

National Polytechnic University of Armenia (NPUA) Yerevan, Armenia

Master in Energy Efficiency and Energy Saving Technologies

General Note

Aim of the MARUEEB competences established in the Genoa meeting is the consistency of the educational objectives, expressed in terms of competences, of the MARUEEB study programmes (SPs) with the educational objectives of engineering programmes required and shared at European level. This means that, in order to be consistent with the educational objectives, expressed in terms of competences to be developed and obtained by the students at the completion of the educational process, of engineering programmes required and shared at European level, the educational objectives of the MARUEEB SPs should be consistent with the MARUEEB competences, which have to be intended as a minimum set of competences

Necessarily, the statements of the MARUEEB competences are very general, and should be made specific for each MARUEEB SP taking into account the identified educational needs of the labour market of reference and on the basis of the available resources. This means that each MARUEEB SP should establish its educational objectives, expressed terms of competences, having as general reference the MARUEEB competences, but adapting/adjusting them according to the identified educational needs of the labour market of reference and to the available resources, and eventually adding other competences required by its stakeholders.

Alternatively, if the educational objectives are defined in a very general way, as in the case of the MARUEEB competences, the identified educational needs should be taken into account in the definition of the programme learning outcomes.

Table 1 – Coherence Identified educational needs / Educational objectives (Competences)

Identified educational needs	Corresponding Educational Objectives (Competences)	Notes
ability to apply knowledge in the energy development planning	(Knowledge and understanding) ability to apply knowledge and understanding of mathematics, sciences and engineering disciplines underlying Energy Efficiency and Energy Saving subjects area to solve / design / investigate / conduct complex problems / products, processes and systems / issues / activities.	<p>"ability to apply knowledge": which kind of knowledge?</p> <p>The established competence might be adapted/adjusted according to the identified educational need.</p>
	(Engineering design) ability to design complex products, processes and systems in energy efficiency and energy saving subject area.	

ability to apply knowledge for to use innovative technologies in energy efficiency and energy saving processes, with the renewable energy sources (sun, wind, geothermal energy, biogas, etc.);	(Engineering practice) ability to use and apply practical knowledge and understanding to solve / design / investigate / conduct complex problems / products, processes and systems / issues / activities in energy efficiency and energy saving subject area.	"ability to apply knowledge": <i>which kind of knowledge? Probably knowledge of innovative technology. In this case, the first educational need should be reformulated (for instance: "ability to apply knowledge of innovative technologies in ...").</i>
ability to apply knowledge in energy audit		
	(Investigations) ability to investigate complex issues in the area using innovative technologies in energy efficiency and energy saving.	Probably to be joined in a unique statement with that on Engineering practice.
ability to solve a wide range of problems by using both theoretical and experimental methods	(Problem solving) ability to solve complex problems in Energy Efficiency and Energy Saving subject area.	The established competence might be adapted/adjusted according to the identified educational needs.
decision making ability	(Decision Making) ability to manage complex work contexts, to take decisions and to formulate judgements reflecting on ethical and social responsibilities.	
ethical commitment		
team-work and time management	Team-working) ability to function effectively in (national and international contexts as leader of) a team that may be composed of different disciplines and levels.	The established competence might be adapted/adjusted according to the identified educational need relative to time management.
experience in team-work and time management		
experimental and computational skills		The corresponding competence might be "(Investigation) ability to carry out simulation and conduct experiments in Energy Efficiency and Energy Saving subject area".
ability using their knowledge to learning in new fields	(Lifelong learning) ability to engage in independent lifelong learning and to follow developments and undertake further studies in science and technology autonomously.	The established competence should specify the field of study.
communication skills also with non-experts	(Communication) ability to use diverse methods and tools to communicate clearly and unambiguously with specialist and non-specialist audiences (in national and international contexts).	

Table 2 – Coherence Educational objectives / Programme learning outcomes

Competences	Programme Learning Outcomes that contribute to developing and obtaining of the competence	Notes
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<p>(Knowledge and understanding) ability to apply knowledge and understanding of mathematics, sciences and engineering disciplines underlying Energy Efficiency and Energy Saving subjects area to solve / design / investigate / conduct complex problems / products, processes and systems / issues / activities.</p>		<p><i>No learning outcomes refers to the competence under consideration. In particular, a learning outcome that specify sciences and engineering disciplines underlying Energy Efficiency and Energy Saving subject area seems necessary.</i></p>
<p>(Problem solving) ability to solve complex problems in Energy Efficiency and Energy Saving subject area</p>		<p><i>No learning outcomes refers to the competence under consideration.</i></p>
<p>(Engineering design) ability to design complex products, processes and systems in energy efficiency and energy saving subject area.</p>	<p>ability to demonstrate knowledge and understanding of designing and implementation of energy saving measures in buildings and constructions and using specialized designing software systems</p>	<p><i>This learning outcome seems to cover only very partially the established competence.</i></p>
	<p>ability to perform computer calculations related to sustainable energy development planning by using appropriate software, learning how to analyse and display results.</p> <p>ability to develop physical and mathematical (computer) models of phenomena and objects related to energy efficiency and energy saving technologies</p>	<p><i>These learning outcomes correspond to a competence of the type "(Investigation) ability to investigate complex issues in energy efficiency and energy saving" that has not been established.</i></p>
<p>(Investigations) ability to investigate complex issues in the area using innovative technologies in energy efficiency and energy saving.</p>		<p><i>As already said, probably to be joined in a unique statement with that on Engineering practice.</i></p>
<p>(Engineering practice) ability to use and apply practical knowledge and understanding to solve / design / investigate / conduct complex problems / products, processes and systems / issues / activities in energy efficiency and energy saving subject area.</p>	<p>ability to demonstrate knowledge and understanding of energy efficiency and energy saving innovation technologies at the fundamentals level</p> <p>ability to demonstrate knowledge and understanding of fundamentals on sustainable energy development, energy audit, environmental protection</p> <p>ability to demonstrate knowledge and understanding properties, technical characteristics and areas of applications of innovative energy using technologies</p>	<p><i>Probably all these learning outcome might be more properly defined as module learning outcomes than as programme learning outcomes.</i></p>

	<p>ability to correctly assess the possibility of using innovation materials and technologies for current conditions with requirements of resource and energy efficient, as well as environmental protection requirements</p> <p>ability to apply knowledge for increase of energy efficiency to use physical and technologies of energy saving measures</p> <p>ability to propose criteria which satisfy aesthetic and technical requirements, principles of energy-efficiency, "green" technologies and sustainable energy development</p>	
(Decision Making) ability to manage complex work contexts, to take decisions and to formulate judgements reflecting on ethical and social responsibilities		<i>No learning outcomes refers to the competence under consideration.</i>
(Team-working) ability to function effectively in (national and international contexts as leader of) a team that may be composed of different disciplines and levels.	<p>ability to organize work of fulfillers group, take execution decisions, determine the order of execution phase</p> <p>acquisition of good working habits concerning both working alone (e.g. Thesis – Final Project) and in teams (e.g. lab reports, including team leading), achieving results within a specified timeframe, with an emphasis on awareness about professional integrity and on how to avoid plagiarism</p>	<i>Probably the two learning outcomes might be joined in a unique learning outcome.</i>
(Communication) ability to use diverse methods and tools to communicate clearly and unambiguously with specialist and non-specialist audiences (in national and international contexts).	ability to demonstrate proficiency in using English and Russian language, including subject area terminology, for literature search	<i>This learning outcome covers only very partially the established competence.</i>
(Lifelong learning) ability to engage in independent lifelong learning and to follow developments and undertake further studies in science and technology autonomously		<i>No learning outcomes refers to the competence under consideration.</i>

Table 3 – Coherence Programme Learning Outcomes / Curriculum

General note

The programme learning outcomes have to be intended as the 'key' learning outcomes of the programme.

Each course unit should contribute to the achievement of at least one programme learning outcome.

This does not mean that it is not possible to establish module learning outcomes not consistent with the established programme learning outcomes (and not to be considered as 'key' learning outcomes for the programme), but in addition to module learning outcomes consistent with the programme learning outcomes.

Programme Learning Outcomes	Course Units whose learning outcomes contribute to the achievement of the Programme Learning Outcomes	Notes
ability to demonstrate knowledge and understanding of energy efficiency and energy saving innovation technologies at the fundamentals level.	<p>...</p> <p>...</p> <p>...</p>	
ability to demonstrate knowledge and understanding of fundamentals on sustainable energy development, energy audit, environmental protection.		
ability to demonstrate knowledge and understanding properties, technical characteristics and areas of applications of innovative energy using technologies.		
ability to correctly assess the possibility of using innovation materials and technologies for current conditions with requirements of resource and energy efficient, as well as environmental protection requirements.		
ability to apply knowledge for increase of energy efficiency to use physical and technologies of energy saving measures.		
ability to demonstrate knowledge and understanding of designing and implementation of energy saving measures in buildings and constructions and using specialized designing software systems.		
ability to develop physical and mathematical (computer) models of phenomena and objects related to energy efficiency and energy saving technologies.		
ability to organize work of fulfillers group, take execution decisions, determine the order of execution phase.		
ability to propose criteria which satisfy aesthetic and technical requirements, principles of energy-efficiency, "green"		

technologies and sustainable energy development.		
ability to perform computer calculations related to sustainable energy development planning by using appropriate software, learning how to analyse and display results.		
acquisition of good working habits concerning both working alone (e.g. Thesis – Final Project) and in teams (e.g. lab reports, including team leading), achieving results within a specified timeframe, with an emphasis on awareness about professional integrity and on how to avoid plagiarism.		
ability to demonstrate proficiency in using English and Russian language, including subject area terminology, for literature search.		

Table 4 – Comments on Course Units

General for all course units	
Specific for course unit	