

International Common Criteria and Criteria Guide

Preamble

The Indonesian Accreditation Board for Engineering Education (IABEE) builds this set of Criteria using outcome-based education approach. All engineering education programs seeking international accreditation from IABEE shall fulfill the following Criteria.

- IABEE Common Criteria (CC) are established as a framework to perform accreditation of higher education programs. These CC comprise of elements that shall be fulfilled by the Program.
- Program shall define the profile of autonomous professionals to be fostered and define the abilities and knowledge as learning outcomes that the graduates are expected to acquire at the time of completion of the study.
- Program should promote self-reliance, welfare, advancement, fairness and justice for the national and global community in general, based on science, technology, culture and sustainable utilization of natural resources.
- Programs to be accredited are four-year bachelor of engineering programs or other higher education programs which IABEE considered as equivalent.
- Program is required to design the curriculum systematically to ascertain the achievement of the learning outcomes. Student and faculty should be aware of the learning outcomes.
- It is important for Program to broadly publicize the learning outcomes to the society. Program is also required to engage in continual improvement and at the same time to consider the sustainability of operation.
- Program is not necessarily limited to the case where a department offers a single program. It is allowed for multiple departments to jointly form a program, and for a department to operate multiple programs as long as the program has a well-defined body of knowledge. Program may include some subjects to be learnt off home campus in cooperation with other higher education institutions.
- The Common Criteria consist of 4 elements, following the management approach of PDCA (Plan Do Check Act). Criterion 1 deals with the orientation of the graduate competence, Criterion 2 explains the learning implementation, Criterion 3 explains the assessment of the expected learning outcomes, and Criterion 4 explains the continual improvements.
- In addition to these Common Criteria, Program seeking for accreditation shall fulfill also the Category and Discipline Criteria.

Criterion 1: Orientation of the Graduate Competence

- Program shall define the profile of graduates to be envisaged as autonomous professionals by considering country's potential resources, cultures, needs and interests.

- Program is required to define the profile of the autonomous professionals intended to foster as its educational objectives, by taking account of :
 - (1) Local and/or national resources, such as human and physical resources.
 - (2) Local and/or national wisdoms,
 - (3) Local and national needs and interests, and
 - (4) Traditions, vision and mission of the education institution.
- Program should demonstrate the process of establishing and periodic reviewing of the autonomous professional profiles, including the involvements of the stakeholders.

- Program shall inform its students and faculty with the envisaged autonomous professional profile and widely publicize it.

- The envisaged autonomous professional profile shall be informed to students and faculty and made accessible to the general public.

- Program shall establish its expected learning outcomes which consist of abilities to utilize knowledge, skills, resources and attitudes as described in the following (a) to (j) items to be acquired by the student at the time of completion of the study:

- Utilization of resources such as rich and unique biodiversity as a comparative advantage should be equipped with human resources with necessary knowledge, skill and attitude to achieve competitive advantage.
- Program shall establish its own learning outcomes based on the autonomous professional profile to be acquired. The learning outcomes shall cover all graduate competences from (a) to (j) as mentioned in Common Criteria 1 (3), which are expressed in such a way to give flexibility to Program. It is important to note that the learning outcomes shall take into account also the Category and Discipline Criteria.
- Program shall define appropriate performance indicators and associated assessment method for each learning outcome.

- (a) an ability to apply knowledge of mathematics, natural and/or materials sciences, information technology and engineering to acquire comprehensive understanding of engineering principles.

- Engineering Principles refers to ideas, rules and concepts to be considered when solving an engineering problem. The set of principles may vary among engineering disciplines depending on the uniqueness of systems, problems, ethical issues, and problem solving methods of the discipline.
- Attaining comprehensive understanding of engineering principles is indicated by acquisition of :
 - 1) Mathematics, basic sciences (such as physics, biology, chemistry) and information technology in the engineering field of Program.
 - 2) An ability to utilize the aforementioned knowledge.

(b) an ability to design components, systems, and/or processes to meet desired needs within realistic constraints in such aspects as law, economic, environment, social, politics, health and safety, sustainability as well as to recognize and/or utilize the potential of local and national resources with global perspective.

- The ability to design components, systems, and/or processes is the hallmark competence of engineering education. Design implies the ability to utilize multidimensional thinking with knowledge of global perspective to develop components, systems, and/or processes to achieve specific objectives. It is not limited to drawing a plan, but also refers to the synthesis of various academic disciplines and technologies to pursue practicable solutions to a problem that does not necessarily have one correct answer.
- It involves also a process of optimization by taking into account some realistic constraints, such as law, economic, environment, social, politics, health and safety, and sustainability as well as utilization of the knowledge of culture, society and available resources.

(c) an ability to design and conduct laboratory and/or field experiments as well as to analyze and interpret data to strengthen the engineering judgment.

- This competence refers to the design and application of laboratory and/or field experiments within the broad context of engineering practice such as problem identification, testing of potential solution ideas, solution implementation plan, and other design-related activities.
- Experiments may include activities in physical laboratories, computer simulations, and field experiments.

(d) an ability to identify, formulate, analyze, and solve engineering problems.

- Engineering problem solving involves iterative activities incorporating the definition of the problem, development of solution alternatives, selection of best alternative, application of solution, evaluation and validation of solution against problem constraints, and revision of solution.

- This competence may include the ability to
 - ✓ utilize techniques and methods for performing engineering works comprising survey, data analysis, planning, design, operation and maintenance.
 - ✓ apply the engineering logical thinking for handling both of the design and trouble shooting context.

(e) an ability to apply methods, skills and modern engineering tools necessary for engineering practices.

- Program shall have a clear definition of the methods, skills, and modern engineering tools appropriate for its level of study and engineering discipline, and how these are learnt throughout the curriculum.
- An ability to select a method and tools with their strength and limitation characteristics for a given problem.
- An ability to utilize and adjust the method and tools to suit specific problems.

(f) an ability to communicate effectively in oral and written manners.

- This competence indicates the need of active and effective communication skills; socio-cultural perspective should be considered for the acceptability and workability of the implementation of engineering works.
- These oral and written communications should include the use of engineering standards.
- Program shall ensure that a measureable portion of the oral and/or written communications involve the use of internationally recognized languages.

(g) an ability to plan, accomplish, and evaluate tasks under given constraints.

- This competence refers to the ability to plan, accomplish, and evaluate tasks associated with any curricular activity deemed appropriate by Program for its assessment and evaluation. The assessment should focus more on the students' task management skills rather than the substantial outcome of the task itself.

(h) an ability to work in multidisciplinary and multicultural team.

- This competence refers to the ability to work collaboratively with people from different technical disciplines, fields and cultural backgrounds.
- Multicultural concerns such as tolerance, mutual understanding, appreciation on differences in building a synergy, are important considerations for the success of a team work.
- Multidiscipline circumstances may cover disciplines within engineering and non-engineering

disciplines.

(i) An ability to be accountable and responsible to the society and adhere to professional ethics in solving engineering problems.

- This competence refers to the understanding on the following issues and the ability to take action accordingly.
 - ✓ the impact of technology of related engineering fields on public welfare, environmental safety and sustainable development
 - ✓ the engineering ethics and regulations
 - ✓ the engineering history and standard & code philosophy in design.

(j) an ability to understand the need for life-long learning, including access to the relevant knowledge of contemporary issues.

- Program is required to assist students to get accustomed to independent and continuous learning through lectures, research, experiments, practical training, exercises and assignment.
- This competence refers to
 - ✓ Understanding the necessity of continuous professional development.
 - ✓ an ability to acquire updated information and knowledge.
 - ✓ an awareness of the importance of sharing knowledge.

Criterion 2: Learning Implementation

2.1 Curriculum

- (1) Curriculum shall include the following subject areas:
- (a) Mathematics and discipline-specific natural sciences
 - (b) Discipline-specific engineering science and technology
 - (c) Information and communication technology
 - (d) Engineering design and problem based experiments
 - (e) General education, which includes morality, ethics, socio-culture, environment and management

- Program shall ensure that the curriculum meets the above mentioned subject areas appropriate to engineering regardless the subject/course names. The program must ensure that the curriculum devotes adequate attention and time to each component, consistent with the learning outcomes, which include:
 - ✓ A minimum of 20% of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline. Basic sciences are defined as courses such as biological, chemical, or physical sciences.

- ✓ A minimum of 40% 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 practices 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, in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet the stated needs.
- ✓ A maximum of 30% general education components that complement the technical content of the curriculum and are consistent with the learning outcomes.

(2). Curriculum development shall consider inputs from Program stakeholders.

- Program should demonstrate on how to develop the curriculum and to assure the requirement of the society, industry and professional fields.
- There must be a documented, systematically utilized, and effective procedure describing the way to meet the need of stakeholders and to review the curriculum periodically to ensure its consistency with the institutional mission, the stakeholders needs, and these criteria.
- Program should provide sufficient opportunity for the stakeholders to discuss Program educational objectives and to foster closer collaboration.

(3) Curriculum shall indicate the structural relationship and contributions of the subject courses to fulfill learning outcomes. Procedures, including syllabus, shall be established and documented so that the expected learning process can be implemented in a controlled way.

- Program shall describe how the curriculum content and structure are aligned to attain the learning outcomes.
- Program should explain how the specific requirements of each curricular area addressed in the Common Criteria or Discipline Criteria can be met, both in terms of load and depth of the material.
- Program shall establish a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements or any applicable criteria.
- Program is required to implement educational activities for students to achieve its learning outcomes.
- Program is required to systematically design curriculum to enable students to achieve the learning outcomes within the allocated academic years.-
- Program is required to adequately inform the faculty and the students through various means such as guidebooks, orientation programs etc. about the curriculum and how the

learning outcomes will be realized through the learning process.

(4) Curriculum shall ensure that the students are exposed to engineering practices and major design project experience using engineering standards and multiple realistic constraints based on knowledge and skills acquired in preceding course work.

- Program must provide opportunity to students to develop competence in practical application of engineering skills, combining theory and experience along with the use of other relevant knowledge and skills. Training in engineering practices may be supported by several courses (subjects) but should culminate in a major design project. This major project serves as a capstone for the program which requires students to integrate knowledge and skills acquired in earlier coursework.
- Program shall define curriculum subjects to optimally support main stream of discipline specific requirements and to provide opportunity for students to acquire practical experience in implementing the subjects in an actual working environment.

2.2 Faculty

(1) Program shall provide necessary number, qualification and competence of faculty members for performing learning process, including planning, delivering, evaluating, and continually improving its effectiveness in order to achieve the learning outcomes.

- Program shall describe the qualifications of the faculty and their adequacy to cover all curricular areas and also to meet any criteria apply.
- This description should include the composition, size, experience and the extent and quality of faculty member involvement in interactions with students, student advising, and oversight of Program.
- Program shall provide detailed descriptions of professional development activities for each faculty member and how activities such as sabbaticals, travel, workshops, seminars, etc., are planned and supported.

(2) Program shall ensure that the faculty members are aware of the relevance and importance of their roles and contributions to the learning outcomes.

- Program shall describe the role played by the faculty with respect to the course creation, modification, and evaluation, and with respect to the definition, revision and attainment of the learning outcomes.
- Program shall have a method to institutionally develop and evaluate faculty educational activities.
- Program shall define and set up communication network among faculty members for close

collaboration among the courses set in the curriculum to obtain better educational results.

2.3 Students and Academic Atmosphere

(1) Program shall define and implement an entry standard for both new and transfer students, as well as transfer of credits.

- Program shall establish written policies on student admission, covering the requirements and the process for accepting new students into Program, including information on how Program ensures and documents that students are meeting prerequisites and how it handles the situation when a prerequisite has not been met.
- Program shall describe the requirements and process for accepting transfer students and transfer credits.

(2) Program shall define and implement ongoing monitoring of student progress and evaluation of student performance. Procedures of quality assurance shall be established to ensure that adequacy of standards is achieved in all assessments.

- Program shall describe the process by which student performance is evaluated and student progress is monitored.
- Program shall document the processes for regularly assessing and evaluating the extent to which the learning outcomes are being attained. It should also describe how the results of these processes are being utilized to perform continual improvement of the program.
- Assessment is defined as one or more processes that identify, collect, and prepare the data necessary for evaluation.
- Evaluation is defined as one or more processes for interpreting the data acquired through the assessment processes in order to determine how well the learning outcomes are being attained.
- The process should include
 - ✓ a listing and description of the assessment processes used to gather the data upon which the evaluation of each learning outcome is based, for example specific exam questions, student portfolios, project presentations, oral exams, focus groups, industrial advisory committee meetings, or other processes that are relevant and appropriate to the program,
 - ✓ the frequency with which these assessment processes are carried out,
 - ✓ the expected level of attainment for each of the learning outcomes,
 - ✓ summaries of the results of the evaluation process and an analysis illustrating the extent to which each of the learning outcomes is being attained, and
 - ✓ how the results are documented and maintained.

(3) Program shall create and maintain good academic atmosphere conducive to successful learning.

- Program shall develop supporting activities to create and maintain good academic atmosphere for learning, such as by providing student guidance and counseling on academic as well as non-academic aspects and career guidance.
- Program shall describe the process for advising and providing career guidance to students, how often students are advised, and who provides the advising.

(4) Program shall promote co-curricular activities for character building and enhancing the students' awareness on the country's needs.

- Program shall create and maintain various co-curricular activities particularly to improve the student soft skill, such as conducting studium generale, involving student in faculty research projects, and participating in scientific meeting and competition.
- Spirit of entrepreneurship as characterized by a deep sense of purpose, perseverance, resourcefulness, open-mindedness, and eagerness to learn should be emphasized in the learning process.

2.4 Facility

Program shall ensure the availability and accessibility of facilities for effective functioning of the learning process and attainment of the learning outcomes.

- Program shall describe the facilities in terms of their ability to support the attainment of the learning outcomes and to provide an atmosphere conducive to learning, such as
 - ✓ offices (such as administrative, faculty, clerical, and teaching assistants) and any associated equipment,
 - ✓ classrooms and associated equipment,
 - ✓ in house laboratory facilities including those containing computers (describe available hardware and software) and the associated tools and equipment that support instruction, and field laboratory whenever necessary
 - ✓ computing resources (workstations, servers, storage, networks including software)
 - ✓ library services.
- Program shall describe and assess the adequacy of these facilities to support the scholarly and professional activities of the students and faculty.
- Program shall describe how students are provided with appropriate guidance regarding the use of tools, equipment, computing resources, laboratories, and other physical facilities so as to enable the utilization of these facilities in a safe and appropriate manner.
- Program shall also describe the policies and procedures for maintaining and upgrading the

tools, equipment, computing resources, laboratories, library and other facilities used by students and faculty.

2.5 Institutional Responsibility

(1) Program shall define and manage the process for the provision of the educational service, including education design, curriculum development and delivery, and assessment of learning.

- Program shall describe the governance of the program and its adequacy to ensure the quality and continuity of the program and how the leadership is involved in decisions that affect the program.
- Program shall describe the process used to establish the program's budget and provide evidence of continuity of institutional support for the program, including the sources of financial support for both permanent (recurring) and temporary (one-time) funds.
- Program shall describe how teaching is supported by the institution in terms of graders, teaching assistants, teaching workshops, etc.
- Program shall describe the adequacy of the staff (administrative, instructional, and technical) and institutional services provided to the program.

(2) Institution shall make efforts to establish resources, supporting service and cooperation with stakeholders on research, education and/or service to community with due consideration to existing local resources.

- Program shall make efforts to develop partnership with external institutions such as industry, research centers, and community units to foster the Tridharma (learning, research, and community engagement). The institution hosting the Program shall demonstrate the support to these efforts.
- The improvement of the students' learning process through the engagement of academia, business, and/or the government in the development of local region through the use of local resources is viewed as a particular advantage of the Program.

Criterion 3: Assessment of the Expected Learning Outcomes

3.1 Program shall ensure that an effective assessment process of learning outcomes based on established performance indicators is implemented and maintained at planned intervals using appropriate methods.

- This criterion is an explanation of the key word of Check in the PDCA cycle. A complete and clearly documented method and procedure for monitoring student progress and measuring the achievement of learning outcomes shall be established.
- Program shall develop relevant performance indicators for each learning outcome so as to

enable an effective measurement of the achievability.

- Program shall establish the method and procedure of student assessment that show the way to collect valid data using the established performance indicators.
- The assessment of each learning outcome shall be conducted at planned interval.

3.2 Program shall ensure that graduates of the program achieve all expected learning outcomes.

- Program shall state the level of learning outcomes as graduation requirements and explain how to measure the achievement.
- The process and results of assessment shall be documented and the records are maintained. The document should contain explanation on resources, source of learning, delivery methods and procedures of examination in particular and of assessment in general and therefore can be used as evidence that all graduates have been directly or indirectly evaluated and that all-sets of learning outcomes have been fulfilled.
- Programs shall have written policies and procedures on how to deal with non-performing students and how to terminate students who are not able to complete their study.

Criterion 4: Continual Improvement

4.1 Based on the assessment results, Program shall perform an evaluation at planned intervals without put in the form of decisions to improve the effectiveness of the educational process, the suitability of the learning outcomes related to the needs of stakeholders, and resources.

- To ensure the continual improvement, Program should run its educational activities by implementing a quality assurance system follows the PDCA cycle as described in the preamble.
- The evaluation shall be based on assessment of the learning outcomes attainment. The output of the evaluation shall contain recommendations on the improvement of learning materials, methods of delivery and other educational processes, suitability and adequacy of the learning outcomes with regards to the needs of stakeholders, and resources.
- The evaluation shall be carried out at planned intervals following a method and procedure made well-known to the faculty. The evaluation method and procedure should be designed so as to enable of identifying constraints, root cause of obstacles, and therefore resulting in opportunities for improvement.

4.2 Program shall maintain documents and records related to the implementation of evaluation, the results and their follow-up.

- A documented procedure for the implementation of Program evaluation shall be established.
- The records of evaluation implementation, its results and its follow-up shall be maintained and accessible to the faculty. These records provide evidence that evaluation has been conducted, the results have been implemented and periodic improvement has been effected and therefore signifying implementation of PDCA.