##### All-Russian Public Organisation

##### Association for Engineering Education of Russia

##### Accreditation Centre

##### PROFESSIONAL ACCREDITATION

##### OF ENGINEERING PROGRAMMES



**CRITERIA AND PROCEDURE**

**FOR PROFESSIONAL ACCREDITATION**

**OF ENGINEERING PROGRAMMES**

*Approved by*

*the AEER Accreditation Board*

*on 19 November 2013*

2013

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INTRODUCTION

The following Criteria and Procedure for Accreditation of Engineering Programmes have been developed by the Association for Engineering Education of Russia (AEER) for quality assurance in secondary vocational and higher engineering education. Compliance of educational programmes with the criteria shall guarantee the quality of training and promote the ongoing improvement of educational programmes.

An accredited programme shall constitute a system of key characteristics (expected learning outcomes, volume, content), organisational and pedagogical approaches and evaluation procedures in the form of a curriculum, academic calendar, course (module) syllabi and other components, as well as assessment tools and teaching materials towards a particular engineering qualification (technician, bachelor, specialist, master). For the purpose of the AEER accreditation, each specialization shall be considered an educational programme.

The AEER Criteria and Procedure for Accreditation of Engineering Programmes have been developed under Federal Law No. 273-FZ On Education in the Russian Federation of 29 December 2012, Art. 96, I. 6.

The Criteria and Procedure have been elaborated by AEER taking into account global experience in evaluation of engineering programmes and are aligned with EUR-ACE Framework Standards for Accreditation of Engineering Programmes and IEA Graduate Attributes and Professional Competencies.

Association for Engineering Education of Russia is a member of ENAEE and is authorised to award the EUR-ACE® Label and record the accreditation in the international databases of ENAEE (European Network for Accreditation of Engineering Education) and FEANI (Fédération Européenne d’Associations Nationales d’Ingénieurs). Graduates of the educational programmes that are accredited by AEER and awarded the EUR-ACE® Label shall have an advantage at receiving the EurIng title and European ENGCard.

Since 2012, AEER is a member of Washington Accord, an international agreement of national agencies responsible for accrediting engineering degree programmes.

Being a member of the reputable international accreditation bodies International Engineering Alliance and ENAEE, AEER awards international accreditation that shall be recognised by all signatory states of the bodies (http://www.ieagreements.org, http://www.enaee.eu).

Graduates from the accredited educational programmes may further register in International Engineering Technicians Register (for graduates qualifying as technicians), APEC Engineer Register and International Professional Engineers Register (for graduates qualifying as bachelors/specialists).

AEER employs a single approach to professional accreditation of educational programmes of different levels, which shall promote coherence and consistency of education and contribute to the creation of a uniform area of engineering education in Russia following the global experience.

The AEER criteria have been developed to evaluate and confirm the quality of secondary vocational and higher education of graduates towards solution of well-defined engineering problems (the qualification of a technician), complex engineering problems (the qualification of a bachelor and a specialist) and innovative engineering problems (the qualification of a master) at the level of professional standards, to meet requirements of engineering society and labour market and international requirements to engineers.

The AEER criteria are focused on the evaluation of programme objectives and expected learning outcomes. Learning outcomes are statements of universal (general) and professional competencies (knowledge, skills and experience) attained by graduates upon completion of an educational programme.

The programme can be accredited only if achievement of learning outcomes by all the students is verified and the graduates are prepared for engineering practice in accordance with programme objectives.

Programme objectives should be formulated by the education institution and must be in full correspondence with its mission. Learning outcomes should be aligned to the programme objectives and agreed with employers and other stakeholders. To obtain accreditation, programme objectives and learning outcomes should comply with the Federal State Educational Standards of the Russian Federation or educational standards of the institution. They should also meet the AEER requirements introduced in the present Criteria and Procedure.

Only the programmes that have been accredited by the government may seek the AEER professional accreditation.

As provided in the RF Federal State Educational Standards, the content of higher educational programmes shall be assessed in ECTS credits introduced in the course of the Bologna process.

In order to be accredited by AEER a programme must meet all the criteria below. The criteria for professional accreditation of engineering programmes set requirements to:

1. Programme objectives and learning outcomes.

2. Programme content.

3. Educational process.

4. Faculty.

5. Professional qualification.

6. Programme resources.

7. Graduates.

The criteria establish different levels of compliance with the stipulated conditions:

– 'must' and 'necessary' are used to specify obligatory requirements;

– 'recommended' is used to specify desirable requirements;

– 'important consideration' means that the accomplishment of the requirement would be advantageous for accreditation but is not mandatory;

– 'may' is used to offer alternative ways of meeting the criterion.

1. ACCREDITATION CRITERIA  
FOR HIGHER EDUCATIONAL PROGRAMMES  
(QUALIFICATION: SPECIALIST)

Higher educational programmes of the specialist's level lead students to master complex engineering activity.

*Complex engineering activity* is challenging and multi-aspect. It includes development, design, production and implementation of technical objects, systems and technological processes and covers a wide range of complex engineering problems. *Complex engineering problems* are connected with investigations, analysis and design of engineering objects, systems and processes and must be solved using fundamental knowledge in mathematics, natural sciences, engineering and other sciences, as well as advanced and cross-disciplinary knowledge in the appropriate professional area. Specialist degree programmes can be focused on scientific, R&D, engineering, manufacturing, organizational, managerial, etc. activity.

Specialists in the field of engineering and technology should demonstrate fundamental knowledge and practical skills in natural sciences and higher mathematics, the ability to apply mathematical methods, statistics, IT-tools, computer technologies and simulation methods. Application of laws and principles of natural sciences should contribute to the creation of new technical objects and systems as a result of complex engineering activity.

Knowledge of engineering design in uncertain environments, abstract thinking and ability to analyse complex ambiguous problems are important for complex engineering activity. Specialists should demonstrate the ability to work effectively as individuals and as team members or team leaders. They should demonstrate management skills, ability to run interdisciplinary projects, to communicate effectively to engineering community and society at large.

Complex engineering activity has a great impact on society and environment. Specialists should solve engineering problems taking into account legal, cultural, health and safety issues. They should be aware of social responsibility for their professional activity. Specialists should demonstrate recognition of the need for and ability to engage in independent on-going professional development.

**CRITERION 1. PROGRAMME OBJECTIVES AND LEARNING OUTCOMES**

1.1. Each educational programme must have:

* + 1. Clearly stated and documented objectives that are in full correspondence with the mission of the educational institution, the Federal State Educational Standards (educational standards of the institution) and the needs of employers and other programme stakeholders.
    2. An efficient system for achievement and improvement of programme objectives.

1.2. Programme objectives must be made public and available for all stakeholders and shared by each faculty member involved in the programme.

1.3. Each educational programme must have clearly defined and documented learning outcomes that must be in full correspondence with the programme objectives.

1.3.1. Learning outcomes must be stated as expected competencies of graduates that must be in full correspondence with the Federal State Educational Standards (educational standards of the institution), professional standards, needs of employers and AEER Criterion 5.

1.3.2. Learning outcomes must correspond to the readiness of programme graduates for complex engineering activity within the whole lifecycle of technical objects, processes and systems (conceiving – designing – implementing – operating).

**CRITERION 2. PROGRAMME CONTENT**

* 1. To meet the requirements of the RF Federal State Educational Standards, the content of educational programmes shall be assessed in *ECTS* credits recommended by the Bologna process. The educational programme must have the value of at least 300 *ECTS* credits.
  2. The Programme curriculum and a course (module) syllabus must correspond to the programme objectives and must ensure achievement of the learning outcomes by all graduates from the programme.
  3. The curriculum must include disciplines and cross-disciplinary modules (courses) that provide integration of professional and universal (general) competencies, including personal attributes, interpersonal skills and experience in design of technical objects, systems and technological processes.
  4. The curriculum must include basic and special courses in natural sciences and mathematics to ensure learning of fundamentals and serve the basis for obtaining required professional competencies by specialists.
     1. Studies in natural sciences and mathematics must have the value of at least 60 *ECTS* credits including at least 20 *ECTS* credits for advanced courses.
     2. Studies in natural sciences must provide knowledge and understanding of basic phenomena and laws of nature and the ability to use them in solving complex engineering problems.
     3. Studies in mathematics must provide the ability to use mathematical methods in solving complex engineering problems.
  5. Studies in humanities, social sciences and economics must provide the basis for development of competencies in solving management, social, economic, legal and ethical problems; such studies must foster commitment for labour safety, health protection and sustainable development.
     1. It is recommended that studies in humanities and economics comprise at least 30 *ECTS* credits.
     2. Studies in humanities, social sciences and economics must contribute to the development of competencies in the field of communication including the ability to deliver information and ideas, define problems and find their possible solutions.
  6. Engineering courses, cross-disciplinary modules, course projects, hands-on experience and research must provide readiness for complex engineering activity in accordance with the objectives of the educational programme.
     1. It is recommended that engineering and cross-disciplinary courses have the value of at least 150 *ECTS* credits including at least 60 *ECTS* credits for specialisation courses.
     2. Studies in engineering must correspond with the level of training in mathematics and natural sciences and must ensure application of the acquired knowledge in engineering practice.
     3. Studies in engineering design must contribute to the development of creative thinking and ability to solve complex engineering problems. Development of project objectives and evaluation criteria, analysis and synthesis of engineering solutions must be an essential element in engineering design.
     4. Internships (of at least 16 weeks) must be an essential element of the educational programme and may result in obtaining qualification for one or more blue-collar jobs.
  7. Studies must culminate with a final qualification project that must contain research and/or R&D elements.

**CRITERION 3. EDUCATIONAL PROCESS**

* 1. Students admitted into the programme must have at least a complete secondary general or secondary vocational education.
  2. Students must have sufficient knowledge in natural sciences and mathematics to enter the programme. If the institution enrolls students with insufficient background knowledge, the institution must have a system of academic adaptation to ensure mastering of the educational programme.
  3. The study process must ensure achievement of the programme learning outcomes by all students. The programme must have a system of on-going evaluation of students' progress and an efficient feedback mechanism for continuous improvement of the programme content and educational technologies.
  4. Active learning and students' self-study from open educational resources including the resources published on the *website* of the institution are given important consideration in the programme evaluation.
  5. Student-centred learning environment and participation of students in the development of individual learning paths are given important consideration in the programme evaluation.
  6. Students’ academic mobility that implies mastering several disciplines (modules) of the curriculum, research projects, hands-on experience and internship at national and international educational or scientific institutions and engineering companies is given important consideration in the programme evaluation.

**CRITERION 4. FACULTY**

* 1. Faculty must be represented by instructors in all subject areas of the programme.
  2. Faculty must be sufficiently qualified.
     1. Faculty must have appropriate education, improve qualification by taking professional development programmes and trainings in related subject areas and increase pedagogical excellence on a regular basis.
     2. Faculty’s industrial experiences in a relevant field and participation in R&D and engineering projects are given important consideration in the programme evaluation.
     3. Faculty must be involved in improvement of the whole programme and individual courses.
     4. Faculty membership in professional societies, awards, scholarships and grants are given important consideration in the programme evaluation.
     5. Academy fellows, laureates of competitions and prize winners among faculty are given important consideration in the programme evaluation.
     6. Engagement of industrial representatives in the educational process is given important consideration in the programme evaluation.
  3. The number of faculty members with academic degrees (PhD and DSc) must be at least 60 % of the total number of faculty involved in the programme delivery.
  4. Faculty must be actively involved in R&D, design and methodological activity, which must be evidenced by relevant reports, participations in scientific and methodological conferences and at least two scientific publications and/or methodological papers per year.
  5. Each faculty member must comprehend and be able to explain the role and place of his / her discipline (module) in the curriculum, its correspondence with prerequisites and sequential courses.
  6. Faculty turnover must not exceed 40 % during the accreditation period.

**CRITERION 5. PROFESSIONAL QUALIFICATION**

5.1. Training of students for complex engineering activity must be arranged through the whole programme. Experience of complex engineering activity must be gained with mastering cross-disciplinary modules of the programme, carrying out R&D projects, work-based training, project works and a final qualification project.

Students’ portfolio with evidence of educational, research and other activities, participation in various contests and competitions is given important consideration in the programme evaluation.

The programme must ensure that all graduates achieve the learning outcomes that are aligned to professional standards and required for professional activity.

Programme graduates must demonstrate the following learning outcomes:

**5.2. Professional competencies**

5.2.1. **Application of fundamental knowledge.** Application of fundamental and special knowledge in mathematics, natural sciences, humanities, social sciences, economics and engineering in a cross-disciplinary context for solving complex engineering problems in the appropriate professional area.

5.2.2. **Engineering analysis.** Ability to formulate and solve complex engineering problems using fundamental and special knowledge, modern analytical methods.

5.2.3. **Engineering design.** Ability to develop and design complex engineering projects (technical products, systems and technological processes) in the appropriate professional area taking into consideration economic, ecological, social and other limitations.

5.2.4. **Investigation.** Ability to conduct investigations when solving complex engineering problems in the appropriate professional area; ability to design and conduct experimental investigations, analyse and interpret data using fundamental and special knowledge.

5.2.5. **Engineering practice.** Ability to create, choose and apply appropriate resources and methods including forecasting and simulation, modern engineering and IT-tools to solve complex engineering problems in the appropriate professional area with consideration of any existing limitations.

5.2.6. **Specialization and labour market commitment.** Ability to demonstrate competencies relevant to the problems, objects and complex engineering activity in the appropriate professional area to potential employers.

**5.3. Universal (general) competencies**

5.3.1. **Management.** Ability to use fundamental and special knowledge of management principles to regulate complex engineering activity in the appropriate professional area.

5.3.2. **Communication.** Effective communication with engineering community and society in national and international contexts; development of documents; presenting and advocating outputs of complex engineering activity in the appropriate professional area.

5.3.3. **Individual and team work.** Effective individual work and work as a team member or a team leader including in a cross-disciplinary team team when solving complex engineering problems in the appropriate professional area; ability to distribute responsibility and authority in a team.

5.3.4. **Professional ethics.** Personal responsibility and commitment to the code of professional ethics when running complex engineering activity.

5.3.5. **Social responsibility.** Running complex engineering activity in the appropriate professional area with consideration to legal and cultural aspects, health protection and safety issues, social responsibility for professional activity, sustainable development.

5.3.6. **Life-long learning.** Recognising the need for and ability to engage in self-study and on-going professional development.

5.4. The educational institution develops and complements the hereinabove requirements for professional and universal (general) competencies of specialists with learning outcomes that correspond to the field of engineering and professional standards.

5.5. The educational institution must have a system for assessment of learning outcomes in the programme as a whole and in particular disciplines (modules). Achievement of such learning outcomes must be verified by appropriate documents. Assessment results must be used for development of the programme and the educational process.

**CRITERION 6. PROGRAMME RESOURCES**

* 1. Facilities, information infrastructure and financial resources of the institution must not violate licensing requirements and must be adequate to the programme objectives.
  2. The educational institution must have a library offering all necessary study materials, including textbooks, professional and reference books, relevant periodicals.
  3. *Internet* access for faculty and students to global information resources in engineering including national and international databases of recent research publications is given important consideration in the programme evaluation.
  4. Students must have sufficient opportunities for self-study and research including open educational resources available on the website of the institution.
  5. The educational institution must have adequate resources (classrooms, equipment, tools, etc.) to provide research, scientific and design activity and self-study of students, acquisition of experience in development of engineering objects and systems, in particular, using team-work.
  6. Financial policy and management of the educational institution must be aimed at improvement of programme resources, continuous professional development of faculty and support staff.
  7. Management of the institution must be efficient and conducive to the programme implementation. A modern quality management system at the institution is given important consideration in the programme evaluation.

**CRITERION 7. GRADUATES**

* 1. The programme must have at least one graduation in order to be accredited. The educational institution must have a system for monitoring the labour market and analysing the demand for specialist's programmes in the appropriate professional area; the institution must have a system for employment support and career guidance of graduates, in particular during 3-5 years after graduation. Monitoring of professional certification for programme graduates is given important consideration in the programme evaluation.
  2. Monitoring results must be used for revision of programme objectives and expected learning outcomes and for further development of the educational programme.

2. ACCREDITATION PROCEDURE

1. The institution submits a written **application** for program accreditation to the Director of the AEER Accreditation Center (AC AEER). In the application the institution must indicate the title and the code of the program to be accredited. If the institution seeks accreditation for several programs, the title and the code of each program must be clearly indicated. The request is subject to initial analysis if the title of the qualification contains the words “engineer”, “technique”, “technology”. The analysis of the request is done collegially by the AEER AC Board of Directors. The AC Board of Directors consists of four persons: the AC Director, the AC Deputy Director, two Members of AC Board of Directors.

The members of the AC Board of Directors do not have a right to vote on the questions of initial screening of the HEI’s application that is in their sphere of interest. To avoid the perceived conflict of interest and to ensure the open and fair discussion of the application these members of the Board are leaving the meeting room during the session.

The request can be denied on the following reasons:

* Incorrect filling in of the request form.
* The program is not included in the state list educational programs.
* The program is not included to the list of engineering qualifications of the Russian Federation Ministry of Labor.
* The HEI lacks the federal license and state accreditation.
* The information about the educational program is not available on the HEI’s web-site.

The HEI has the right to consider the remarks and repeat the request. In case of disagreement with the AEER AC Board of Directors decision on the denial of the initial request concerning accreditation of education program, HEI appeal in writing to the Appeal Commission of the AEER. The appellation should contain the reasons why the negative decision of the AEER AC is wrong (due to the factual mistakes or due to incompliance to the document “Criteria and Procedure”).

2. The AEER AC Board of Directors takes the decision to start the procedure of public accreditation. The AEER signs a **contract** with HEI on educational program public accreditation. To avoid the perceived conflict of interest the administrative support of the accreditation process is done by the AC staff in one of the branches (Moscow, Novosibirsk or Tomsk) that is unbiased regarding the HEI applying for accreditation.

3. The Accreditation Center provides the institution with the latest version of the criteria and self-study questionnaires.

4. The institution carries out a **self-study process** according to the AEER requirements and submits a self-study report to the Accreditation Center.

5. The Accreditation Center appoints an **Evaluation Team** to carry out an auditing of the program. The Evaluation Team should comprise not less than four experts and consist of a chair, program evaluators as well as a representative from industry. If the institution seeks accreditation for several programs, the Accreditation Center appoints a separate Evaluation Team for each program.

6. The institution officially informs the Accreditation Center on refusal of a team member or on agreement to accept the proposed examination team.

7. Each program evaluator signs the statement for no-conflict of interests and sends it to the Accreditation Center.

8. Upon examination of a self-study report the Accreditation Center takes decision on continuation of accrediting procedure and running of the on-site visit or on necessity to re-elaborate the self-study report or decision on noncompliance of the program with criteria and failure to receive accreditation. In the last cases the institution will receive a written statement from the Accreditation Center.

9. In case the decision on continuation of accrediting procedure is taken, the team chair and the institution agree on the dates and schedule of the visit.

10. An on-site visit takes not less than three days. At the end of the visit the team chair and the HEI rector sign **The Audit Memorandum.**

11. On the basis of the audit results and the self-study report analysis the Evaluation Team prepares an **evaluation report** that shall contain a detailed statement on compliance or noncompliance of the program with the AEER criteria as well as examiner opinion different from the team statement, if any.

12. Within three weeks following the on-site visit one copy of the report is presented to the institution. Within the two weeks of receiving the report the institution may send its **complaints** on team report or breach of accrediting procedure to the Accreditation Center.

13. The Accreditation Center reviews the report of the Evaluation Team and the institution complaints, if any, and prepares a **suggestion on accreditation or non-accreditation** for a final decision by the Accreditation Board.

14. The decision of the Accreditation Board **is to be approved by** the AEER Administrative Board. The AEER sends an accreditation certificate signed by the President to the institution. The accredited programs are included in the AEER register that is publishing in media and the Accreditation Center web site. The list of accredited programs is reported to the Ministry of Education and Science of the Russian Federation.

15. In case of program accreditation with awarding the EUR-ACE® Label the AEER AC issues for HEI the corresponding certificate signed by representatives of the AEER and ENAEE. The accredited program is placed to the ENAEE register.

3. APPEAL PROCEDURE

1. **General Provisions**

In compliance with Regulations on the AEER Appeal Commission in order to ensure guarantee and rights of HEI willing to pass through accreditation of educational programs the AEER Administrative Board includes the Appeal Commission.

1. **Grounds of Appeal**
   1. Programs which were rejected during preliminary consideration of application for accreditation or the ones which were given recommendation of the Evaluation Team “To Deny from Accreditation” (“Not-to-accredit”) can apply to the Appeal Commission within 2 weeks from receiving the decision.
   2. The Appeal Commission accepts HEI’s inquiries for appeals based on two reasons only:
      1. *“Errors in Procedure”*. This means that the members of the AEER AC violated the AEER “Criteria and procedures”.
      2. *“Errors in facts”*. This means that data and other information were used incorrectly by the Evaluation Team, which led to the recommendation “To Deny from Accreditation” (“Not-to-accredit”). If the incorrect data and information provided by the program, HEI’s appeal is not accepted.
   3. Shall the program be subject for appeal against the decision made by the AC, it has to fill in the application request and process the official appeal application via HEI.
2. **Procedure for appeals consideration and decision making**
   1. Within one month from the date of receiving the HEI’s appeal the Appeal Commission calls a meeting and reviews whether there are “*Errors in Procedure*” and/or “*Errors in facts*”.
   2. The Appeal Commission will be provided with copies of all documentation that has been made available to the HEI during the different phases of the accreditation cycle, including materials submitted by the institution or the Evaluation Team.
   3. Upon completion of the meeting the Executive Director of AEER provides assistance on drawing up the “*Decision on the Appeal*” and submits it to the HEI on behalf of the Appeal Commission.
   4. The content of the “*Decision on the Appeal*” shall reflect the appeal decision, reasons of appeal, established facts, grounds for decision-making, consideration procedure, etc. The decision of the Appeal Commission can be of two types: “*Appeal accepted*” and “*Appeal rejected*”.
   5. The HEI and the AC AEER will be notified in writing of this decision by the Executive Director of AEER within 15 days of the final decision.
   6. The meeting of the Appeal Commission takes place “behind closed doors”. If necessary the Chairman and members of the Evaluation Team can be invited for interviews or to provide additional information.
   7. Shall the Appeal Commission take the decision “*Appeal rejected*” the HEI cannot appeal again.
3. **Execution of the appeal decision.**
   1. If the appeal decision is “Appeal accepted” the Accreditation Centre shall assign the supplementary Evaluation Team for the “Re-visit” or for “Re-review of documents” in compliance with the “*Decision on the Appeal*” and take into account the fact that additional decision of the supplementary Evaluation Team shall be the accreditation decision.
   2. The number of the supplementary Evaluation Team members is not limited; however, all of them cannot be members of the initial Evaluation Team. The educational program may present the list and reasons for rejection of some experts from the supplementary Evaluation Team.
   3. The procedure for the follow-up re-visit and re-review of documents, decision-making process shall correspond strictly to the document “Criteria and procedures”.
   4. Upon the execution of the Appeal Commission decision by the Accreditation Centre the Executive Director of AEER prepares the document “*Execution of the Decision on the Appeal*” and submits it to the HEI on behalf of the Appeal Commission.
   5. The document “*Execution of the Decision on the Appeal*” shall include the following: procedure of the follow-up re-visit or re-review of documents, reconsideration results, reconsideration decision, etc.
   6. The Appeal Commission’s decision will be reported to the AEER Administrative Board in writing by the Head of the Commission. The decision rendered by the Appeal Commission is the final decision of AEER.
4. **Additional Provisions.**
   1. Members of the Appeal Commission shall comply with confidentiality and willful refusal from work in case of conflict of interests.