND BIOMEDICAL ENGINEERING PROGRAMS
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: Biomedical Engineering Society
Cooperating Societies: American Institute of Chemical Engineers,
American Society of Agricultural and Biological Engineers,
American Society of Mechanical Engineers,
Institute of Electrical and Electronics Engineers, and National Institute of Ceramic Engineers

These program criteria apply to ~~bio~~engineering programs ~~and biomedical engineering programs~~ including "bioengineering," "biomedical," and similar modifiers in their titles. ~~with the exception of agriculturally-based engineering programs.~~

1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

The program must demonstrate that graduates have: an understanding of biology and physiology, and the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology; the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.

PROPOSED REVISION TO THE
PROGRAM CRITERIA FOR
BIOLOGICAL
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: American Society of Agricultural and Biological Engineers,
Cooperating Societies: American Academy of Environmental Engineers,
American Institute of Chemical Engineers, American Society of Civil Engineers,
American Society of Mechanical Engineers, Biomedical Engineering Society,
Institute of Electrical and Electronics Engineers,
Institute of Industrial Engineers, Minerals, Metals, & Materials Society,
National Institute of Ceramic Engineers

These program criteria apply to engineering programs including "biological," "biological systems," "food," and similar modifiers in their titles with the exception of bioengineering and biomedical engineering programs.

1. Curriculum

Programs must demonstrate that graduates have proficiency in mathematics through differential equations, a thorough grounding in chemistry and biology and a working knowledge of advanced biological sciences consistent with the program educational objectives. Competence must be

demonstrated in the application of engineering to biological systems.

2. Faculty

The program shall demonstrate that those faculty members teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of education and experience or professional licensure.

PROPOSED REVISION TO THE
PROGRAM CRITERIA FOR
SOFTWARE
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: CSAB
Cooperating Society: Institute of Electrical and Electronics Engineers

These program criteria apply to engineering programs that include "software" or similar modifiers in their titles.

1. Curriculum

The curriculum must provide both breadth and depth across the range of engineering and computer science topics implied by the title and objectives of the program.

The program must demonstrate that graduates have: the ability to analyze, design, verify, validate, implement, apply, and maintain software systems; the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems; ~~and~~ the ability to work in one or more significant application domains; and the ability to manage the development of software systems.

PROPOSED
PROGRAM CRITERIA FOR
SYSTEMS
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Societies: American Society of Mechanical Engineers,
Institute of Electrical and Electronics Engineers, Institute of Industrial Engineers,
ISA, International Council on Systems Engineering, and
SAE International

These program criteria apply to systems engineering programs without modifiers in their title.

There are no program- specific criteria beyond the General Criteria.

PROPOSED

EAC Harmonized General Criteria

Introduction

These criteria are intended to assure quality and to foster the systematic pursuit of improvement in the quality of engineering education that satisfies the needs of constituencies in a dynamic and competitive environment. It is the responsibility of the institution seeking accreditation of an engineering program to demonstrate clearly that the program meets the following criteria.

This document contains three sections. The first section includes important **definitions** used by all ABET commissions. These definitions, taken from the ABET Accreditation Policy and Procedure Manual, are included here so that this document is self-contained.

The second section contains the **General Criteria for Baccalaureate Level Programs** that must be satisfied by all programs accredited by the Engineering Accreditation Commission of ABET and the **General Criteria for Masters Level Programs** that must be satisfied by those programs seeking advanced level accreditation.

The third section contains the **Program Criteria** that must be satisfied by certain programs. The applicable Program Criteria are determined by the technical specialties indicated by the title of the program. Overlapping requirements need to be satisfied only once.

Definitions

(From Section II.D.1. of the ABET *Accreditation Policy and Procedure Manual*)

While ABET recognizes and supports the prerogative of institutions to adopt and use the terminology of their choice, it is necessary for ABET volunteers and staff to have a consistent understanding of terminology. With that purpose in mind, the Commissions will use the following basic definitions:

Program Educational Objectives – Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies.

Student Outcomes – Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative, and qualitative measures as appropriate to the outcome or objective being measured. Appropriate sampling methods may be used as part of an assessment process.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes and program educational objectives are being attained. Evaluation results in decisions and actions regarding program improvement.

I. GENERAL CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS

All programs seeking accreditation from the Engineering Accreditation Commission of ABET must demonstrate that they satisfy all of the following General Criteria for Baccalaureate Level Programs.

Criterion 1. Students

Student performance must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.

The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution. The program must have and enforce procedures to assure that students who graduate meet all graduation requirements.

Criterion 2. Program Educational Objectives

The program must have in place published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. There must be a documented and effective process, involving program constituencies, for the periodic review and revision of these program educational objectives.

Criterion 3. Student Outcomes

The program must have documented student outcomes that prepare graduates to attain the program educational objectives.

Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Criterion 4. Continuous Improvement

The program must use assessment data for regular evaluations. The results of these evaluations must

be systematically used to effect continuous improvement of the program. Other information may also be used in effecting continuous improvement.

Criterion 5. Curriculum

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

(a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline

(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.

Criterion 6. Faculty

The faculty must be of sufficient number and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.

The program faculty must have appropriate qualifications and must have and demonstrate sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment, and continuing improvement of the program, its educational objectives and outcomes. The overall competence of the faculty may be judged by such factors as education, diversity of backgrounds, engineering experience, teaching effectiveness and experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers.

Criterion 7. Facilities

Classrooms, offices, laboratories, and associated equipment must be safe and adequate to support attainment of the student outcomes and to provide an atmosphere conducive to learning. Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available, accessible, and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs. Students must be provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories available to the program.

The library services and the computing and information infrastructure must be adequate to support the scholarly and professional activities of the students and faculty.

Criterion 8. Institutional Support

Institutional support and leadership must be adequate to ensure the quality and continuity of the program.

Resources available to the program must be sufficient to attract, retain, and provide for the continued professional development of a qualified faculty. Resources available to the program must be sufficient to provide, operate, and maintain infrastructures, facilities and equipment appropriate for attainment of student outcomes.

II. GENERAL CRITERIA FOR MASTERS LEVEL PROGRAMS

Masters level programs must develop, publish, and periodically review, educational objectives and program outcomes. The criteria for masters level programs are fulfillment of the baccalaureate level general criteria, fulfillment of program criteria appropriate to the masters level specialization area, and one academic year of study beyond the baccalaureate level. The program must demonstrate that graduates have an ability to apply masters level knowledge in a specialized area of engineering related to the program area.

III. PROGRAM CRITERIA

Each program must satisfy applicable Program Criteria (if any). Program Criteria provide the specificity needed for interpretation of the baccalaureate level criteria as applicable to a given discipline. Requirements stipulated in the Program Criteria are limited to the areas of curricular topics and faculty qualifications. If a program, by virtue of its title, becomes subject to two or more sets of Program Criteria, then that program must satisfy each set of Program Criteria; however, overlapping requirements need to be satisfied only once.