**EXTERNAL REFERENCES OF PROGRAMME LEARNING OUTCOMES**

* European Qualification Framework (EQF)
* Dublin Descriptors
* European level subject requirements (EUR-ACE, etc.)
* National Qualification Framework (NQF)
* National level field specific requirements (LT-Subject benchmarking statements)

**EUROPEAN QUALIFICATION FRAMEWORK**

Descriptors defining levels in the European Qualifications Framework (EQF)

**Each of the 8 levels is defined by a set of descriptors indicating the learning outcomes relevant to qualifications at that level in any system of qualifications.**

|  | **Knowledge** | **Skills** | **Responsibility and autonomy** |
| --- | --- | --- | --- |
|  | **In the context of EQF, knowledge is described as theoretical and/or factual.** | **In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments).** | **In the context of the EQF responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility** |
| **Level 6**The learning outcomes relevant to Level 6 are | Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles | Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study | Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups |
| **Level 7**The learning outcomes relevant to Level 7 are | Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or researchCritical awareness of knowledge issues in a field and at the interface between different fields | Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields | Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams |
| **Level 8**The learning outcomes relevant to Level 8 are | Knowledge at the most advanced frontier of a field of work or study and at the interface between fields | The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice | Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research |

**DUBLIN DESCRIPTORS**

The Dublin Descriptors are general statements about the ordinary outcomes that are achieved by students after completing a curriculum of studies and obtaining a qualification. They are neither meant to be prescriptive rules, nor they represent benchmarks or minimal requirements, since they are not comprehensive. The descriptors are conceived to describe the overall nature of the qualification. Furthermore, they are not to be considered disciplines and they are not limited to specific academic or professional areas.

The Dublin Descriptors consist of the following elements:

• Knowledge and understanding;

• Applying knowledge and understanding;

• Making judgements;

• Communication skills;

• Learning skills.

**1st cycle**

Qualifications that signify completion of the first cycle are awarded to students who:

• have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study;

• can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study;

• have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues;

• can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences;

• have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.

**2nd cycle**

Qualifications that signify completion of the second cycle are awarded to students who:

• have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;

• can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;

• have the ability to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments;

• can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;

• have the learning skills to allow them to continue to study in a manner that may be largely selfdirected or autonomous.

**3rd cycle**

Qualifications that signify completion of the third cycle are awarded to students who:

• have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of research associated with that field;

• have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity;

• have made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, some of which merits national or international refereed publication;

• are capable of critical analysis, evaluation and synthesis of new and complex ideas;

• can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;

• can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.

**AZERBAIJAN QUALIFICATION FRAMEWORK**

|  |  |  |  |
| --- | --- | --- | --- |
| **AzQF Level** | **Knowledge and understanding** | **Skills** | **Autonomy and responsibility** |
|  **Level 6**  | Has a systematic overview of the basic concepts, theoretical principles and research methods of the field of study or workAnalyses facts, theories, principles and methods of the work or study areaUses knowledge for creative solving of abstract tasks in interconnected areas | Performs complicated tasks assuming novel approach Is able to formulate problems relating to the field of work or study and analyse and evaluate different solutionsIs able to select and use appropriate information, technologies and methods when solving problems of the field of work or study within given frameworks, and to model and/or assess the potential results on the basis of the information givenShows initiative, responsibility, leadership and teamwork skills in launching and implementation of projects Is able to explain orally or in written form in the Azerbaijan language and at least one foreign language problems relating to the field of work or study, and to participate in professional discussions | Works independently in complicated and unpredictable situationsIs able to evaluate the role and consequences of his/her professional activities for the community, with consideration to social and ethical aspectsIs able to apply the acquired knowledge and skills in work as a specialist and undertake continuous independent professional development |
| **Level 7** | Has a systematic overview and broad knowledge of the concepts, theories and research methods of the field of work or studyHas in-depth knowledge in a narrower field of work or study  | Solves unpredictable and complicated tasks in his/her professional area Initiates and plans activities and methods; analyses their short- and long-term consequencesIs able to independently and creatively identify and formulate problems related to the field of work or study; is able to solve them within given timeframes and within limited informationIs able to select and use appropriate technologies and methods when solving the problems of the field of work or study, and to model and/or assess the potential results Is able to critically evaluate his/her activities when solving problems of the field of work or studyIs able to present and reason orally or in written form in Azerbaijan language and one foreign language the problems relating to the field of work or study, and to participate in relevant discussions of specialists and non-specialists | Works independently in complicated and unpredictable situations requiring innovative approachIs responsible for the strategic actions of organisations or teamsIs able to hand down his/her knowledge by teaching, instruction, or in another mannerIs able to act ethically in complex situations, be aware of the ethical aspects, possibilities, restrictions and social role of his/her activities and be able to provide reasoned assessment in issues concerning his/her field of work or studyIs able to assess his/ her need, and the needs of others, of continuing training and professional development, and have command of the effective methods necessary for independent study |
| **Level 8** | Has broad knowledge and a systematic overview within his/her professional field, and in-depth and up-to-date knowledge within a narrower sphere of professional activitiesUnderstands the meaning and scope of the existing knowledge and methods of the professional field and between fields so as to extend, re-evaluate, and formulate them as necessary Contributes to the body of professional knowledge  | Solves unique problems in professional areas creating new knowledgeIs able to independently and critically analyse, synthesise, and evaluate new and complex ideas relating to the professional fieldIs able to conceive, design, implement, and critically evaluate research and development projects that lead to new knowledge and new procedural solutionsInitiates, plans and implements strategic research and development activities that widen the realm of work or knowledge or that result in considerable changesIs able to act in work and study environment which requires leadership and team work skills, innovative thinking, and the ability to make strategic decisionsIs able to participate orally or in written form in professional discussions, as well as to publish original research results in internationally pre-reviewed academic publications or, in art specialities, present creative works for international audience | Works independently in complicated, undefined situations requiring excellence and new strategic approach Is responsible for the strategic action of organisations or large teamsIs responsible for the planning and development of the professionEvaluates new and complicated professional ideasIs able to provide scientific ethical assessments, show insight into the possibilities and limitations with science, the social role of science, and the responsibility of people in the use of scientific achievementsIs able to act independently in a complex project, including international work and study environmentHas the ability to identify his/her need for new competences; supports the studies of others both in the context of education and training as well as on a wider social level |

**European level subject requirements** (EUR-ACE, etc.)

**EUR-ACE**

**Standards and Guidelines for Accreditation of Engineering Programmes.
These Standards and Guidelines are described in terms of the Student Workload Requirements, Programme Outcomes and Programme Management which apply to engineering degree programmes to be awarded the EUR-ACE® label.**

The Programme Outcomes are described here separately for both Bachelor and Master Degree programmes with reference to the following eight learning areas:

* Knowledge and understanding;
* Engineering Analysis;
* Engineering Design;
* Investigations;
* Engineering Practice;
* Making Judgements;
* Communication and Team-working;
* Lifelong Learning.

**2.3.1 Programme Outcomes for Bachelor Degree Programmes**

**Knowledge and Understanding**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* knowledge and understanding of the mathematics and other basic sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes;
* knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes, including some awareness at their forefront;
* awareness of the wider multidisciplinary context of engineering.

**Engineering Analysis**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to analyse complex engineering products, processes and systems in their field of study; to select and apply relevant methods from established analytical, computational and experimental methods; to correctly interpret the outcomes of such analyses;
* ability to identify, formulate and solve engineering problems in their field of study; to select and apply relevant methods from established analytical, computational and experimental methods; to recognise the importance of non-technical –societal, health and safety, environmental, economic and industrial - constraints.

**Engineering Design**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to develop and design complex products (devices, artefacts, etc.), processes and systems in their field of study to meet established requirements, that can include an awareness of non-technical – societal, health and safety, environmental, economic and industrial– considerations; to select and apply relevant design methodologies;
* ability to design using some awareness of the forefront of their engineering specialisation.

**Investigations**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to conduct searches of literature, to consult and to critically use scientific databases and other appropriate sources of information, to carry out simulation and analysis in order to pursue detailed investigations and research of technical issues in their field of study;
* ability to consult and apply codes of practice and safety regulations in their field of study;
* laboratory/workshop skills and ability to design and conduct experimental investigations, interpret data and draw conclusions in their field of study.

**Engineering Practice**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* understanding of applicable techniques and methods of analysis, design and investigation and of their limitations in their field of study;
* practical skills for solving complex problems, realising complex engineering designs and conducting investigations in their field of study;
* understanding of applicable materials, equipment and tools, engineering technologies and processes, and of their limitations in their field of study;
* ability to apply norms of engineering practice in their field of study;
* awareness of non-technical -societal, health and safety, environmental, economic and industrial - implications of engineering practice;
* awareness of economic, organisational and managerial issues (such as project management, risk and change management) in the industrial and business context.

**Making Judgements**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to gather and interpret relevant data and handle complexity within their field of study, to inform judgements that include reflection on relevant social and ethical issues;
* ability to manage complex technical or professional activities or projects in their field of study, taking responsibility for decision making.

**Communication and Team-working**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to communicate effectively information, ideas, problems and solutions with engineering community and society at large;
* ability to function effectively in a national and international context, as an individual and as a member of a team and to cooperate effectively with engineers and non-engineers.

**Lifelong Learning**

The learning process should enable **Bachelor Degree graduates to demonstrate**:

* ability to recognise the need for and to engage in independent life-long learning;
* ability to follow developments in science and technology.

**Programme Outcomes for Master Degree Programmes**

**Knowledge and Understanding**

The learning process should enable **Master Degree graduates to demonstrate**:

* in-depth knowledge and understanding of mathematics and sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes;
* in-depth knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes;
* critical awareness of the forefront of their specialisation;
* critical awareness of the wider multidisciplinary context of engineering and of knowledge issues at the interface between different fields.

**Engineering Analysis**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to analyse new and complex engineering products, processes and systems within broader or multidisciplinary contexts; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods; to critically interpret the outcomes of such analyses ;
* ability to conceptualise engineering products, processes and systems;
* ability to identify, formulate and solve unfamiliar complex engineering problems that are incompletely defined, have competing specifications, may involve considerations from outside their field of study and non-technical – societal, health and safety, environmental, economic and industrial – constraints; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods in problem solving;
* ability to identify, formulate and solve complex problems in new and emerging areas of their specialisation.

**Engineering Design**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to develop, to design new and complex products (devices, artefacts, etc.), processes and systems, with specifications incompletely defined and/or competing, that require integration of knowledge from different fields and non-technical - societal, health and safety, environmental, economic and industrial commercial – constraints; to select and apply the most appropriate and relevant design methodologies or to use creativity to develop new and original design methodologies.
* ability to design using knowledge and understanding at the forefront of their engineering specialisation.

**Investigations**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to identify, locate and obtain required data;
* ability to conduct searches of literature, to consult and critically use databases and other sources of information, to carry out simulation in order to pursue detailed investigations and research of complex technical issues;
* ability to consult and apply codes of practice and safety regulations;
* advanced laboratory/workshop skills and ability to design and conduct experimental investigations, critically evaluate data and draw conclusions;
* ability to investigate the application of new and emerging technologies at the forefront of their engineering specialisation.

**Engineering Practice**

The learning process should enable **Master Degree graduates to demonstrate**:

* comprehensive understanding of applicable techniques and methods of analysis, design and investigation and of their limitations;
* practical skills, including the use of computer tools, for solving complex problems, realising complex engineering design, designing and conducting complex investigations;
* comprehensive understanding of applicable materials, equipment and tools, engineering technologies and processes, and of their limitations;
* ability to apply norms of engineering practice;
* knowledge and understanding of the non-technical – societal, health and safety, environmental, economic and industrial - implications of engineering practice;
* critical awareness of economic, organisational and managerial issues (such as project management, risk and change management)

**Making Judgements**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to integrate knowledge and handle complexity, to formulate judgements with incomplete or limited information, that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgement;
* ability to manage complex technical or professional activities or projects that can require new strategic approaches, taking responsibility for decision making.

**Communication and Team-working**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to use diverse methods to communicate clearly and unambiguously their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences in national and international contexts;
* ability to function effectively in national and international contexts, as a member or leader of a team, that may be composed of different disciplines and levels, and that may use virtual communication tools.

**Lifelong Learning**

The learning process should enable **Master Degree graduates to demonstrate**:

* ability to engage in independent life-long learning;
* ability to undertake further study autonomously.

**EXAMPLE FROM FIELD DESCRITOR‘S DESCRIPTION OF ENGINEERING**

**19. Upon completion of the first cycle university studies, the following learning outcomes should be achieved:**

**19.1. Knowledge and abilities:**

19.1.1. Knowledge and understanding of the basis of natural science and mathematics in order to understand fundamental principles of engineering study field of the study programme;

19.1.2. Knowledge and systematic understanding of theoretical and applicable basics and definitions of engineering study field of the study programme;

19.1.3. Coherent knowledge of engineering study field of the study programme;

19.1.4. Knowledge of a wider multidisciplinary engineering context, ability to adapt methods and processes of other science fields.

**19.2. Ability to perform engineering analysis:**

19.2.1. Ability to apply the acquired knowledge and understanding in formulating and solving problems of engineering study field of the study programme by selecting appropriate methods;

19.2.2. Ability to apply the acquired knowledge and understanding in formulating and analysing engineering tasks by selecting appropriate methods for solving them, as well as experimental and manufacturing equipment;

19.2.3. Ability to select and apply proper analytical and modelling methods for the engineering study field of the study programme.

**19.3. To have knowledge and skills necessary for the implementation of designing works of the engineering study field of the study programme:**

19.3.1. Ability to apply engineering knowledge of engineering study field of the study programme and understanding of the development and implementation of projects meeting the defined requirements;

19.3.2. Understanding of project methodologies and ability to apply them.

**19.4. Ability to perform fundamental and applied research:**

19.4.1. Ability to find necessary scientific and professional information by using databases and other information resources;

19.4.2. Ability to plan and perform necessary experiments, process and access data thereof, provide findings;

19.4.3. Holding skills of work with the equipment used in the engineering study field of the study programme.

**19.5. Holding skills of practical work in solving engineering tasks:**

19.5.1. Ability to select and apply proper methods, measures and equipment in the implementation of engineering solutions, knowledge of constructions, principles of operation and functions of such engineering equipment, having initial abilities of usage thereof;

19.5.2. Ability to combine theoretical and applied knowledge in solving engineering problems;

 19.5.3. Understanding and assessment of ethical, environmental and commercial circumstances of the engineering activity;

19.5.4. Understanding principles of organisation of engineering activity, the importance of work and fire safety and the key requirements thereof, interaction of engineering activity links.

**19.6. To have the following personal and social abilities:**

19.6.1. Ability to work effectively on an independent basis and in a team;

19.6.2. Ability to communicate with engineering community and the public;

19.6.3.To have a holistic understanding of the impact of engineering solutions to the public and the environment, to follow norms of professional ethics and engineering activity, to be aware of the responsibility for the engineering activity;

19.6.4. Knowledge of project management and business aspects, understanding of the links between technological solutions and economical consequences;

19.6.5. To understand the importance of individual life-long learning and be prepared for it.

**20. Upon completion of the second cycle university studies and integrated studies, the following learning outcomes should be achieved:**

**20.1. Knowledge and abilities:**

20.1.1. Good knowledge and ability to creatively apply basics of natural science and mathematics, comprehensive knowledge and understanding of principles of engineering study field of the study programme and ability to apply them for the solving of new engineering solutions;

20.1.2. Knowledge and critical assessment of new achievements in the engineering field.

**20.2. Ability to perform engineering analysis:**

20.2.1. Ability to solve atypical problems, which are not strictly defined and not thoroughly specified;

20.2.2.Perceiving standard and non-standard engineering problems, ability to formulate and solve them clearly;

20.2.3. Ability to use one’s own knowledge and understanding for solving practical engineering tasks by application of theoretical models and research methods, including mathematical analysis, calculation modelling and experimental methods of research;

20.2.4. Understanding the importance of social, health, work and fire safety, environmental and commercial requirements;

20.2.5. Ability to apply innovative methods for the solving of specific problems and implementation of solutions thereof.

**20.3. Knowledge and skills necessary for the implementation of designing works of the engineering study field of the study programme:**

20.3.1.Ability to apply one’s own acquired knowledge and understanding in the solving of atypical problems, also those related to other scientific and engineering fields;

20.3.2.Ability to innovatively develop new and original engineering ideas and methods;

20.3.3. Ability to make engineering decisions in coping with multipartite, technically undefined and accurately non-characterised problems;

**20.4. Ability to perform fundamental and applied research:**

20.4.1. Ability to identify, find and assess data necessary for the engineering work by using databases and other information resources;

20.4.2. Ability to plan and perform analytical, modelling and experimental research, also critically assess their data and provide conclusions;

20.4.3. Ability to explore the adaptability of new and newly evolving methods of solving problems of engineering study field of the study programme

**20.5. Skills of practical work in solving engineering tasks:**

20.5.1. Ability to aggregate the knowledge of different study fields and to solve multiple engineering problems;

20.5.2. Comprehensive understanding of applied methods and techniques and their limits, ability to select engineering equipment and software;

20.5.3.Be aware of ethical, environmental and commercial requirements of engineering activity;

20.5.4. Be aware of principles of organisation of engineering activity, understanding of interaction between its links, ability to assess the engineering activity in the aspects of work safety and environmental protection.

**20.6. Personal and social abilities:**

20.6.1. Ability to work effectively on an individual basis and in a team, ability to be a leader of a team of representatives of different study fields and levels.

20.6.2.Ability to communicate with engineering community and the public on a national and international scale;

20.6.3. To have a holistic understanding of the impact of engineering solutions to the public and the environment, to follow norms of professional ethics and engineering activity, to be aware of the responsibility for the engineering activity;

20.6.4. To have thorough knowledge of project management and business aspects, understanding of links between technological solutions and economical consequences thereof.

**Criteria and indicators for study programme evaluation and accreditation in Azerbaijan**

|  |
| --- |
| **1) Programme aims and learning outcomes** |
| CRITERIA | INDICATORS AND INFORMATIN IN SAR |
| 1. The programme aims and learning outcomes are well defined, clear and publicly accessible. | 1. Formulation of the aims and learning outcomes of the programme. |
| 2. The programme aims and learning outcomes are based on the academic and/or professional requirements, public needs and the needs of the labour market. | 2. programme aims and learning outcomes are known by students and other stakeholders. |
| 3. The programme aims and learning outcomes are consistent with the type and level of studies and the level of qualifications offered. | 3. Public resources (information publications, websites, etc.) containing the description of the programme aims and learning outcomes. |
| 4. The name of the programme, its learning outcomes, content and the qualifications offered are compatible with each other. | 4. Data on the regularity of evaluation of learning outcomes and the involvement of Stakeholders. |
| 5. Learning outcomes of the programme correlate with the strategy of the HEI and regional context. | 5. Compliance with legal acts and other documents establishing academic or professional requirements or recommendations for the qualifications of specialists trained. |
| 6. Opportunities for further education and employment are brought to the attention of students and other stakeholders. | 6. Research findings in the respective area of professional practice to support the validity of the intended learning outcomes. |
|  | 7. The learning outcomes are linked to professional activity areas for which the graduates are trained under the programme. |