ZİDEK

Association for Evaluation and Accreditation of Agricultural Engineering Educational Programs
Ziraat Fakülteleri Eğitim Programları Değerlendirme ve Akreditasyon Derneği

EVALUATION CRITERIA FOR BACHELOR'S DEGREE PROGRAMS

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Gazi Mahallesi Özata Sokak No:21/5
Yenimahalle-ANKARA/TÜRKİYE
Phone: +90 (312) 419 04 99 Fax: 0 (312) 419 04 98
E-mail: info@zidek.org.tr
Web page: http://www.zidek.org.tr/

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PART I

PURPOSE AND DEFINITIONS

PURPOSE

1) These criteria aim to ensure the quality of agriculture, forestry and aquaculture engineering programs at the Bachelor level, consisting of a minimum of eight semesters or its equivalent (240 ECTS credits) credits and to support the continuous improvement of such programs in order to meet the expectations of all stakeholders in a dynamic and competitive environment.
2) It is the responsibility of the institution seeking accreditation for a Bachelor level program to demonstrate clearly that the program meets the criteria specified in this document.

DEFINITIONS

1) Terms used in this document have the following meaning;

a) *Program Educational Objectives:* General statements, defining the career goals and professional accomplishments that graduates are expected to achieve in the years following graduation.

b) *Program Outcomes:* Statements defining the knowledge, skills, and attitudes that students must have acquired by the time they graduate.

c) *Assessment:* The process of collecting, defining and arranging data and evidence through various methods in order to determine the achievement levels of the program educational objectives and program outcomes.

d) *Evaluation:* The process of interpreting the information, data and evidence obtained from assessments through various methods. The evaluation process should yield the achievement levels of the program educational objectives and the program outcomes and the results obtained through the evaluation process should be used for decisions and actions aimed at improving the program.

e) *Credit:* One credit is equivalent to an educational load of one-hour (45-minute) theoretical class taught regularly every week during a semester, or a two to three hour-long applied, practical or laboratory class.

f) *ECTS Credit:* Credit as defined by the European Credit Transfer System.

g) Even though the institutions may use their own, different terminology, the evaluations based on ZİDEK's criteria must consistently use the aforementioned basic definitions.

h) Complex Problem: A comprehensive problem which requires:

- for its solution:
  - in-depth engineering knowledge,
  - abstract thinking, and
  - creative use of fundamental engineering principles, research-based knowledge at the forefront of the relevant engineering discipline,
- the development of a new model or method
- that requires one or all of the aforementioned items
- concerns various stakeholders with different needs,

- a comprehensive problem that may yield important results in various contexts

i) Complex System, Process, Device or Product: A system, process, device, or product that contains multiple components and various sub-systems and/or may relate to more than one discipline; and whose analysis and design poses a complex problem.

j) Realistic Constraints and Conditions in Engineering Design: Factors such as economics, environmental issues, sustainability, manufacturability, ethics, health, safety, and social, legal and political dimensions, in accordance with the nature of the design.

k) Multidisciplinary Teamwork: Realization of a specific project, assignment or case study by a team formed with participation of students from different programs. (The definition of multidisciplinary teamwork requires the participation of students from at least 2 different disciplines. The different program definition does not include normal education and secondary education programs, does not include programs carried out in different teaching languages, and does not include different specialties in the same program).

l) Awareness: Having heard of a subject at the level of consciousness. (Methods such as seminars, conferences, wall posters, etc., can be used for this purpose. It is necessary to prove that these methods are applied by the program and that all students participate in these activities).

m) Knowledge: Being trained on a specific subject, within the scope of a course or by direct student work or any other similar methods. It is necessary to measure, evaluate and prove the acquisition of knowledge through methods such as exams, assignments, laboratory studies, or project studies.

n) Skill: To have competence and ability in a certain subject. It is necessary to measure, evaluate and prove the acquisition of skill through applied methods such as laboratory studies or project studies.

PART II

GENERAL CRITERIA

Criterion 1. Students

A program being evaluated must adhere to the following criteria regarding the quality, development and success of students:

1.1. Students admitted to the program must have the required background to achieve the program outcomes such as knowledge, skills, and attitudes, within the planned period. The indicators used in admitting students must be monitored, and their variation over the semesters/years must be evaluated.

1.2. Policies concerning the admission of students through vertical or horizontal transfer, double major, minor, student exchange, and the evaluation of courses taken at and credits awarded by other institutions and/or programs must be defined in detail, easily accessible and enforced accordingly

1.3. The institution and/or program must take measures to encourage and ensure student mobility, in the form of agreements and partnerships with other institutions.

1.4. Advisory services that guide students in their course and in terms of career planning must be provided.

1.5. Student performance in all courses and other activities within the scope of the program must be assessed and evaluated based on transparent, fair, and consistent methods.

1.6. In order to determine whether students may graduate, reliable methods to determine the fulfillment of all conditions required by the program must be developed and implemented.

1.7. Evaluation of the student satisfaction must be conducted and the outcomes of these must be evaluated in various administrative levels. The results of evaluations must provide feedback to relevant units and individuals.

Criterion 2. Program Educational Objectives

2.1. For every engineering program to be evaluated, a set of program educational objectives must be defined.

2.2.These objectives must be

a) consistent with the ZİDEK definition for Program Educational Objectives, (program educational objectives should not be defined evoking program outcomes and should not be defined to be similar to program outcomes.)

b) consistent with the missions of the institution, faculty, and department,

c) determined with the involvement of the program's various internal and external stakeholders,

d) revised periodically and updated if necessary, based on the needs of the program's internal and external stakeholders, and

e) published in a way to allow easy access.

2.3. a) There must be an ongoing assessment and evaluation process in place in order to determine and document that the educational objectives are being achieved.

b) Programs should demonstrate that the program educational objectives are being achieved using the process subject to accreditation.

Criterion 3. Program Outcomes

3.1. Program outcomes must cover all knowledge, skills, and attitude components necessary to accomplish program educational objectives, and they must be defined to include all the ZİDEK Outcomes listed in Clause 3.3 of this document (3.3-a,b,c,d,e,f,g,h,i,j and k) completely.

3.2. Programs may define additional program outcomes specific to their needs, provided that they are consistent with their educational objectives. Although programs can define their own program outcomes, these program outcomes should cover all ZİDEK outcomes completely.

3.3. It must be proven that the students about to graduate have achieved the following program outcomes

a) Adequate knowledge in mathematics, science and engineering (Agricultural Engineering, Forestry Engineering, Aquaculture Engineering etc.) subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in the solution of complex engineering problems.

b) Ability to formulate, and solve complex engineering problems in the relevant engineering field; ability to select and apply proper analysis and modeling methods for this purpose.

c) Ability to design a complex system, process, device or product under realistic constraints and conditions, in other words, under the current means and status of the field, in such a way as to meet the desired result; and ability to apply modern design methods for this purpose.

d) Ability to select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; and ability to employ information technologies effectively.

e) Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems in the relevant field or discipline specific research questions.

f) Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.

g) Ability to write effective reports in the relevant field and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions.

h) Awareness of the need for lifelong learning, ability to access information, to follow developments in science and technology, and to continue to educate him/herself.

i) Knowledge on behavior based on ethical principles, professional and ethical responsibility and standards used in engineering practices.

j) Knowledge about professional life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development.

k) Knowledge about the global and social effects of engineering practices on health, environment, and safety, and on contemporary issues of the era reflected into the field of engineering; awareness of the legal consequences of engineering solutions.

3.4. There must be an ongoing assessment and evaluation process in place in order to periodically determine and document in how far program outcomes are being achieved. This process should be mainly based on student evaluations such as exams, projects, homework. Measurement and evaluation methods based on surveys and course success grades only will be considered insufficient.

Criterion 4. Continuous Improvement

4.1. Programs should provide evidence that they use the results obtained through their assessment and evaluation system for their continuous improvement.

4.2. These improvement efforts must be based on solid data gathered systematically in all areas of the program that are open to development, primarily those that are related to Criterion 2. Program Educational Objectives and Criterion 3. Program Outcomes

Criterion 5. Curriculum

5.1. The curriculum of each program must support its program educational objectives and program outcomes. The curriculum must contain common components, as described below under this criterion, as well as the discipline-specific components given under discipline specific criteria.

5.2. Educational methods used in the implementation of the curriculum should guarantee that the students acquire the necessary knowledge, skills, and attitudes.

5.3. An education management system that guarantees the implementation of the curriculum as stipulated and that ensures its continuous improvement must be in place.

5.4. The curriculum must contain the following components:

a) A minimum of one year or 32 credits or 60 ECTS credits of mathematics and basic sciences. Basic sciences education must be relevant to the specific discipline and supported by experimental studies.

b) A minimum of one-and-a-half years or 48 credits or 90 ECTS credits of basic engineering sciences and engineering topics relevant to the specific discipline.

c) A general education that is consistent with the program objectives, complementing the technical content of the curriculum.

d) At least 25% of the classes must be applied courses

e) At least 240 ECTS credits for graduation in a four-year Bachelor's Degree program.

5.5. The curriculum must prepare students for engineering practice, through a major design experience, based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints.

Criterion 6. Faculty Members

6.1. Faculty members, which are the essential components of curriculum must fulfill the following criteria:

a) Faculty members must be academically sufficient and the number of faculty members must be adequate to cover all areas of the program

b) Faculty members must ensure the efficient execution, evaluation, and improvement of the program

c) Faculty members must have the quality to maintain interaction with relevant industrial and professional organizations, as well as employers

6.2. In addition to carrying out the curriculum, faculty members must ensure an adequate level of conducting scientific research, student-faculty interaction, student advising and counseling, service to the university and professional development services.

6.3. The criteria for appointing and promoting faculty members must be determined and applied in a way to satisfy and develop the points listed above.

Criterion 7. Facilities

Facilities where educational programs are fulfilled must have the following properties:

7.1. Classrooms, laboratories, application areas and associated equipment must be adequate to accomplish the program objectives and program outcomes and to provide an atmosphere conducive to learning.

7.2. There must be adequate facilities to allow students to participate in extra-curricular activities, to meet students' social and cultural needs, to foster faculty-student interaction, and to create a climate that encourages professional development and professional activities.

7.3. Programs must provide the facilities for the students to be able to learn the use of modern engineering tools. Computing and information facilities must be adequate for the scientific and educational activities of students and faculty members to support the program educational objectives.

7.4. The library services provided to students must be adequate to accomplish the program educational objectives and program outcomes.

7.5. Necessary safety measures must be in place in the teaching environment and in student laboratories. Facilities for disabled persons must be available.

Criterion 8. Institutional Support and Financial Resources

Programs must have the following properties in terms of institutional support and financial resources:

8.1. Institutional support, constructive leadership, financial resources, and the strategy for the distribution of resources must be adequate to ensure program quality and its continuity.

8.2. Resources must be sufficient to attract, retain, and provide for the continuous professional development of qualified faculty members.

8.3. Resources must be sufficient to acquire, maintain, and operate the facilities necessary for the program.

8.4. Support personnel and institutional services must be adequate to meet program needs. Technical and administrative staff must be of adequate number and quality to support the achievement of program outcomes.

Criterion 9. Organization and Decision Making Processes

The organization of the higher education institute and all decision-making processes of the president's office, the faculty, the department and, if any, other sub-units, within themselves and with each other, must be organized in a way so as to support the achievement of program educational objectives and program outcomes.

PART III
DISCIPLINE-SPECIFIC CRITERIA (Criterion 10)

(1) Each program must prove that they satisfy the relevant discipline-specific criteria defined in Part III.
(2) If a program, by virtue of its name, becomes subject to two or more sets of discipline-specific criteria, then that program must satisfy each set of these criteria.

Horticulture

(1) These program criteria apply to programs with "horticulture" or similar modifiers in their name.
(2) The program must demonstrate that graduates have the ability to plan and apply various agricultural systems for horticulture, to create and conduct horticultural breeding programs, to apply modern technologies to production, to have quality awareness in the production, storage and utilization of horticulture products, to measure, evaluate and manage various quality parameters, to conserve, reproduce and sustain all botanical material in horticulture and to reflect these in applications via designs.

Plant Protection

(1) These program criteria apply to programs with "plant protection" or similar modifiers in their name.
(2) The program must demonstrate that graduates have the ability to solve problems in the field of plant protection using science and engineering knowledge and principles. Program must demonstrate that graduates have the ability to recognize common problems in agricultural fields, pests, diseases, weeds and beneficial organisms in microscopic and macroscopic levels and can determine their levels of harm/benefit, to sustain current suggestions that are defined with technical and scientific knowledge to the solution of plant protection problems while considering sustainable agriculture, environment, public health and food safety and to reflect these in applications via designs.

Plant Production and Technologies

(1) These program criteria apply to programs with "plant production and technologies" or similar modifiers in their name.
(2) The program must demonstrate that graduates have the ability to solve problems in the field of plant production and technologies using science and engineering knowledge and principles. The program must demonstrate that graduates have the knowledge of modern cultivation methods and techniques and strategies of field crops and horticulture, knowledge of soil, plant nutrition methods and techniques, ability to determine biotic and abiotic factors that cause losses in plant production, to plan and apply pest control management systems, to apply environmentally friendly agricultural production systems in which natural resources are used effectively, have the knowledge of ecosystem and sustainable agriculture management, planning and application regarding plant production, have the ability to gain knowledge on food, renewable energy/bioenergy, raw material production and/or processing and to reflect these in applications via designs.

Animal Production and Technologies

(1) These program criteria apply to programs with “animal production and technologies” or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of animal production and technologies using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to apply strategies, methods and techniques regarding animal production, have the knowledge on animal genetic sources and animal breeding and have the ability to use this knowledge in solving problems of animal production, the ability to determine the factors causing low efficiency in animal production, to apply environmentally friendly production systems in which natural resources are used effectively, have the knowledge of ecosystem and sustainable agriculture management, planning and application regarding animal production, have the ability to gain knowledge on feed, renewable energy/bioenergy/biogas, raw material production and/or processing and reflect these in applications via designs.

Poultry Farming

(1) These program criteria apply to programs with “poultry farming” or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to acquire knowledge and to conduct reference research for this purpose, to use databases and other information resources, to reach information and to think critically for solving problems, to use computer and information technologies sufficiently to support their professional development, to conduct intra-disciplinary and inter-disciplinary teamwork, to work efficiently in multidisciplinary teams as an individual to reflect these in applications via designs.

Dairy Technology

(1) These program criteria apply to programs with “dairy technology” or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of dairy technology using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to select and use the required modern techniques and tools for dairy technology applications, have the sufficient knowledge in dairy and dairy products production, quality control, product development, product quality improvement and safety, the ability to manage while considering sustainable agriculture, environment, public health and food safety and to reflect these in applications via designs.

Agricultural Economics

(1) These program criteria apply to programs with “agricultural economics” or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to comprehend and solve the economic problems of agriculture using fundamental principles of agricultural sciences and economics. The program must demonstrate that graduates have the ability to comprehend economic problems of agriculture, to collect, analyze and interpret data in micro and macro levels, to create solutions based on projects, to make forward-looking decisions by technical and economic analyses of production factors in agriculture and agriculture-based industry, to predict and interpret the effects of national and international economic and political developments on Turkish agriculture, to follow national and international agricultural markets, to understand the behavior of market

actors and to reflect these in applications via designs.

Agricultural Machinery and Technologies Engineering

(1) These program criteria apply to programs with "agricultural machinery and technologies engineering" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of agricultural machinery and technologies using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to define, formulate and solve the problems in the field of agricultural machinery and technologies and to reflect these in applications via designs.

Agricultural Biotechnology

(1) These program criteria apply to programs with "agricultural biotechnology" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of agricultural biotechnology using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to develop superior plant, animal and microorganisms using modern biotechnology methods to support classic breeding methods, to develop modern plant and animal breeding techniques, to develop resistant/tolerant varieties/genotypes, to develop environmentally friendly production methods that will not damage the ecological balance, to ensure the development of breeding animals and new plant cultivars that producers require, to obtain and characterize enzymes and microorganisms that are required in every step of agricultural production and to produce primary and secondary metabolites that have the potential to be utilized in various industries using these organisms, to detect domestic genetic sources and to ensure the conservation and cultivation of these sources and to reflect these in applications via designs.

Agricultural Genetic Engineering

(1) These program criteria apply to programs with "agricultural genetics" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of agricultural genetic engineering using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to define and model problems regarding agriculture and to solve these problems using agricultural genetic engineering and plant breeding approaches, have theoretical and applied knowledge on agricultural production, ecosystem, biodiversity, sustainable agriculture, renewable energy and use of technology, have knowledge on plant development, plant genetics, molecular biology, plant genetic sources and plant breeding and have the ability to use this knowledge in solving agricultural problems and to reflect these in applications via designs.

Agricultural Structures and Irrigation

(1) These program criteria apply to programs with "agricultural structures and irrigation" or similar modifiers in their name.

(3) The program must demonstrate that graduates have the ability to solve problems in the field of agricultural structures and irrigation using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to design and apply plant and animal production systems, to think holistically and analytically towards conservation, development and sustainability of soil and water resources, to

measure, evaluate and manage quality parameters during system design, application and evaluation processes and to reflect these in applications via designs.

Field Crops

(1) These program criteria apply to programs with "field crops" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of field crops using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to define, model and solve problems that occur in the related areas to field crops discipline, to contribute to science in various areas of agriculture, primarily field crops, in order to ensure quality, efficiency and sustainability, nationally and internationally, and to reflect these in applications via designs.

Soil Science and Plant Nutrition

(1) These program criteria apply to programs with "soil science and plant nutrition" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of soil science and plant nutrition using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to define chemical, physical, optical and formation properties of soil, rocks and minerals, to define morphological and genetic properties of soil and soil horizons, to evaluate dynamic reactions in soil processing, to use advanced cartographical materials and databases to determine and map agricultural objects, to prepare and apply fertilization programs for various plant production patterns, to correlate multifunctional properties of microbial populations in soil ecosystem with soil quality, to conduct and interpret microbiological analyses and chemical analyses of soil and to reflect these in applications via designs.

Animal Science

(1) These program criteria apply to programs with "animal science" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in the field of animal science using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to determine the effect of morphological and physiological properties of farm animals and environmental conditions on animal production and animal products, to determine feed quality, to feed and breed animals, to increase the quality and efficiency of animal products, to solve problems in farm animal production, to determine nutritional values of animal feeds, skills and to reflect these in applications via designs.

Agricultural Engineering

(1) These program criteria apply to programs with "agricultural engineering" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to acquire knowledge and to conduct reference research for this purpose, to use databases and other information resources, to reach information and to think critically for solving problems, to use computer and information technologies sufficiently to support their professional development, to conduct intra-disciplinary and inter-disciplinary teamwork, to work

efficiently in multidisciplinary teams as an individual to reflect these in applications via designs.

Genetics and Life Sciences

(1) These program criteria apply to programs with "genetics and life sciences" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to acquire knowledge and to conduct reference research for this purpose, to use databases and other information resources, to reach information and to think critically for solving problems, to use computer and information technologies sufficiently to support their professional development, to conduct intra-disciplinary and inter-disciplinary teamwork, to work efficiently in multidisciplinary teams as an individual to reflect these in applications via designs.

Biosystem Engineering

(1) These program criteria apply to programs with "biosystem" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in automation, information technologies, precision agriculture, power and energy in agriculture, post-harvest processes, agricultural structures and environment, animal production technologies, soil and water and rural development areas using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to develop automation and newly emerging technologies in agriculture, precision agriculture techniques, energy and machinery, mechanization applications in plant and animal production, post-harvest mechanization applications, agricultural structures, field and water resources, to develop rural areas and to reflect these in applications via designs.

Aquaculture, Fisheries Technology and similarly named Engineering Programs

(1) These program criteria apply to programs with "aquaculture", "fisheries" or similar modifiers in their name.

(2) The program must demonstrate that graduates have the ability to solve problems in aquaculture using science and engineering knowledge and principles. The program must demonstrate that graduates have the ability to recognize and classify aquatic ecosystems and aquatic creatures, to analyze, synthesize and control the biology, dynamics and population structures of aquatic creatures and have the skills and knowledge on topics such as capture and aquaculture, processing, feeding, diseases, economy, facility design of sea and inland waters.

Forestry, Forest Industry and similarly named Engineering Programs

These program criteria apply to programs with "forestry engineering", "forest industry engineering" or similar modifiers in their name.

(1) **Forest Engineering Programs:**

The program must demonstrate that graduates have: the proficiency of knowledge in the fields of basic sciences, including mathematics and statistics required for the solutions of problems pertinent to forest engineering applications, and of universal and local knowledge in ecological, biological, silvicultural, technical, socio-economical, legal and administrative topics in accordance with program educational objectives. Program must also demonstrate that graduates have: the knowledge and skills to identify forest

resources and elements of related ecosystem as a system; to analyze interrelations between them by using modern measurement, modeling, and information systems; to take inventory; to develop and plan designs, and administer such plans and their applications for the purpose of intervening consciously with forests and related ecosystems according to the sustainability principle.

(2) **Forest Industry Engineering Programs:**

The program must demonstrate that graduates have the knowledge of mathematics, statistics, physics, and chemistry. The curriculum must include basic knowledge in the fields of anatomical, physical, chemical, mechanical, and other technological properties of wood, paper, and lignocellulose-based materials, as well as their production technologies and protection methods for increasing their lifetime, in line with program educational objectives. The program must also demonstrate that graduates have the skills to measure the properties of wood, paper, and lignocellulose-based materials, to measure, control, and technically interpret the variables in their production processes, and to assess the effects of these variables on the behavioral properties of such materials.

The program must demonstrate that graduates comprehend the technical, economic, social, cultural, ethical, and legal dimensions required by the planning, controlling, administering, and managing the production and use of wood, paper, and lignocellulose-based materials, and reflect them into practice by their designs.