Environmental Security Education Modules for Better Learning

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ABSTRACT: *Engineering education as a discipline has the important component information security. The environment protection has many research fields consisting of engineering vocation which is formed based on the program interdisciplinarity. For the transition courses, we proposed the requirement for the educated people who are willing to get acceptable to solve the accumulated complex issues. This will lead to the better protection for engineering security education.*

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1. Introduction

The academic program of undergraduate studies - the first cycle (Bologna), Engineering for environmental protection is designed as a highly interdisciplinary and multidisciplinary study program. The program of undergraduate studies of engineering for environmental protection consists of educational research fields from the engineering vocation and is formed by study units that with the intersection of several disciplines make the interdisciplinary of the program. In the realization of the program the curriculum areas of environmental protection, machinery, energy, electrical engineering, management, construction and basic scientific disciplines of mathematics, chemistry, physics and other sciences that form the basis of multidisciplinary engineering study program for environment protection are studied.

The universal phenomenon of global warming, acid rains, the effect of greenhouse, ozone holes, extinction and the vanish of a complete range of plants and animals, changed conditions of life, destruction of the natural resources and riches at a global and local national level grew into one of the most important world issues and factors in the future sustainable development of the human civilization.

A special problem of the transition countries (such as the Republic of Macedonia) as the unequal economic growth, the need for plausible development, imperatively impose the need for educated professionals who in the commercial and industrial systems, public enterprises and state institutions will be ready and educated in such a way to solve the accumulated complex problems in the area of engineering for environment protection.

The interdisciplinarity of the study program of the engineering for environment protection is the one which is the result of technical and engineering knowledge, provides an opportunity to educate engineers for the environmental protection who will be able to solve the accumulated issues in the system of environmental protection, and also in other industrial and commercial systems in the Republic and outside its borders.

Engineering for environment protection program that was created as a response to the needs of the industry, economy and the institutions that are facing with the problems relating to environmental protection and which need engineers with interdisciplinary knowledge in the field of engineering for environment protection.

2. Subject and Objectives of the Study Program

The subject of the study program is to educate students about the profession engineer for environment protection in accordance to the needs and development of the country and very complex engineering problems in the environment, which in direction of society development must be resolved. The study program of engineering for environment protection is designed in such a way that it provides the acquisition of competencies, knowledge, and skills that are socially justified and useful. The Faculty of Technical Sciences defines the basic tasks and goals so as to educate highly competent personnel in the field of technology and engineering. The subject of the study program of engineering for environment protection is fully in line with the basic tasks and goals of the Faculty of Technical Sciences in Bitola.

With the implementation of Curriculum Thus designed, engineers for the protection of the environment which own competence in European and worldwide frames are educated. The aim of the study program is achieving competence and academic knowledge and skills in the engineering field of environmental protection. It includes among other developing innovative engineering capabilities for consideration of ecological problems, the ability for critical and analytical thinking, to develop the characteristics of teamwork, cooperation, communication skills and subduing specific practical skills needed for an optimum professional work.

The aim of the study program is to mold an expert who owns a sufficient necessary knowledge of the basic scientific disciplines (mathematics, physics, chemistry, mechanics, thermodynamics) to create a clear picture of the processes unfolding in the industrial systems and the environment, as well as knowledge and skills from traditional engineering disciplines mechanical engineering, energy, processing systems, programming and applied scientific disciplines such as waste and hazardous substances management, environmental projects, assessments, managing and reducing the threat and risk over the environment.

One of the specific purposes, which is consistent with the goals of educating professionals at the Faculty of Technical Sciences, is developing a level of knowledge and awareness among students about the need for permanent education (Life Long Learning – 3L), especially in the areas of plausible development and environmental protection.

The aim of the study program also is educating professionals in the domain of the teamwork, as well as developing the abilities and skills for announcing and displaying the results to the professional and general public.

3. Structure of the Study Program

The title of the study program for undergraduate studies - the first cycle is Engineering for environment protection. As a result of the processes of learning knowledge , skills and competencies are acquired that enable students to use their knowledge to solve problems that arise in the profession, the practice of research, by using theoretical technical literature and enables the continuation of post graduate studies (Second cycle). Following the needs of the economy of our country and the adoption of the new law for high education, new curricula are organized into two cycles:

1. Bologna first cycle with a duration of eight (8) semesters (four academic years) and

2. Bologna second cycle with a duration of two (2) semesters (one academic year).

At the undergraduate studies - Bologna first cycle, which last for four academic years there is one study group: Engineering for environmental protection.

In the course of study, students are given the opportunity, according to their own aspirations and desires, in addition to the compulsory subjects, elect a number of optional subjects.

The compulsory as well as the optional subjects, are defined on the basis of dominant identified problems of the environmental protection in our country, the region and globally, and also on the basis of experience and similar study programs in the EU and the countries worldwide. The structure of the studies is organized such that the first six semesters have common subjects for the three modules, which then constitute a ground for subduing the professional disciplines in the seventh and eighth semester, as well as during the second cycle of the study. From the seventh semester students can choose one of the three modules. Thus, the students are offered a broad opportunity to build themselves as specialists in more specialized areas, with an opportunity to choose many vocational subjects from one or more areas.

Therefore, in order to provide a greater flexibility of the study program, during the academic years, in addition to the compulsory subjects, optional subjects are also projected. The optional subjects are chosen from groups of enclosed subjects, but the students have an opportunity, according to their own aspirations and desires, but in accordance with the teachers, to choose one of the subjects from the Faculty of Technical Sciences, St. “Kliment Ohridski” University or from another University in the country or abroad. At the same time certain conditions that are prescribed for attending the classes of the optional subject should be fulfilled.

The ratio of European points that are received about certain types of subjects is in accordance with the existing legal norms in the Republic of Macedonia and the University St. Kliment Ohridski "- Bitola. Each subject brings a certain number of European credits (ECTS), and for the completion (graduation) of the first cycle, it is necessary to achieve the minimum 240 European credits. For the completion (graduation) of the second cycle, it is necessary to achieve the total of 300 European credits.

4. Qualifications and Competencies of Graduate Students

Students at the end of the study of the first cycle (with completion of all exams including the eighth semester),i.e., after the accomplishing the required minimum of 240 European points, they graduate and gain a degree "Bachelor of University Engineer of Engineering for Environment Protection" or "Bachelor of Science in Environment Protection Engineering". Students at the end of the study of the second cycle (with completion of all exams including the tenth semester), i.e., after the accomplishing the required minimum of 300 European points, graduate and gain a degree "Master of Engineering in Environment Protection" or "Master of Science in Environment Protection Engineering Engineering ".

Graduates from the first and second cycle of engineering in environment protection are competent, qualified and competitive to solve the real problems from the practice, as well as to continue their education, provided that they are determined to do it. Competencies primarily include: developing an ability for critical thinking, an ability to analyze problems, synthesize solutions,

prediction and evaluation of the behavior of the chosen solution with a clear image of which are good and which are bad sides to the foresaid.

When it comes to the specific abilities of the students, by adopting the study program, the student acquires fundamental knowledge and understanding the disciplines of the technical and engineering professions, as well as the ability to solve specific problems with implementation of scientific methods and procedures. Given the interdisciplinary nature of engineering study program for environmental protection, it is especially important the ability to connect to and overview of the fundamental and technical disciplines, the holistic approach and knowledge of the basic expertise and skills from different areas and their utilization. The graduate students of the first cycle of university studies in engineering for the environment protection are capable, in an appropriate manner, to design, and project and present results and activities out of the engineering practice. During the study, emphasis will be placed on much more intensive usage of modern information technologies and tools. Graduates of the first cycle are competent to apply their knowledge into practice and monitor news in the profession, solve problems at all levels and collaborate with local social and international institutions and organizations. Students are able to project, organize, manage in the field of environmental protection. During the study, the student acquires the ability to make experiments independently, interpret and statistically process results, as well as to formulate and convey concrete, realistic and applicable conclusions.

Graduates in engineering for environmental protection – Associate degree (second cycle), are able to define and present the results of the work in an appropriate manner with a very intensive use of information and communication technologies.

Graduates of the second cycle own also additional competencies, unlike students from undergraduate studies, to apply the knowledge into practice and monitoring the implementation of innovations in the profession. Students are qualified to project, organize and manage the environmental protection. In the course of study, students acquire the ability to independently plan and implement an experimental statistical processing of results, as well as formulation and adoption of appropriate conclusions. Graduates (First and Second cycle), from engineering for environmental protection also gain competencies so as how to keep using the resources of the Republic of Macedonia in accordance with the fundamental principles of plausible development. During the study program, students in particular nurture and develop the ability for team work and development of professional ethics.

5. Mobility of the Students

The mobility of the students is provided through the Agreement of academic, scientific and technical cooperation with Fakultet Tehnichkih Nauka (Faculty of Technical Sciences) at the University of Novi Sad, Serbia.

6. Plausibility of Curricula

If Macedonia wants to keep pace with the changes in the environment, its aim is to have well educated engineers for environmental protection - professionals. The purpose of the study programs is creating a basis for competitive model in the education of engineers for environmental protection in line with internationally recognized norms and standards.

Potential students will be informed about the new opportunities and offer by the Faculty using printed brochures and the website of the Faculty (www.tfb.edu.mk). The study programs allow update, using the European system for transferring points (ECTS), optional subjects, with which is achieved education on many levels. Starting from the first cycle which lasts for four years and the second cycle lasting a year, the proposed program is designed so that it can easily fit in the system of higher education 4 + 1 = 5, which opens the possibility for the third cycle (doctoral studies) for a period of three years (six semesters). The Mechanical Engineering Department will respond to the changing demands of national, regional and international level.

7. Funding of the Study Programs (Curricula)

The financing of the study programs will be according to the criteria for financing curricula by the Ministry of Education and Science of the Republic of Macedonia, and in accordance with the positive legal solutions in this area.

8. Conclusion

Serial concept of pre-gradual and post-gradual study via Bologna Declaration looks simple, but it's quite difficult to work out its

contents and program:

It is necessary to distinguish goals of separate stages of education (3-2-3) in connection with different profile of the graduates. We have to find proper mechanisms and criteria for assessing quality of education in separate stages. Implementation of structured education will demand creation of new curricula and to expand the programs in some subjects.

In connection with the fact that graduates acquire a wide range of comprehensive knowledge, it will be possible for the universities to concentrate on scientific education.

Mutual relations of educational programs mentioned above will allow students to have maximal mobility, i.e. transfers between different institutions.

It is necessary to economize in the education process through approximation curricula of technical departments in the first semesters of education. This is a necessary premise for introducing parallel education in foreign language and for implementation of distance learning elements.

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