

Criteria for Accrediting Engineering Programs

Effective for Evaluations during the 2005-2006 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 BASIC 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 basic 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.

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 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.