CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS

Effective for Evaluations During the
2007-2008 Accreditation Cycle

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

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TABLE OF CONTENTS

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Criteria for Accrediting Engineering Programs

Effective for Evaluations during the 2007-2008 Accreditation Cycle

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.

I. GENERAL CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS

Criterion 1. Students

The quality and performance of the students and graduates are important considerations in the evaluation of an engineering program. The institution 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 institution must have and enforce policies for the acceptance of transfer students and for the validation of courses taken for credit elsewhere. The institution must also have and enforce procedures to assure that all students meet all program requirements.

Criterion 2. Program Educational Objectives

Although institutions may use different terminology, for purposes of Criterion 2, program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

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

(a) detailed published educational objectives that are consistent with the mission of the institution and these criteria
(b) a process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated
(c) an educational program, including a curriculum that prepares students to attain program outcomes and that fosters accomplishments of graduates that are consistent with these objectives
(d) a process of ongoing evaluation of the extent to which these objectives are attained, the result of which shall be used to develop and improve the program outcomes so that graduates are better prepared to attain the objectives.

Criterion 3. Program Outcomes and Assessment

Although institutions may use different terminology, for purposes of Criterion 3, program outcomes are statements that 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 student acquire in their matriculation through the program.

Each program must formulate program outcomes that foster attainment of the program objectives articulated in satisfaction of Criterion 2 of these criteria. There must be processes to produce these outcomes and an assessment process, with documented results, that demonstrates that these program outcomes are being measured and indicates the degree to which the outcomes are achieved. There must be evidence that the results of this assessment process are applied to the further development of the program.

Engineering programs must demonstrate that their students attain:

(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 multi-disciplinary 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.

In addition, an engineering program must demonstrate that its students attain any additional outcomes articulated by the program to foster achievement of its education objectives.

Criterion 4. Professional Component

The professional component 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 the 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 5. Faculty

The faculty is the heart of any educational program. 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 experience, ability to communicate, enthusiasm for developing more effective programs, level of scholarship, participation in professional societies, and licensure as Professional Engineers.

Criterion 6. Facilities

Classrooms, laboratories, and associated equipment must be adequate to 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 7. Institutional Support and Financial Resources

Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering 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 engineering program. In addition, support personnel and institutional services must be adequate to meet program needs.

Criterion 8. 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

Criteria for masters level programs are completion of a program of study satisfying the general criteria for baccaureate level engineering programs, one academic year of study beyond the baccalaureate level, and an engineering project or research activity resulting in a report that demonstrates both mastery of the subject matter and a high level of communication skills.

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 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 have: proficiency in mathematics through differential equations, probability and statistics, calculus-based physics, and general chemistry; proficiency in a minimum of four (4) recognized major civil engineering areas; the ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas; the ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum; and an understanding of professional practice issues such as: procurement of work, bidding versus quality-based selection processes, how the design professionals and the construction professions interact to construct a project, the importance of professional licensure and continuing education, and/or other professional practice issues.

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, Society of Automotive Engineers, 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: knowledge of chemistry and calculus-based physics with depth in at least one; the ability to apply advanced mathematics through multivariate calculus and differential equations; familiarity with statistics and linear algebra; the ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems.

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.

1. 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 named naval architecture and/or marine engineering and 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

This section presents proposed changes to the criteria.

The following proposals were approved by the Engineering Accreditation Commission (EAC) and were brought before the ABET Board of Directors on October 28, 2006 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. The proposals include:

1. Revisions to Criterion 5 and 6 of the General Criteria for Baccalaureate Level Programs
2. Revisions to the General Criteria for Masters Level Programs
3. Revisions to Program Criteria for
   a. Civil Engineering
   b. Mechanical Engineering

Comments about these revisions will be considered until June 15, 2007. The ABET Board of Directors will determine, based on the comments received and on the advice of the Engineering Accreditation Commission, the content of the adopted criteria. The adopted criteria will then be first applied by the EAC for accreditation actions during the 2008-2009 accreditation cycle.

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

Please note that the ABET Board of Directors also approved a revision of Section II.B.8.a. of the ABET *Accreditation Policy and Procedure Manual*. This revision replaces the "level designations" of basic or advanced with baccalaureate or masters for programs accredited by the EAC.

IMPORTANT NOTICE

The ABET Board of Directors has mandated that the General Criteria of ABET's four Accreditation Commissions be restructured so that the various criteria sections occur in the same order. This restructuring also included some editorial revisions to improve the consistency and clarity of the criteria. Every effort was made to accomplish these objectives without changing the intent of any of the criteria.

ABET's Accreditation Council prepared a draft of the General Criteria at its meeting of January 13, 2007, and the ABET Board of Directors approved the General Criteria at its meeting of March 17, 2007, for implementation in the 2008-2009 accreditation cycle. The Program Criteria remain unchanged.

A revised Self-Study Questionnaire for the 2008-2009 accreditation cycle will be posted at www.abet.org by July 1, 2007.

Criteria for Accrediting Engineering Programs

Effective for Evaluations during the 2008-2009 Accreditation Cycle

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 the career and professional accomplishments that the program is preparing graduates to achieve.

Program Outcomes – Program outcomes are narrower statements that 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 in their matriculation through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes or program educational objectives are being achieved, and results in decisions and actions to improve the program.

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 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 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.

PROPOSED REVISION TO THE
GENERAL CRITERIA FOR BACCAULEATE LEVEL PROGRAMS

Criterion 5. Faculty

The faculty is the heart of any educational program. 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 6. 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.

PROPOSED REVISION TO THE
GENERAL CRITERIA FOR MASTERS LEVEL PROGRAMS

II. GENERAL CRITERIA FOR ADVANCED LEVEL PROGRAMS

Advanced level programs must develop, publish, and periodically review, educational objectives and program outcomes. The ~~C~~criteria for advanced level programs are ~~completion of a program of study satisfying the~~ fulfillment of the basic level general criteria, fulfillment of program criteria appropriate to the advanced level specialization area, ~~for basic level engineering programs,~~ and one academic year of study beyond the basic level~~,~~ ~~and an engineering project or research activity resulting in a report that demonstrates both mastery of the subject matter and a high level of communication skills.~~ The program must demonstrate that graduates have an ability to apply advanced level knowledge in a specialized area of engineering related to the program area.

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

1. Curriculum

The program must demonstrate that graduates ~~have: proficiency in~~ can apply knowledgeof mathematics through differential equations, ~~probability and statistics,~~ calculus-based physics, ~~and general~~ chemistry, and at least one additional area of science, consistent with the program educational objectives; can apply knowledge ~~proficiency in a minimum~~ of four ~~(4) recognized~~ technical areas appropriate to ~~major~~ civil engineering ~~areas~~; can conduct civil engineering ~~the ability to conduct laboratory~~ experiments ~~and~~ to ~~critically~~ analyze and interpret the resulting data ~~in more than one of the recognized major civil engineering areas~~; ~~the ability to perform civil engineering~~ can design a system, component, or process in more than one civil engineering context; ~~by means of design experiences integrated throughout the professional component of the curriculum~~; ~~and an understanding of professional practice issues such as: procurement of work, bidding versus quality-based selection processes, how the design professionals and the construction professions interact to construct a project,~~ can explain basic concepts in management, business, public policy, and leadership; and can explain the importance of professional licensure ~~and continuing education, and/or other professional practice issues~~.

PROPOSED REVISION TO
PROGRAM CRITERIA FOR
MECHANICAL
AND SIMILARLY NAMED ENGINEERING PROGRAMS
Lead Society: American Society of Mechanical Engineers

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 have the ability to work professionally in both thermal and mechanical systems areas.