

# IDENTIFYING THE GAP IN COURSES ON SUSTAINABLE DEVELOPMENT OFFERED BY GREEK UNIVERSITIES

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*Abstract:* In this paper, we present the outcome of the analysis of contemporary curricula of Greek Universities regarding subjects that relate to the environment. We reviewed the syllabuses of the Pedagogical, Scientific and Engineering departments of the major Greek Universities and Technological Educational Institutes, as well as the study programmes offered by the Hellenic Open University. We collected quantitative data on the total number of courses provided in each department or study program and highlighted those that are related to sustainable development. Based on the data we draw conclusions and provide recommendations, which will provide the basis for the development of focused courses.

*Keywords:* sustainable development, higher education, Greece

## INTRODUCTION

Project ÉPOQUE promotes a smart specialization of prospective teachers, scientists and engineers through an environmental portfolio ready to be integrated into the syllabuses of Higher Education Institutes (HEIs). It aims at shaping a new generation of environmental-friendly (green) teachers, scientists, and engineers in the context of higher education modernization agenda connected to SMEs and organizations (including schools). The project will produce a set of comparative studies, courses, and teaching manuals for HEIs.

In this paper, we present the outcome of the analysis of contemporary curricula of Greek HEIs regarding subjects that relate to the environment. In the Greek context, HEIs consist of Universities and Technological Educational Institutes (TEIs).

The objective of this analysis is to bring out the gaps in terms of the knowledge and skills that are fostered through the curricula, and on the other hand highlight the importance of inclusion of issues related to the environment, the sustainable usage of natural resources and especially how energy can be managed across different disciplines. Moreover, we identify the gaps in the curricula of adult education regarding the aforementioned issues, because improving the content of adult education will not only enhance the skills and knowledge of adults, but it will also improve their position in the labour market.

In the following sections, we describe the methodology we applied, the findings for major Greek HEIs and the conclusions drawn. We also add a table listing the specific HEI courses.

## **METHODOLOGY**

The methodology for realizing the survey included mainly:

- Reviewing relevant online literature
- Recording and analysis of the number of environmental courses in the current curricula of the UOI and HOU (that are project partners)
- Recording of environmental-friendly or sustainable development courses in the curricula of the major Greek HEIs, in a way that good coverage is ensured. We included the biggest Greek Universities and TEIs, as well as HEIs from the North to South and from East to West
- Survey of the opinion of HEI professors with the University Professor's Questionnaire posted in google docs. The answers were collected and analysed, leading in the creation of charts, comments and conclusions

## **FINDINGS**

In this section we present specific indicative results of the study for major Greek HEIs. All findings are summarized in a table at the end of the section.

### **University of Ioannina**

In the University of Ioannina, according to the latest results, there are only a very few sustainable development courses in undergraduate level and the same situation is in master's level. A large gap is recorded between the total number of the courses provided and those on environmental or sustainable development; there are only a very few sustainable development courses in undergraduate and postgraduate levels. More specifically:

- In Dept. of Mathematics, there are 116 provided undergraduate courses in total, while there is none in sustainable development and education
- In Dept. of Physics the proportion between the courses on sustainable development to the total number of courses is 3/96 at the undergraduate level and 1/5 at the postgraduate level
- In Dept. of Biology the same proportion is 7/111. There are also 2 master's programs with 1 of them on sustainable development and education issues
- In Dept. of Computer Science and Engineering there are no courses on sustainable development and education

During the last years, the University of Ioannina tried to become a green university. In this context, several conferences were organised included Green Chemistry, while a recycling project of the rubbish and the electronic devices was initiated. Also, many professors and researchers support the environmental strategic plan and action of the region of Epirus.

### **Hellenic Open University**

There are no sustainable development courses in undergraduate level while the situation becomes a little better in master's level. More specifically:

- In School of Humanities there are 50 provided undergraduate courses in total, while there is none in sustainable development and education. There are also 6 master's programs with 1 of them on sustainable development and education issues.
- In School of Social Science there are 15 provided undergraduate courses in total, while there is none in sustainable development and education. There are also 6 master's programs with none of them on sustainable development and education.
- In School of Science & Technology there are 47 provided undergraduate courses in total, while there is none in sustainable development and education. But there are 12 master's programs with 4 of them on sustainable development and education.
- In School of Applied Arts there are no undergraduate courses in general, while there are 3 master's programs; none of them on sustainable development and education.

### **National and Kapodistrian University of Athens**

- In Dept. of Mathematics there are neither undergraduate courses nor master's programs on sustainable development and education
- In Dept. of Physics the proportion of courses on sustainable development to the total number of courses is  $3/90$  at the undergraduate level and  $1/2$  at the postgraduate
- In Dept. of Chemistry the proportion is  $5/63$  at the undergraduate level and  $2/8$  at the postgraduate
- In Dept. of Biology the proportion is  $8/54$ . There are also 6 master's programs with 3 of them on sustainable development and education
- In Dept. of Informatics and in Dept. of Mass Media there are no courses on sustainable development and education

### **Aristotle University of Thessaloniki**

- In the Dept. of Mathematics there are 73 provided undergraduate courses in total, while there is none in sustainable development and education. The same holds true in the master's program of the department.
- In Dept. of Physics the proportion of courses on sustainable development to the total number of courses is  $2/78$  at the undergraduate level and  $9/113$  at the postgraduate level.
- In Dept. of Chemistry the proportion is  $7/104$  at the undergraduate level and  $5/79$  at the postgraduate.
- In Dept. of Biology the proportion is  $5/52$ . There are also 10 master's programs with 5 of them on sustainable development and education issues.
- In Dept. of Geology the proportion is  $4/100$  for the undergraduate courses. But, we see that in their master's programs there are 6 in total with 4 environmental ones.

- In Dept. of Informatics there are no courses on sustainable development and education

### **University of Patras**

- In Dept. of Mathematics there are 94 provided undergraduate courses in total, while there is none in sustainable development and education
- In Dept. of Physics the proportion of courses on sustainable development to the total number of courses is  $3/82$  at the undergraduate level and  $4/10$  at the postgraduate
- In Dept. of Chemistry the proportion is  $4/64$  at the undergraduate level and  $3/7$  at the postgraduate
- In Dept. of Biology the proportion is  $12/55$ . There are also 3 master's programs with 1 of them on sustainable development and education
- In Dept. of Geology the proportion is  $7/84$  for the undergraduate courses. But, we see that all their master's programs are environmental-friendly
- In Dept. of Informatics there are no courses on sustainable development and education

### **National Technical University of Athens**

- In Civil Engineering Department the proportion of courses on sustainable development to the total number of courses is  $13/129$  at the undergraduate level and  $11/70$  at the postgraduate.
- In Mechanical Engineering Department the proportion is  $7/141$  at the undergraduate level. There are also 13 master's programs with 2 of them on sustainable development and education
- In Electrical and Computer Engineering Department the proportion is  $5/206$  at the undergraduate level and  $1/127$  at the postgraduate
- In Architecture Department the proportion is  $3/100$ . There are also 4 master's programs with 1 of them on sustainable development and education.
- In Chemical Engineering Department the proportion is  $9/113$  at the undergraduate level. There are also 10 master's programs with 2 of them on sustainable development and education
- In Rural and Surveying Engineering Department the proportion is  $8/113$  for the undergraduate courses. But, we see that in their master's program the proportion between the total number of courses is  $56/26$ .
- In School of Applied Mathematical and Physical Sciences the proportion is  $5/201$  for the undergraduate courses. There are also 16 master's programs with 1 of them on sustainable development and education.

## **TEI of Athens**

- In Electronic Engineering Department, Biomedical Engineering Department, Library Science & Information Systems Department, Business Administration Department, Social Work Department, Midwifery Department, Nursing Department, Dental Technology Department, Optics and Optometry Department, Marketing Department, Occupational Therapy Department, Preschool Education Department, Department of Radiologic Technologists, Physiotherapy Department, Department of Interior Architecture, Decorative Arts & Design and Photography and Audiovisual Arts Department at Technological Educational Institute of Athens there are no courses on sustainable development and education
- In Technology Engineering Department the proportion of courses on sustainable development to the total number of courses is  $\frac{5}{48}$  for the undergraduate courses and  $\frac{2}{10}$  for the postgraduate
- In Civil Engineering and Surveying & Geoinformatics Engineering Department the proportion is  $\frac{3}{45}$  for the undergraduate courses.
- In Public Health Department the proportion is  $\frac{5}{40}$  for the undergraduate courses. There are also 4 master's programs with none of them on sustainable development and education.
- In Food Science and Technology Department the proportion is  $\frac{1}{40}$  for the undergraduate courses. There are also 18 provided post graduate courses in total, while there is none in sustainable development and education.
- In Graphic Design Department the proportion is  $\frac{1}{44}$  for the undergraduate courses

## **TEI of Thessaloniki**

- In Information Technology Department, Department of Automotive Engineering, Science departments, Aesthetics Department, Midwifery Department, Nursing Department, Physiotherapy Department, Library Department, Department of Marketing, Accounting and Finance Department, Degree of Tourism Department, Food Science and Technology Department at Technological Educational Institute of Thessaloniki there are there are no courses on sustainable development and education.
- In Electronic Engineering Department the proportion of courses on sustainable development to the total number of courses is  $\frac{1}{52}$  for the undergraduate courses, while post graduate programs are not provided at all.
- In Civil Engineering Department the proportion is  $\frac{1}{45}$  for the undergraduate courses, while post graduate programs are not provided at all.
- In Crop Science Department there are 40 provided undergraduate courses in total, while there is 1 in sustainable development and education.
- In Agricultural Development and Agribusiness Management Department the proportion is  $\frac{3}{42}$  for the undergraduate courses

- In Food Technology Section Department there are 42 provided undergraduate courses in total, while there are 2 in sustainable development and education.

### Summary table

Table 1 presents a summary of the data presented above, regarding courses on sustainable development offered by Greek Universities.

Table 1. Summary of the data regarding courses on sustainable development offered by Greek Universities

Department/School	Undergraduate Courses	Environmental Courses	Postgraduate Courses	Environmental Courses
<b><u>University of Ioannina</u></b>				
Philology	141	0	1	0
History and Archaeology	124	0	16	0
Philosophy, Education and Psychology	156	1	1	0
Mathematics	116	0	3	0
Physics	96	3	5	1
Chemistry	105	0	8	2
Computer Science and Engineering	104	0	5	0
Materials Science and Engineering	106	2	2	0
Primary School Education	89	2	4	1
Pre-School Education	109	5	6	1
Economics	79	1	1	0
Medicine	141	1	8	0
Biological Applications & Technologies	111	7	2	1
Fine Arts and Sciences of Arts	130	0	3	0
<b><u>Hellenic Open University</u></b>				
School of Humanities	50	0	6	1
School of Social Science	15	0	6	0
School of Science & Technology	47	0	12	4
School of Applied Arts	-	-	3	0

<b><u>Aristotle University of Thessaloniki</u></b>				
Math	73	0	41	0
Physics	78	2	113	9
Chemistry	104	7	79	5
Biology	52	5	10	5
Geology	100	4	6	4
Informatics	79	0	6	0
<b><u>University of Patras</u></b>				
Mathematics	94	0	41	02
Physics	82	3	10	4
Chemistry	64	4	7	3
Biology	55	12	3	1
Geology	84	7	2	2
Environmental and Natural Resources Management	104	43	-	-
Cultural Heritage Management and New Technologies	101	0	-	-
Business Administration of Food and Agricultural Enterprises	74	5	2	0
Material Science	82	3	-	-
Business Administration	70	0	-	-
Educational Sciences and Early Childhood Education	117	1	28	0
Computer Engineering and Informatics	280	5	3	1
Medicine	100	1	6	6?
Electrical and Computer Engineering	115	0	3	0
Mechanical and Aeronautical Engineering	195	4	1(35)	1
Economics	52	1	2	0
Primary Education	130	1	61	0
Civil Engineering	112	3	56	12

Chemical Engineering	100	4	28	2
<b><u>National and Kapodistrian University of Athens</u></b>				
Primary School Education	125	2	10	0
Pharmacy	67	1	3	1
Biology	54	8	6	3
Philosophy and History of Science	123	1	5	1
Physics	90	3	2	1
Chemistry	63	5	8	2
Law	103	1	6	0
Political Science and Public Administration	129	1	4	0
Philosophy, Pedagogy and Psychology	129	4	6	0
<b><u>National Technical University of Athens</u></b>				
Civil Engineering	129	13	70	11
Mechanical Engineering	141	7	13	2
Electrical and Computer Engineering	206	5	127	1
Architecture	100	3	4	1
Chemical Engineering	113	9	10	2
Rural and Surveying Engineering	113	8	56	26
Mining and Metallurgical Engineering	117	12	34	6
Naval Architecture and Mechanical Engineering	137	2	-	-
School of Applied Mathematical and Physical Sciences	201	5	16	1
<b><u>TEI of Athens</u></b>				
Electronic Engineering	40	0	17	0
Biomedical Engineering	44	0	4	0
Technology Engineering	48	5	10	2
Naval Architecture	44	1	-	-



Civil Engineering and Surveying & Geoinformatics Engineering	45	3	-	-
Library Science & Information Systems	44	0	15	0
Business Administration	3	0	15	0
Marketing	44	0	-	-
Aesthetics and Cosmetology	43	0	15	13
Public Health	40	5	4	0
Occupational Therapy	42	0	-	-
Medical Laboratory	40	0	25	7
Social Work	43	0	25	0
Midwifery Department	42	0	23	0
Nursing	40	0	7	0
Dental Technology	38	0	20	0
Optics and Optometry	43	0	10	0
Preschool Education	42	0	-	-
Department of Radiologic Technologists	40	0	-	-
Physiotherapy Department	42	0	-	-
Beverage Technology	48	1	21	0
Food Science and Technology	40	1	18	0
Graphic Design	44	1	-	-
Department of Interior Architecture, Decorative Arts & Design	48	0	-	-
Conservation of Antiquities and Works of Art	48	0	22	12
Photography and Audiovisual Arts	44	0	-	-
<b><u>TEI of Thessaloniki</u></b>				
Electronic Engineering	52	1	-	-
Information Technology	39	0	10	0
Department of Automotive Engineering	42	0	-	-

Civil Engineering	45	1	-	-
Science departments	42	0	-	-
Faculty of Crop Science	40	1	-	-
Department of animal production	39	1	-	-
Agricultural Development and Agribusiness Management	42	3	-	-
Aesthetics	49	0	-	-
Early Childhood Care & Education	63	1	-	-
Medical Laboratory	48	0	-	-
Midwifery Department	40	0	-	-
Nursing	47	0	10	0
Physiotherapy	42	0	-	-
Library Department	39	0	-	-
Department of Marketing	42	0	-	-
Accounting and Finance	36	0	-	-
Degree of Tourism	70	0	-	-
Food Science and Technology	45	0	-	-
Food Technology Section	42	2	-	-

## CONCLUSIONS

The percentage of courses related to sustainability and the environment is higher in the postgraduate study programmes compared to undergraduate study programmes offered by various Departments or Schools in Greek Universities. This can be considered as a surprise, because the number of ECTS allocated to postgraduate study programmes is lower than that allocated to the undergraduate ones, therefore the variety of subjects that can be included in the former is restricted.

There exist a few environmental-friendly study programmes, in which the percentage of courses related to sustainability and the environment is high compared to the total number of courses offered (i.e. Environmental Engineering at Univ. of Crete, Rural Engineering at NTUA, Environment at Univ. of the Aegean, Environmental Design at HOU, etc.).

The broader domain of the Departments or Schools offering most of the environmental-friendly study programmes is closely related to the environment. Among the other Departments or Schools of the Greek Universities, we observed that:

- The higher percentage of courses related to sustainability and the environment is found in engineering study programmes, especially at postgraduate level
- Among the natural science study programmes, those offered by Departments of Biology, Chemistry and in some cases, Geology and Physics, contain a satisfactory number of courses related to sustainability and the environment; on the contrary, these courses are scarce in programmes of study offered by Departments of Mathematics and Informatics

Moreover:

- Departments that focus on education, pre-school or primary, offer a surprisingly high number of courses related to sustainability and the environment
- The study programmes offered by Departments or Schools related to humanities (i.e. Philology, Archaeology, Sociology etc.) offer very few or no courses related to sustainability and the environment
- The study programmes offered by Departments or Schools of medicine, law and economics / business contain very few or no courses related to sustainability and the environment; this comes as no surprise given the breadth of the disciplines that these have to cover, however, one can argue that sustainability and the environment are horizontal topics affecting all facets of human activity

Overall, the study programmes of Greek Technological Educational Institutes contain very few courses related to sustainability and the environment. This is surprising given the applied nature of the subjects and the study programmes offered by TEIs. Clearly, a coordinated effort is required in order to enrich them.