



Accreditation Criteria for Computing Programs

Developed according to the
Graduate Attribute Exemplars of
the Seoul Accord



Version 2022

Common Criteria

Criteria Guide

Discipline Criteria

Indonesian Accreditation Board for Engineering Education

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Document Control

The International Common Criteria and Criteria Guide version 2022 for Computing Programs have been approved by IABEE Executive Committee on 18 February 2022. This version replaces the 2020 version by adding an article at the Preamble section of the Criteria Guide which sets the policy for programs with multiple streams (such as regular, international, and transfer-path classes) wishing to request evaluation of accreditation.

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Common Criteria

Preamble

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

I. Orientation of the Graduate Competence

- 1.1. Program shall define the profile of graduates to be envisaged as Autonomous Professionals by considering country's potential resources, cultures, needs and interests.
- 1.2. Program shall inform its students and faculty with the envisaged autonomous professional profile and widely publicize it.
- 1.3. 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 (e) items to be acquired by the student at the time of completion of the study:
 - (a) analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions,
 - (b) design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline,
 - (c) communicate effectively in a variety of professional contexts,
 - (d) recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles,
 - (e) function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline,

2. Learning Implementation

2.1. Curriculum

- 2.1.1. Curriculum shall include the following subject areas:
 - (a) Mathematics
 - (b) Fundamental and advanced topics in the computing discipline

(c) General education, which includes morality, ethics, socio-culture, and management

- 2.1.2. Curriculum development shall consider input from Program stakeholders.
- 2.1.3. 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.
- 2.1.4. Curriculum shall ensure that the students are exposed to computing practices and problem solving based on algorithm or computational thinking.

2.2. Faculty

- 2.2.1. The 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.
- 2.2.2. The Program shall ensure that faculty members are aware of the relevance and importance of their roles and contributions to the Learning Outcomes.

2.3. Students and Academic Atmosphere

- 2.3.1. The Program shall define and implement an entry standard for both new and transfer students, as well as transfer of credits.
- 2.3.2. 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.
- 2.3.3. The Program shall create and maintain good academic atmosphere conducive to successful learning.
- 2.3.4. The Program shall promote co-curricular activities for character building and enhancing the students' awareness on the country's needs.

2.4. Facilities

Program shall ensure the availability, accessibility, and safety of facilities for effective functioning of the learning process and attainment of the Learning Outcomes.

2.5. Institutional Responsibility

- 2.5.1. The 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.
- 2.5.2. The Program Operating 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.

3. Assessment of the Learning Outcomes

- 3.1. The 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.
- 3.2. The Program shall ensure that graduates of the program achieve all expected Learning Outcomes.

4. Continual Improvement

- 4.1. Based on Program Learning Outcomes assessment results, the Program shall perform an evaluation at planned intervals with output in the form of decisions to improve the effectiveness of the educational process and resources.
- 4.2. The Program shall maintain documents and records related to the implementation of evaluation, the results and their follow-up.

Criteria Guide

0. Preamble

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

- 0.1. IABEE Common Criteria (CC) are established as a framework to perform accreditation of higher education programs. These CC comprise of elements that must be fulfilled by the Study Program to be accredited.
- 0.2. Programs to be accredited are four-year bachelor of computing programs or other higher education programs which IABEE considered as equivalent, such as Computer Science, Informatics, Software Engineering, Information Systems, Computer Systems, Information Technology or similarly named programs.
- 0.3. The Program is not restricted to single Programs operated by a Department or Faculty. A Program may be formed and/or operated by multiple Departments / Faculties. Programs may include matriculated learning activities outside of its home campus, in conjunction with other higher education institutions.
- 0.4. In cases where multiple Programs of the same nomenclature are offered in multiple locations by the same Program-Operating Institution (such as Programs established according to the *Program Studi di Luar Kampus Utama (PSDKU)* scheme as defined by the Indonesian Ministerial Regulation of *Peraturan Menteri Riset, Teknologi, dan Pendidikan Tinggi No. 1/ 2017*), evaluation by IABEE shall treat the parallel Programs as separate entities.

- 0.5. In cases where a program consists of multiple streams (such as regular, international, or path-transfer classes), Program Operating-Institution must explicitly mention the scope for which the evaluation of accreditation is requested. In addition, Program Operating-Institution must be able to make a clear distinction among the streams with regards to permanent records of the graduates, such as certificate and academic transcript.
- 0.6. The Program shall define the profile of Autonomous Professionals to be fostered, and define the knowledge, skills, and attitudes as Learning Outcomes that graduates are expected to master upon completion of their study.
- 0.7. The 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.
- 0.8. The Program is required to design the curriculum systematically to ascertain the achievement of Program Learning Outcomes. Student and faculty should be aware of these Learning Outcomes.
- 0.9. The Program must disclose its Learning Outcomes to the public. The Program is also required to engage in continual improvement and at the same time to consider the sustainability of operation.
- 0.10. Common Criteria consist of 4 elements, following the management approach of PDCA (Plan Do Check Act) continual improvement cycle. Criterion 1 describes 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.
- 0.11. In addition to these Common Criteria, Program seeking for accreditation shall fulfill also the Category and Discipline Criteria, as well as eligibility requirements required by the Rules and Procedures of Evaluation and Accreditation (RPEA).

I. Orientation of the Graduate Competence

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| <p>1.1. The Program shall define the profile of graduates to be envisaged as Autonomous Professionals by considering country's potential resources, cultures, needs and interests.</p> <hr/> | <p>1.1.1. The Program is required to define the Profile of the Autonomous Professionals intended to foster as its educational objectives, by taking account of:</p> <ul style="list-style-type: none"> (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 (4) Traditions, vision and mission of the education institution <p>1.1.2. The Program should demonstrate the process of establishing and periodic reviewing of the Autonomous Professional Profiles, including the involvements of the stakeholders.</p> |
| <p>1.2. The Program shall inform its students and faculty of the envisaged Autonomous Professional Profile and widely publicize it.</p> <hr/> | <p>1.2.1. The envisaged Autonomous Professional Profile shall be informed to students and faculty and made accessible to the general public.</p> |
| <p>1.3. The 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 (e) graduate competences to be acquired by the student at the time of completion of the study.</p> <hr/> | <p>1.3.1. The Program shall establish its own Program Learning Outcomes based on the Autonomous Professional Profile to be acquired. The Learning Outcomes shall cover all graduate competences from (a) to (e) as referred to in Common Criteria 1.3, which are expressed in such a way to provide flexibility to Program. It is important to note that the Learning Outcomes shall also include Category and Discipline Criteria</p> <p>1.3.2. The Program shall establish procedures to conduct periodic review of the Learning Outcomes.</p> |

1.3.a. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

- 1.3.a.1. Ability to analyze a complex computing problem which involves many components, and/or high risks and critical systems.
- 1.3.a.2. Principles of computing include computation, communication, and design.
- 1.3.a.3. Ability to apply other relevant disciplines such as organization processes, finance, medical and engineering

1.3.b. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

- 1.3.b.1. Ability to apply information science and technology to the problem-solving process..
- 1.3.b.2. Ability to respond to requirements of the society by utilizing various information sciences and technologies.
- 1.3.b.3. Design ability is composed of items such as complex problem analysis, modelization, extract and define requirements and design, implement and evaluate systems, processes, components and programs.
- 1.3.b.4. Ability to create, select, or adapt and then apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

1.3.c. Communicate effectively in a variety of professional contexts.

- 1.3.c.1. This competence indicates the need of active and effective communication skills; sociocultural perspective should be considered for the acceptability and workability of the implementation of computing works.
- 1.3.c.2. These oral and written communications should include the use of computing standards.
- 1.3.c.3. Ability to communicate oral and/or written internationally recognized languages.

1.3.d. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

1.3.d.1. Professional responsibilities include relationship among technologies, society and nature, and understanding of health, safety and cultural issues within local and global contexts.

1.3.d.2. Sufficient understanding on issues related to legal principles, such as copyright shall be particularly considered.

1.3.d.3. Ability to comprehend issues related to ethical principles, such as integrity and independence in professional judgment.

1.3.d.4. Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

1.3.e. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

1.3.e.1. Ability to collaboratively work with others including people from different fields.

1.3.e.2. Ability to precisely judge and conduct own work during collaborative work.

1.3.e.3. Ability to appropriately judge what others should do and to address to others during collaborative work.

2. Learning Implementation

2.1. Curriculum

2.1.1. Curriculum of the Program shall include the following subject areas:

- (a) Mathematics**
 - (b) Fundamental and advanced topics in the computing discipline**
 - (c) General education, which includes morality, ethics, socio-culture, and management**
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2.1.1.1. Program shall ensure that the curriculum meets the above mentioned subject areas appropriate to computing 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 mathematics that are appropriate to the discipline, a maximum of 30% general education components, and at least 50% of fundamental and advanced topics in the computing discipline that provide both breadth and depth. The computing topics must include:

- Techniques, skills, and tools necessary for computing practice.
- Principles and practices for secure computing or cyber security.
- Local and global impacts of computing solutions on individuals, organizations, and society.

2.1.2. Curriculum development shall consider input from Program stakeholders.

2.1.2.1. The Program should demonstrate on how to develop the curriculum and to assure the requirement of the society, industry and professional fields.

2.1.2.2. 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.

2.1.2.3. The Program should provide sufficient opportunity for the stakeholders to discuss Program educational objectives/Profile of Autonomous Professionals, and to foster closer collaboration.

2.1.3. The Curriculum must 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.

- 2.1.3.1. The Program shall describe how the curriculum content and structure are aligned to enable the attainment of Program Learning Outcomes by students.
- 2.1.3.2. The Program should describe how specific requirements of each curricular area in Common Criteria or Discipline Criteria can be met, both in terms of load and depth of the curricular content.
- 2.1.3.3. The Program shall establish syllabi for all courses designed to satisfy mathematics, science, and discipline-specific requirements or any applicable criteria.
- 2.1.3.4. The Program is required to implement educational activities for students to achieve its Program Learning Outcomes.
- 2.1.3.5. The Program is required to systematically design curriculum to enable students to achieve the expected Program Learning Outcomes within the intended period of study.
- 2.1.3.6. The Program is required to adequately inform the faculty and students through various means such as guidebooks, orientation programs etc. about the curriculum, and how the Program Learning Outcomes will be attained through the learning process.

2.1.4. The Curriculum shall ensure that students are exposed to computing practices and problem solving based on algorithm or computational thinking.

- 2.1.4.1. Program must provide opportunity to students to develop competence in practical application of computing skills, combining theory and experience along with the use of other relevant knowledge and skills.
- 2.1.4.2. The Program shall define curriculum subjects to optimally support mainstream 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

- 2.2.1. The 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.**
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- 2.2.1.1. The Program shall describe qualifications of the faculty and their adequacy to cover all curricular areas and to meet any applicable criteria.
- 2.2.1.2. 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 the Program.
- 2.2.1.3. The 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.

- 2.2.2. The Program shall ensure that faculty members are aware of the relevance and importance of their roles and contributions to the Learning Outcomes.**
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- 2.2.2.1. The 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.
- 2.2.2.2. The Program shall have a method to institutionally develop and evaluate faculty educational activities.
- 2.2.2.3. The 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

- 2.3.1. The Program shall define and implement an entry standard for both new and transfer students, as well as transfer of credits.**
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- 2.3.1.1. The 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 cases where prerequisite have not been met.

- 2.3.1.2. The Program shall describe the requirements and process for accepting transfer students and transfer credits.
- 2.3.2. 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.**
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- 2.3.2.1. The Program shall establish policies and procedures to monitor students' progress and performance
- 2.3.2.2. The Program shall document the process by which student performance is monitored.
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- 2.3.3. The Program shall create and maintain good academic atmosphere conducive to successful learning.**
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- 2.3.3.1. The 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.
- 2.3.3.2. The Program shall describe the process for advising and providing career guidance to students, how often students are advised, and who provides the advising.
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- 2.3.4. The Program shall promote co-curricular activities for character building and enhancing the students' awareness on the country's needs.**
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- 2.3.4.1. The Program shall create and maintain various co-curricular activities particularly to improve the student soft skills, such as conducting *studium generale*, involving student in faculty research projects, and participating in scientific forums.
- 2.3.4.2. An entrepreneurial spirit 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. Facilities

2.4.1. Program shall ensure the availability, accessibility, and safety of facilities for effective functioning of the learning process and attainment of the Learning Outcomes.

2.4.1.1. The 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.

2.4.1.2. The Program shall describe and assess the adequacy of these facilities to support the scholarly and professional activities of the students and faculty.

2.4.1.3. The Program shall describe how students are provided with appropriate guidance regarding the use of tools, equipment, computing resources, laboratories, and other physical facilities to enable the utilization of these facilities in a safe and appropriate manner.

2.4.1.4. The 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

2.5.1. The 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.

2.5.1.1. The 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.

2.5.1.2. The 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.

2.5.1.3. The Program shall describe how teaching is supported by the institution in terms of graders, teaching assistants, teaching workshops, etc.

2.5.1.4. The Program shall describe the adequacy of the staff (administrative, instructional, and technical) and institutional services provided to the Program.

2.5.2. The Program Operating Institution (POI) 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.

2.5.2.1. The POI 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.

2.5.2.2. 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.

3. Assessment of the Learning Outcomes

3.1. The 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.

3.1.1. The Program shall define for each Learning Outcome the relevant performance indicators and appropriate assessment method as the basis for measuring achievements of these indicators.

3.1.2. A complete and clearly documented method and procedure for measuring the achievement of Learning Outcomes shall be established.

3.1.3. The assessment of each learning outcome shall be conducted at planned interval.

3.2. The Program shall ensure that graduates of the program achieve all expected Learning Outcomes.

3.2.1. The Program shall maintain effective policy and procedures to ensure that its graduates meet all graduation requirements.

3.2.2. The process and results of graduation requirement review shall be documented and the records are maintained as evidence that all graduates have been evaluated and that all Program Learning Outcomes have been fulfilled.

3.2.3. The Program shall have written policies and procedures on how handle non-performing students and how to terminate students who are not able to complete their study.

4. Continual Improvement

- 4.1. Based on Program Learning Outcomes assessment results, the Program shall perform an evaluation at planned intervals with output in the form of decisions to improve the effectiveness of the educational process and resources.**
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- 4.1.1. To ensure the continual improvement, the Program should run its educational activities by implementing a quality assurance system follows the P-D-C-A cycle as described in the preamble.
- 4.1.2. The evaluation shall be based on assessment of the Program 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.
- 4.1.3. 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 to enable the identification of constraints and root causes of problems, and therefore resulting in opportunities for improvement.
- 4.2. The Program shall maintain documents and records related to the implementation of evaluation, the results and their follow-up.**
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- 4.2.1. A documented procedure for the implementation of Program evaluation shall be established.
- 4.2.2. The documentation 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 achieved, thereby signifying the implementation of P-D-C-A cycle.

Discipline Criteria

Discipline Criteria for Computer Science, Informatics, and Similarly-named Computing Programs

Lead Society(ies):

- *Asosiasi Pendidikan Tinggi Informatika dan Komputer (APTIKOM)* – Association of Higher Education Programs in Informatics and Computer

These program criteria apply to computing programs using computer science or similar terms in their titles.

Learning Outcomes

In addition to learning outcomes 1.(3).a through 1.(3).e, graduates of the program will also have an ability to: 1.(3).f. apply computer science theory and software development fundamentals to produce computing-based solutions

Curriculum

The curriculum requirements specify topics, but do not prescribe specific courses. These requirements are:

- (a) Computer science: At least 48 SKS (or equivalent) that must include:
 1. Substantial coverage of algorithms and complexity, computer science theory, concepts of programming languages, and software development.
 2. Substantial coverage of at least one general-purpose programming language.
 3. Exposure to computer architecture and organization, information management, networking and communication, operating systems, and parallel and distributed computing.
 4. The study of computing-based systems at varying levels of abstraction.
 5. A major project that requires integration and application of knowledge and skills acquired in earlier course work.
- (b) Mathematics: At least 12 SKS (or equivalent) that must include discrete mathematics and must have mathematical rigor at least equivalent to introductory calculus. The additional mathematics might include course work in areas such as calculus, linear algebra, numerical methods, probability, statistics, or number theory.

Discipline Criteria for Information Systems and Similarly-named Computing Programs

Lead Society(ies):

- *Asosiasi Pendidikan Tinggi Informatika dan Komputer (APTIKOM)* – Association of Higher Education Programs in Informatics and Computer

These program criteria apply to computing programs using information systems or similar terms in their titles

Definition

Information Systems Environment – An information systems environment is an organized domain of activity within which information systems are used to support and enable the goals of the activity. Examples of information systems environments include (but are not limited to) business, health care, government, not-for-profit organizations, and scientific disciplines.

Learning Outcomes

In addition to learning outcomes 1.(3).a through 1.(3).e, graduates of the program will also have: 1.(3).f. Ability to support the delivery, use, and management of information systems within an information systems environment.

Curriculum

The curriculum requirements specify topics, but do not prescribe specific courses. These requirements are:

- (a) Information systems: at least 36 SKS (or equivalent) that include coverage of fundamentals and applied practice in application development; data and information management; information technology infrastructure; systems analysis, design and acquisition; project management; and the role of information systems in organizations.
- (b) Information systems environment: at least 18 additional SKS (or equivalent) of a cohesive set of topics that provide an understanding of an information systems environment.
- (c) Quantitative analysis or methods that must include statistics.

Discipline Criteria for Information Technology and Similarly-named Computing Programs

Lead Society(ies):

- *Asosiasi Pendidikan Tinggi Informatika dan Komputer (APTIKOM)* – Association of Higher Education Programs in Informatics and Computer

These program criteria apply to computing programs using information technology or similar terms in their titles.

Learning Outcomes

In addition to learning outcomes 1.(3).a through 1.(3).e, graduates of the program will also have an ability to: 1.(3).f. Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing based systems.

Curriculum

The curriculum requirements specify topics, but do not prescribe specific courses. The curriculum must include coverage of fundamentals and applied practice in the following:

- (a) The core information technologies of human-computer interaction, information management, programming, web systems and technologies, and networking.
- (b) System administration and system maintenance.
- (c) System integration and system architecture

Discipline Criteria for Software Engineering and Similarly-named Computing Programs

Lead Society(ies):

- *Asosiasi Pendidikan Tinggi Informatika dan Komputer (APTIKOM)* – Association of Higher Education Programs in Informatics and Computer

These program criteria apply to computing programs using software engineering or similar terms in their titles.

Learning Outcomes

In addition to learning outcomes 1.(3).a through 1.(3).e, graduates of the program will also have an ability to: 1.(3).f. an ability to develop a software system to meet desired needs within realistic constraints and resources.

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 curriculum must include computing fundamentals, software design and construction, requirements analysis, security, verification, and validation; software engineering processes and tools appropriate for the development of complex software systems; and discrete mathematics, probability, and statistics, with applications appropriate to software engineering.

Discipline Criteria for Computer Systems and Similarly-named Computing Programs

Lead Society(ies):

- *Asosiasi Pendidikan Tinggi Informatika dan Komputer (APTIKOM)* – Association of Higher Education Programs in Informatics and Computer

These program criteria apply to computing programs using computer system or similar terms in their titles.

Learning Outcomes

In addition to learning outcomes 1.(3).a through 1.(3).e, graduates of the program will also have an ability to: 1.(3).f. to design computers, computer-based systems, and networks that include both hardware and software as well as their integration

Curriculum

The curriculum requirements specify topics, but do not prescribe specific courses. These requirements are:

1. Exposure to computer architecture and organization, information management, networking and communication, operating systems, and parallel and distributed computing.
2. The study of computing-based systems at varying levels of abstraction.
3. Computer system administration and system maintenance.
4. Computer system integration and system architecture.
5. Mathematics, including discrete mathematics, probability and statistics.