



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

Α.ΔΙ.Π.

H.Q.A.

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ΠΟΙΟΤΗΤΑΣ

HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

EXTERNAL EVALUATION REPORT

**DEPARTMENT OF ENVIRONMENTAL & NATURAL RESOURCES
MANAGEMENT**

UNIVERSITY OF WESTERN GREECE

April 7, 2012



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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Environmental & Natural Resources Management, University of Western Greece, consisted of the following five (5) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005:

1. Professor Spyridon Agathos, Coordinator
University of Louvain, Louvain (Belgium)
2. Professor Angelos M Efstathiou
University of Cyprus, Nicosia (Cyprus)
3. Professor Vassily Hatzimanikatis
École Polytechnique Fédérale de Lausanne
Lausanne (Switzerland)
4. Professor Spyros Pavlostathis
Georgia Institute of Technology
Atlanta, Georgia (USA)
5. Professor Sevastianos Roussos
Université Aix Marseille
Marseille (France)

Introduction

I. The External Evaluation Procedure

- Dates of the site visit (Agrinio, Greece)

The visit was carried out from 5 pm on 2/04/2012 until 6 pm on 4/04/2012.

- Whom did the Committee meet?

Day 1 - Monday April 2, 2012:

In the morning the External Evaluation Committee (EEC) members were briefed in the HQAA offices in Athens by Prof. Gerothanassis.

In the afternoon the EEC members travelled to Agrinio. At the beginning of the evaluation process, the EEC members met at the Department premises with the Chairman of the Administrative Committee of the University of Western Greece (UWG), the Vice Rector of Academic Affairs of the University of Ioannina (UOI), the Chairman of the Department, and the members of the Internal Evaluation Committee (OMEA). An introduction and a general discussion were held on the transition of the department from the University of Ioannina to the newly established University of Western Greece (located in the town of Agrinio). In particular, the history of the Department and the issue relating to the professional practice of the Department's graduates were brought up. Both authorities (UOI and UWG) underlined the quality of the department which is held as an example for the newly established UWG.

Following this meeting, the EEC attended a series of presentations regarding the history of the department, its evolution, current teaching and research activities. The following were highlighted:

- (i) the overview of the educational and research activities of the department by the chairman of the department (Prof. P. Demopoulos)
- (ii) the research achievements of the sector "Environmental systems technology" (publications, citations and h-index, awards, patents) as well as its educational activities (courses, PhD/MSc awarded) by Prof. D. Vayenas
- (iii) the research achievements of the sector "Natural Environment and Energy Management" (publications, citations and h-index, awards, patents) as well as its educational activities (courses, PhD/MSc awarded) by Asst Prof. I. Zacharias and Asst Prof. D. Karamanis
- (iv) the research achievements of the sector "Molecular technologies and pollution control" (publications, citations and h-index, awards, patents) as well as its educational activities (courses, PhD/MSc awarded) by Lecturer G. Tsiamis and Assoc. Prof. I Konstantinou.

During and after the presentations there was given the opportunity to further discuss and comment on the presentations.

Day 2- Tuesday April 3, 2012

On the second day, the EEC met with the academic staff members of the Department in groups based on their academic rank, and with samples of the undergraduate students, postgraduate students, and PhD candidates. The schedule was kept flexible to address a broad range of issues and provide relevant input to the EEC.

Day 3- Wednesday April 4, 2012

On the third day, the EEC met with the group of Full Professors, visited all teaching and research laboratories/facilities of the department, the UWG library, and the administrative services of the department. The EEC had also discussions with all respective staff members of the above units.

In the late afternoon of Day 3, the EEC members returned to Athens.

Day 4 - Thursday April 5, 2012

The EEC members worked on the final draft of the EER at the hotel facilities arranged by the HQAA.

Day 5 - Friday April 6, 2012

The EEC members continued working on the final draft of the EER.

Day 6 - Saturday April 7, 2012

The EEC members continued working on the final draft and submission of a first draft of the EER. The EEC members departed from Athens.

Summary: The Department of Environmental & Natural Resources Management prepared a program that allowed meetings, discussions and visits with all divisions of the Department. The EEC also met with the Chairman of the Administrative Committee of the UWG at his request, where important issues about the current status and future plans of UWG, but also the EEC's concerns were discussed. In these meetings, all members of the academic staff were present except for those who were on leave of absence abroad.

Furthermore, the EEC had the opportunity to speak to the laboratory instructors, visit all teaching and research laboratories/facilities, computing facilities, and the core teaching and research instrumentation used. The EEC also met and had discussions with a number of students (undergraduate, MS) and PhD candidates. The EEC visited the University library facilities, and the University restaurant. Our stay in Agrinio was very well organised thanks to the hospitality of all the faculty members and the administration of UWG.

II. The Internal Evaluation Procedure

- *Appropriateness of sources and documentation used*

The EEC members had at their disposal prior to and during the evaluation process the following documentation: (i) reports of teaching and research activities of the Department in the period 2006-2011, and (ii) Internal Evaluation Reports for the periods 2006-2008 and 2009-2010. These documents included detailed information on the structure of the Department, the building facilities and a short introduction to the organisational structure of the University. However, there was no adequate written description of the structure and organization of the UWG and the position, role, and function of the Department within the University of Ioannina and the University of Western Greece. Additional documents concerning several research aspects and activities were made promptly available upon the request of the members of the EEC (e.g., textbooks, theses, teaching load).

- *Quality and completeness of evidence reviewed and provided*

The reports supplied reflected the current situation of the department (up to 2011). They clearly describe the goals, structure, organisation and facilities of the Department. The Department made a truly professional effort to provide a complete picture of teaching and research activities, of administrative and laboratory facilities, and expeditiously responded to all requests of EEC.

- *To what extent have the objectives of the internal evaluation process been met by the Department?*

Overall, the Internal Evaluation Reports met the objectives of the evaluation process.

A1. Undergraduate Curriculum

APPROACH

Goals and objectives of the Undergraduate Curriculum (UGC)

This is a relatively new program, established in 1998 under the administrative authority of the University of Ioannina. The first significant revision of UGC was made in 2005, and a second major revision was implemented in 2009 to reflect the decision of the department to establish a program leading to a degree in Environmental Engineering. The latter was undertaken in order for the graduates to have the professional rights and accreditation of an environmental engineer as is the case with the other two programs in Greece (Democritus University of Thrace, Xanthi and Technical University of Crete, Chania).

The UGC has gone through four distinct phases in the period 1998-2011: (i) 1998- 2000, UGC was similar to the ones of forestry departments; (ii) 2001-2005, many of the agronomic courses were replaced by biological and engineering courses; (iii) 2006-2009, additional courses were included; and (iv) 2009 - , more engineering courses were added in the place of biological and other science courses.

Currently, the courses of UGC consist of seven general areas as classified by the academic staff: technical/engineering (38%), biological (21%), general (17%), social/economics (9%), geology (6.5%), environmental sciences and technology (5%), and agronomy (3.5%).

The academic staff has identified a strategic plan for the current and future development of the UGC which is summarized by the following points:

- Completion of the process to evolve the Department into an *Environmental Engineering School*
- Establishment of their own Postgraduate Program on *Environmental and Natural Resources Management*
- Improvement of the laboratories in terms of both new buildings and infrastructure for education and research purposes.

The goal of the UGC is to provide students with basic and specific knowledge in both theoretical and applied topics, to equip them with exceptional technical and communication skills, raise their awareness of global environmental issues, and enable them with leadership abilities to handle rational design and management of environmental systems and valorization of natural resources.

- *What is the plan for achieving excellence?*

The structure of the current curriculum, while similar to that of the other two Environmental Engineering curricula offered in Greece, it capitalizes on the strengths of the environmental science courses and academic staff expertise. Significant components of the program are of a similar structure and quality of well established international programs.

It is commendable that the academic and other teaching staff is investing extra efforts in order to improve the technical and scientific level of incoming students with very weak

background in this subject due to the current criteria of the national entrance examination.

Student attendance in lectures, though not mandatory, is considered satisfactory by both the academic staff and the EEC. The undergraduate laboratory training is mandatory and successful. However the EEC noted the lack of safety practices and shortage of necessary funds for the proper and safe operation of the laboratories. In addition, the Department has been successful in keeping the curriculum current and effective.

- *How were the objectives decided? Which factors were taken into account?*

A committee in charge of the undergraduate program within the Department revises annually the UGC and submits recommendations to be decided by the department.

The driving force for the evolution of the UGC is the objective to achieve engineering accreditation by the Greek state, and a special character to distinguish it from the other two Environmental Engineering programs.

Technical training with commercial enterprises is not mandatory for the undergraduate students but the Diploma Thesis is mandatory within the curriculum in keeping with international standards.

Undergraduate instruction is transparent as all course summaries are presented in the Studies Guide. The methods used in the classroom for teaching and testing are determined by the instructors and are commensurate with international standards. Some faculty members who teach the undergraduate courses had education and academic experience in Universities outside Greece hence the operation of the undergraduate curriculum reflects this valuable experience. The high level of preparation of undergraduates who matriculate under this Departmental curriculum is evidenced by the successful performance of a number of these students in post-graduate studies in Europe and North America.

IMPLEMENTATION

- *How effectively is the Department's goal implemented by the curriculum?*

The Department has been proactive so that the UGC could achieve the goal of establishing an Environmental Engineering School.

The current curriculum is at a similar level as Environmental Engineering curricula in internationally recognized universities in Europe (European Credit Transfer System, ECTS) and North America. As such, the training of undergraduate students will produce environmental scientists and engineers who will effectively meet the needs of academia and industry. Moreover, the UGC shapes professionals with a unique profile of environmental engineers with specialization in sustainability and natural resources management.

- *How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?*

As stated previously, the first version of UGC was closer to forestry and agronomy, while the current curriculum (after 2009) compares very well with well established environmental

science and engineering undergraduate programs.

- *Is the structure of the curriculum rational and clearly articulated?*

Until 2009, the UGC was not clearly articulated and was lacking coherence. Since 2009, the UGC is rational and clearly articulated and the academic staff is committed to the continuing improvement and implementation of the UGC. This is reflected also in the feedback the EEC received from the various interviews with both the academic staff and the undergraduate students. However, some improvements should be made as indicated below.

- *Is the curriculum coherent and functional?*

As indicated above, the current UGC has coherence and functionality. However, the academic staff and the students recognise that as the curriculum evolved the number of courses became too high (currently 72 courses in total (=71 + diploma thesis) required to graduate). The number of courses should be reduced (see Recommendation 1). Furthermore, the EEC notes that the experimental (laboratory and field) versus theoretical content of the courses must be higher – according to the information provided the EEC by the Department this more practical content currently stands at 33.7% (see Recommendation 3).

- *Is the material for each course appropriate and the time offered sufficient?*

Generally, yes. The time offered for the experimental part in some courses should be increased.

- *Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?*

The departmental facilities provide classrooms and laboratories of inferior quality (e.g., lack of safety issues, lack of access to computer-based presentation). Some of them are of good quality but are lacking essential elements and still do not conform to international standards. The same is also true for the library, instrumentation and utility areas.

A pair of qualified (PhD level) instructors supervises the laboratories, they are very motivated, and they are appreciated by the students and faculty members. The EEC was impressed by the strong effort of the laboratory staff. Although they are often overqualified, they help teach the undergraduates and ensure good working practices in the laboratory.

Recommendation 1: Reduce by at least 20% the current number of courses offered in the curriculum, while at the same time respecting the European standards (number of ECTS to graduate) and quality. In achieving this: (i) avoid overlaps and duplication of subject matter; (ii) move relatively more specialised material to a flexible menu of elective courses.

Recommendation 2: Increase the homework and project load to the students; introduce mandatory mid-term exams and a mandatory internship; create a logical progression of courses based on prerequisites (chain courses); increase computer and computing literacy (e.g., MS Office, Matlab, SigmaPlot).

Recommendation 3: Consider offering complete experimental courses covering material from several theoretical principles within specific areas (e.g., physical chemistry, mass and

heat transport, chemical and biochemical processes).

Recommendation 4: Increase the experimental portion of the ECTS lab load without increasing the overall ECTS of the curriculum, including field exercises, industrial visits, etc. For example, cost benefit analysis and guest lectures from industry accompanied by complete project assignments. This will facilitate employment opportunities for graduates.

Recommendation 5: Investigate the possibility of introducing a capstone, final-year design course (e.g., see accreditation required design courses in US and UK environmental engineering schools).

RESULTS

- *How well is the implementation achieving the Department's predefined goals and objectives?*

The current curriculum includes good quality core courses that meet the Department's predefined objectives. Implementation of the above Recommendations 1-5 will further improve the curriculum.

- *If not, why is it so? How is this problem dealt with?*

N/A

- *Does the Department understand why and how it achieved or failed to achieve these results?*

The Department fully understands the weaknesses of the curriculum, and has already invested on the strengths. The EEC feels that the department will consider and work towards the implementation of the above recommendations.

IMPROVEMENT

- *Does the Department know how the Curriculum should be improved?*

The Department has made several positive suggestions on the improvement of the curriculum in their Internal Evaluation Report (see pages 65-66, IER 2010-2011) with which the EEC fully agrees. In addition, the department has articulated its position in a document on the strategy of the department's academic developments which foresees the establishment of an Engineering School in the UWG (one program in environmental engineering and one in biological and ecological engineering).

Recommendation 6: Currently, a lack of fellowships exists for non-permanent teaching assistants who can support the instruction work of the academic staff during their laboratory courses. Funding and provision of these teaching fellowships by the State and/or the University is necessary and urgently recommended, on a priority basis.

Recommendation 7: Currently, a lack of technical staff exists to maintain and run the instrumentation of the Department that is a basic requirement of the curriculum. The EEC strongly recommends the employment of new technical staff (e.g., technicians). Additional instrumentation is also needed for training and laboratory exercises.

Recommendation 8: The EEC strongly recommends the implementation of homework assignments, group projects, and mid-term examinations (see also Recommendation 2). In addition to the final exams, these items should contribute to the final grade. This will largely improve the quality of the educational experience.

Recommendation 9: The implementation of required prerequisite courses ("chain

system” of instruction) is essential for the more effective development of the curriculum and the quality of the educational experience (see also Recommendation 2).

A2. Postgraduate Curriculum

APPROACH AND IMPROVEMENT RECOMMENDATIONS

Goals and objectives of the Postgraduate Program (PGP)

The PGP consists of two directions that may be followed sequentially (A and B) or, in the case of A, be a final destination.

- A) Postgraduate Diploma of specialization (Master of Science; MSc thesis is mandatory)
- B) PhD Diploma

The current MSc curriculum was established in 2003, and offers one inter-university MSc degree entitled “Sustainable Management of Protected Areas” (Universities of Ioannina, Patras and Thessaloniki), with faculty from national and international universities (IER, pages 23-24). This program leads into two specializations, namely “Conservation and Management of Natural Environment of Protected Areas” and “Technologies of Management of Protected Areas”. This program was financed from 2003 until 2008 by the Ministry of Education via EPEAK-II with the amount of about 1 M Euros. From 2009 until recently, it was covered by the operational budget of the University of Ioannina.

The PGP is focused on two directions: one leads to “Conservation and Management of the Natural Environment of Protected Areas” and the second one addresses “Technologies of Management of Protected Areas”, i.e. all other areas of expertise of the faculty members.

The quality of the program (as well as of the doctoral studies program) is evidenced by the good number of publications in high-impact international journals for the respective areas of research. This metric also attests to the high level of achievement of the academic staff and postgraduate students (see section C).

Given the relatively short existence of the department and the PGP, the prospects of the students having earned a postgraduate degree (MSc) seem satisfactory, but it remains to be seen how the PGP will meet the needs of the national and regional economy and education in the long run. The PhD is more appropriate for preparation of supervisory and managerial industrial positions, academic positions or post-Ph.D. research positions. Even though the two programs (PGP and doctoral studies) are academically attractive and successful, their sustainability and viability is in danger in the absence of a structured financial and administrative support within the University of Western Greece (Agrinio).

Recommendation 10: The EEC supports the proposal of the department to establish its own new MSc program entitled “Management of Environment and Natural Resources”. Within this program, emphasis should be given mainly to core courses and to a lesser extent to elective ones.

Recommendation 11: The EEC recommends the establishment of a mechanism to obtain financial support for postgraduate students through merit-based fellowships. Such support could come from instituting tuition fees, of which a significant portion should be given as fellowships. Another source of support could come from the return to the department of part

of the overhead earned by the department's academic staff through competitive research grants. It should be noted that significant responsibility for the implementation of this recommendation lies with the central administration of the University of Western Greece.

Recommendation 12: There is a need, also strongly requested by the students (MSc/PhD) to increase significantly the practical courses, site visits and field-trips with the appropriate logistical means.

Recommendation 13: The central administration of the University of Western Greece should urgently provide: (i) additional laboratory space for the PGP, (ii) additional office space for the PG students and PhD candidates, and (iii) shared research equipment for teaching needs (e.g., microscopes and analytical instrumentation). In addition, mechanisms for financing the work of Ph.D. candidates should be sought: it is unacceptable that only about 12% of the current Ph.D. students are receiving remuneration.

Recommendation 14: The present safety and hygiene conditions of the teaching and research laboratories emerged as dramatically deficient and potentially dangerous. This requires the immediate attention and action of the University of Western Greece, starting with a site inspection by experts.

Recommendation 15: One specialised technician is required to run the maintenance of all the infrastructure of the teaching and research laboratories of the department.

B. Teaching

APPROACH

The overarching principle of the teaching philosophy of the Department is to provide sufficient knowledge in Environmental Science and Engineering through core and elective courses, as well as applied projects towards undergraduate and graduate (MSc and PhD) degrees.

- *Teaching methods used, course updates, student participation, grades, and average duration for the undergraduate degree*

Teaching methods employ both the traditional classroom lectures based on white board and also modern projection facilities. The content of the courses was recently updated as stated before (see section A1) but also based on an external critical assessment (2009) requested by the department.

Faculty members of the department have published their own textbooks or are using translated popular modern textbooks in several core areas. Most course lectures, notes, homework assignments and solutions are made available in hard copies or through the use of Web resources and multimedia. The distribution of textbooks to the entitled students is streamlined thanks to the newly instituted Evdoxos system which seems to work reasonably well.

The combination of these methods reflects the good quality and teaching expertise of the

academic staff. The teaching faculty members for course work and laboratory work are available to the students not only through regularly scheduled office hours but also on demand at any requested time by the students.

- *Teaching staff/student ratio, interactions of faculty and students, and faculty teaching hours per week*

The ratio of the overall teaching staff to the number of undergraduate students (5 years of study) is $23/496 = 1/21.5$. Taking into account the 227 additional undergraduate students attending between 5-10 years, the overall number of undergraduate student ratio becomes $23/723 = 1/31.4$. The faculty have on average a teaching load of 15 h/week, and this load is doubled if one considers the time devoted to the supervision of final-year diploma theses. This load seems to be high taking into consideration the examination load of the faculty members and the extensive time they and the few lab instructors have to invest in teaching laboratory courses due to the lack of teaching fellowships for postgraduate or doctoral students and the limited technical staff.

- *Teacher/student collaboration*

The interviews conducted with the students demonstrated that there is a high level of collaboration between students, lab instructors, and academic staff.

- *Adequacy of means and infrastructure resources*

The Department is ill-equipped for teaching. The facilities and research instruments for teaching are either non-existent or in unacceptable condition. Several classrooms are lacking basic instructional support, neglected, and are not kept in good shape.

The teaching laboratories do not meet safety international standards (e.g., lack of proper cabinets for chemicals storage, evacuation routes, ventilation system, eye-wash stations, safety shower system, etc.).

The Department has access to a well-maintained central university library. There is a need of extra space and upgraded PCs.

- *Use of information technologies*

Computer equipment and internet resources are used, including online bibliographic databases, electronic books and wireless internet access (e-class). Dedicated computational facilities with several personal computers are available to the students within the Department. Dedicated infrastructure for online access to satellite data is also available. However, continuous upgrading of IT is needed.

- *Examination system and assessment of course work by the students*

Assessing the performance of students in each class is carried out through written final exams. At the discretion of the instructor, in certain classes/laboratories, the final grade is a combination of lab assignments, written reports and oral presentations. Some faculty members had been using a student questionnaire for the assessment of the quality of their

courses, but recently the department made this evaluation process mandatory.

IMPLEMENTATION

- *Quality of teaching procedures*

The teaching methods are highly commended (as seen also in the students' evaluations, see below) and this reflects the experience, flexibility, availability, and dedication of the teaching staff (faculty members and lab instructors). This was also reflected by the undergraduate and postgraduate students during the interviews.

- *Quality and adequacy of teaching materials and resources.*

The EEC notes that in this rapidly evolving field of environmental science and engineering the teaching material is appropriate and updated frequently, although the resources are not adequate. The EEC was impressed by the number and quality of the textbooks and notes contributed by the faculty members.

- *Quality of course material. Is it brought up to date?*

The lectures in all courses are reviewed and updated frequently, while the quality of the course material is considered good.

- *Linking of research with teaching*

The Department has implemented a mandatory Diploma Thesis in the undergraduate curriculum. The latter provides the students with a first-hand research experience which may also provide a link with industry. For those students that enter the MSc program, the link between experimental research and teaching is clearer, and as a result of this it provides a better opportunity for industrial employment and professional career development.

- *Mobility of academic staff and students*

Since the establishment of the department and until 2010, the Department was part of the Erasmus program agreement of the University of Ioannina. Within this program, the Department was collaborating with several other European Universities (pages 10-11, IER 2010-2011). This program has given a lot of students the opportunity to spend 1-2 academic semesters abroad. The Department also participates in several research collaborations with other Universities and Institutes in Greece and abroad. These efforts should be maintained and further increased in the future. Since last year, it appears that in the frame of the new administrative status of the department within the University of Western Greece, the Erasmus program is not functioning.

- *Evaluation by the students of (a) the teaching and (b) the course content and study material/resources*

The evaluation by the undergraduate and postgraduate students during the interviews was extremely positive on both aspects. However, further improvements in the feedback provided by the students could be made through unified questionnaires (see Recommendations 16 and

17).

Recommendation 16: The EEC highly recommends that either the Department or the University review the existing student questionnaires, develop and administer a uniform questionnaire approved by the University, which should remain mandatory for all courses. The results of these questionnaires should be used in a timely manner by the Department to improve teaching effectiveness. This evaluation process should be done via access to a secure internet University site at which each student will provide his/her comments anonymously.

Recommendation 17: It is strongly suggested that special efforts should be given to the use of computer-based tools within the courses. The department should actively search for and implement methods to improve and maintain the computer literacy of the students.

Recommendation 18: It is suggested that the undergraduate and MSc students create awards for the best teachers annually, where the nomination, assessment and selection process is exclusively student-controlled.

RESULTS

- *Efficacy of teaching*

Based on the interviews with the undergraduate and postgraduate students, but also on the results from the teaching evaluation questionnaires, the teaching is very efficient and highly appreciated by the students. Moreover, the students mark their even stronger appreciation of the practical (laboratory and field) courses compared to the already well-liked theory courses. According to the interviewed students, the faculty members are present hands-on in the laboratories and are highly knowledgeable in both theory and practical aspects. However, because of space shortage (given the 150 incoming first-year students) and commensurate lack of supplies and consumables, several lab sessions end up being conducted theoretically in classrooms.

- *Differences between students in (a) the time to graduation, and (b) final degree grades*

The average grade of the undergraduate degree is 6.9/10 for the year 2009-2010, with a worrisome tendency to drop in recent years, at least partially due to the ill-adapted background of the admitted students through the national entrance examinations. Time to graduation averages to 6.2 years (academic years 2004-2011) which is more than the expected 5 years.

- *Whether the Department understands the reasons of such positive or negative results?*

The reason of the current length of graduation time is due to: (a) the indefinite number of repetitions following failure in examinations; (b) the need of certain students to support their educational expenses by working; (c) the lack of fellowships in support of education; and (d) the inappropriate background of the in-coming students from secondary education.

IMPROVEMENT

- *Does the Department propose methods and ways for improvement?*

While the Department does not propose a specific plan for improvements, it has invested a considerable effort to identify the main reasons of the weaknesses of the current teaching program.

The Department has made several positive suggestions in their Internal Evaluation Report (see page 33, IER 2009-2010), which the EEC fully agrees with, and include: (a) reduction in the number of students admitted (with a suggested number around 50); (b) reduction in the teaching load of faculty staff; (c) avoid the danger of reduced quality of the teaching process.

- *What initiatives did the department take in this direction?*

The Department has already requested to the appropriate authorities the reduction of the number of incoming students, the adaptation of their background to natural or technological sciences, and the increase of technical support of its teaching programs. Thus, the EEC finds that the responsibility for addressing these issues from now on lies outside the Department.

Recommendation 19: The EEC strongly recommends the recognition by the Hellenic Republic of the professional rights stemming from the curriculum and the designation of the final degree as an Engineering Diploma.

Recommendation 20: The EEC strongly recommends that the Department should expend considerable effort to find effective ways of increasing classroom attendance for the undergraduate students. For example, classroom assignments will only be handed to those attending and would need to be completed before a student is allowed to conduct the experimental part of the course.

Recommendation 21: The EEC strongly suggests that a significant increase in the quality of the incoming students will be guaranteed only if the admitted secondary school graduates come with a background in natural (currently known as «Θετικές») and technology (currently known as «Τεχνολογικές») sciences. In addition, the highest number of admitted students should not exceed that of 50.

C. Research

APPROACH

- *What is the Department's policy and main objective in research?*

The Department is pursuing research in the general area of environmental science and engineering and natural resources management. In particular, the Department is benefiting from the access to the regional environmental and agro-industrial systems, as well as the natural and anthropogenically impacted habitats of Western Greece.

The Department has presently 23 faculty members. They have organised their research expertise in three research sectors: (i) Environmental Systems Technologies, (ii) Natural Environment and Energy Management, and (iii) Molecular Technologies and Pollution Control.

Overall the Department aims at high quality research as one of the basic competitiveness tools for the regional and national economy, which depends on environmental stewardship and ecosystems services. The Department's strategic goal is to become a Centre of Excellence in Environmental Science and Engineering.

- *Has the Department set internal standards for assessing research?*

The Department has set internal evaluation procedures (see Internal Evaluation Reports for the period 2010-2011) for assessing all aspects of research activity including an external review undertaken on their own initiative.

An internal committee (OMEA) was established for the evaluation of the scientific work and the presentation of the most important results. This committee was very responsive to all EEC requests for additional information or arrangements. The internal evaluation process used commonly accepted international standards for the assessment of the scientific work, such as the number of publications (peer review journals and chapters in books) and citations, the impact factor of journals in which the results have been published, the h-index (ISI Web of Science/Scopus), the number of invited talks at conferences, and the recognition of faculty members with domestic/national or international awards.

IMPLEMENTATION

- *How does the Department promote and support research?*

The Department has initiated multiple actions to promote research: a) several research collaborations have been set up with Environmental Engineering Departments in Europe and North America, many of them with distinguished researchers; b) faculty members participate in several national and international funding programs; c) several faculty members have initiated collaborations with industry; d) several faculty members arrange for graduate student exchanges; e) several faculty members accommodate each other's research by sharing laboratory space and equipment when critical needs appear; f) several national and international symposia have been organized by the Department at the University.

- *Quality and adequacy of research infrastructure and support*

The research infrastructure of the Department is very good with state-of-the-art instrumentation in many cases. This is a credit to the initiatives of faculty members who have been able to acquire specialized equipment through competitive national and European funding sources. It is worth noting though that the infrastructure (e.g., lab space) is not quite completed yet, safety standards are minimal or non-existent, and equipment maintenance and technical support is still a concern. Furthermore, the limited available State funds for fellowships for MSc and PhD students are noted. There may be a risk that this could jeopardise the high quality of research and contribute to brain drain for Greece in the near future. The Department has set up a prioritized equipment list to be purchased. The EEC members fully support this, and urge the State and/or the University to contribute towards this need.

Recommendation 22: The EEC fully supports the prioritized equipment list set up by the Department. As the highest priority, the EEC members suggest the purchase of the following equipment: (1) Off-road vehicle; (2) Shuttle mini-bus (7-9 seats) for small groups of researchers and students; (3) Spectroscopy instrumentation for the characterization of solid samples and surfaces (X-ray photoelectron spectroscopy, XPS); (4) Spectrophotometers in

the UV/visible/near IR; (5) System for cell sorting (FACS); (6) Pyrosequencing system (MiSeq personal sequencer); and (7) System for ecotoxicity measurements based on bacterial luminescence.

- *Scientific publications*

This young Department is already very active in research as evidenced by: a) the large number of publications in peer-reviewed journals, b) the fact that several faculty members have published their own books in English, c) the appreciable number of contributions to books and participation in conferences (invited talks, keynote and plenary lectures), d) the invitation of faculty members to act as guest editors for special issues, e) the number of patents, and f) several international awards. An increasing number of publications in journals with an impact factor >3.0 during the last five years indicates the overall increasing quality of the scientific work carried out. The impact nationally and internationally of the research results and achievements of faculty members are noteworthy as indicated by the following two measures: a) the annual average number of publications per faculty member of the Department of Environmental Engineering is 4.59 (2011 data), which is considerably higher than other University Departments in Greece (average of 1.0); b) the average h-index for the Department is 10.5, which is higher than the average in many University Departments and Research Institutes in Greece and comparable to several such entities in Europe and North America.

The high quality of the research conducted in the Department is accompanied by a high number of publications and commensurate citations. According to the Internal Evaluation Report, during the period 2007-2011 the Academic Staff of the Department has published 469 papers in peer reviewed academic journals (counted since their recruitment) and had almost 3,250 citations according to SCOPUS (3800 when other sources are also taken into account). Moreover, during these years, the faculty members of the Department participated in hundreds of presentations in international scientific meetings. It is also noted that in recent years an increase of the number of publications and citations is observed.

- *Research projects*

The Department has been successfully involved in several competitive research projects that for the period 2010-2011 amounted to approximately 3.9 M Euros. This includes 63 research projects. The EEC members note that most of this support has been obtained through competitive framework and inter-regional projects of the European Union rather than domestic sources. In addition to this support, more than 3 M Euros have been obtained over the same period in educational funding which, either directly (postgraduate program) or indirectly (infrastructure, supplies, books, etc.) contributes to research activities.

- *Research collaborations*

The Department has established numerous research collaborations with domestic and international academic and research institutions, as well as with industrial partners and local authorities.

RESULTS

- *How successfully were the Department's research objectives implemented?*

The departmental objective of excellence in research is attained to a high degree (see above). The participation of faculty members in several national and international funding programs

have attracted significant amounts of research funds in the form of contracts and competitive grants, which led to a current state-of-the-art infrastructure. The research initiatives and achievements in specific areas, such as ecological engineering, advanced physico-chemical systems of effluent treatment, contaminant remediation through intensified biochemical means (e.g. immobilized-cell, fixed-bed bioreactors), and novel functional (meta)genomic tools and high-throughput methodologies, are remarkable and in some cases unique in Greece. Several faculty members of the Department have also initiated strong collaborations with industry.

- *Scientific publications*

See comments in the IMPLEMENTATION section above. The EEC considers several members of this group of researchers as highly productive and on the way to national and international excellence. It is noteworthy that in the short life of the Department, i.e. little more than a decade, 61 PhD theses and 113 MSc theses have been completed, resulting in 213 international peer-reviewed (ISI) publications and 359 conference communications (international: 195, national 164).

- *Research projects*

See comments in the IMPLEMENTATION section above. In the EEC's opinion the quality and the number of research projects is very good and comparable to that of many solid Environmental Science and Engineering Departments in Europe and North America. Therefore, the EEC strongly believes that the Department is fully capable of becoming a leading actor in Greece and in the greater region in this field.

- *Research collaborations*

See comments in the IMPLEMENTATION section above. In the EEC's opinion the number of national and international collaborations is impressive.

- *Efficacy of research work. Applied results and patents*

The efficacy and applied results of the Department research activities are evident by the high productivity in publications, numerous invited presentations, awards and patents.

- *Is the Department's research acknowledged and visible outside the Department?*

- *Rewards and awards*

The international recognition and visibility of several faculty members are evident by the participation of faculty members in international scientific bodies, serving as Editors, Guest Editors and Editorial Board members in peer-reviewed journals/books, journal reviewers, keynotes and international awards. In addition, several faculty members act as Coordinators and reviewers/evaluators for European funded research projects.

IMPROVEMENT

- *Improvements in research proposed by the Department, if necessary.*

The Department is to be commended for its high level of research effort in spite of the limited resources available within the Hellenic Republic. The Department has made specific suggestions, of which paramount is the drastic improvement of the laboratory infrastructure

(buildings and grounds, space, instrumentation) and with which the EEC fully agrees.

- *Initiatives in this direction undertaken by the Department*

The faculty have made significant efforts to maintain and improve their high research level. External factors, such as legal/administrative and financial hurdles, seem to be the main limitation for the Department to reach its full potential. The uncertainty stemming from the status of the newly established University of Western Greece and, more crucially, the inadequate administrative support from services such as the Research Committee and Liaison Office (until recently the Department depended on these services of the University of Ioannina). The Department believes that establishing its own new postgraduate program entitled “Management of Environment and Natural Resources” will contribute to its recognition (“branding”) and will further enhance its research strengths.

Recommendation 23: In addition to supporting the Department’s proposal for the above postgraduate program (see also Recommendation 10, above), the EEC recommends that the Department offers the opportunity to submit the MSc Thesis and PhD Dissertation in English. The EEC anticipates that this will attract a higher calibre of students, as well as students from other countries, and increase international research collaboration even further.

Recommendation 24: The EEC strongly recommends that start-up funding for the entry-level new faculty members should be provided by the University soon after their appointment. This measure will largely enhance participation in competitive grants and excellence in research by young researchers.

Recommendation 25: The EEC strongly recommends that the University establishes explicit (written) internal rules that will help young researchers to quickly develop their own research. For example, besides start-up funding (Recommendation 24), another measure could be the allocation of funds from the overhead retained by the Research Committee of the University from competitive grants received by the research-oriented faculty members.

D. All Other Services

APPROACH

- *How does the Department view the various services provided to the members of the academic community (teaching staff, students).*
- *Does the Department have a policy to simplify administrative procedures? Are most procedures processed electronically?*

The Department views that the various kinds of administrative and technical services provided by the Department itself and by the newly established University of Western Greece to the academic community is borderline adequate.

Student admissions and the recording of course grades are handled by the capable secretarial staff of the Department. By comparison, in many other foreign universities these duties are handled by the central administration. In addition, it appears that there is a lack of support by the central university students’ welfare office for those students who face severe financial needs and academic performance problems.

The library, as pointed out before, is merely adequate but does not have either the space (reading rooms) or facilities (up-to-date computer terminals) that would induce the students to frequent it.

The University restaurant catering to students and faculty is efficient and provides high quality meals (around 430 portions down from 750 before the current financial crisis).

Conversely, there are no residence halls for out-of-town students.

Overall, given the small size of the Department and despite the multiple commitments of the faculty members and the other technical and administrative personnel, there exists a very positive, collaborative, family-like atmosphere that allows the accomplishment of most day-to-day tasks.

Recommendation 26: The University should create a centralized e-system to handle student admissions, student grades and other student-related inquiries. This will alleviate the heavy load currently handled by the Department secretarial staff. The grades for a given course should be available on line through a secure internet site to address student inquiries.

IMPLEMENTATION

- *Organization and infrastructure of the Department's administration (e.g. secretariat of the Department).*

The Department is composed of three major sections on the basis of teaching and research responsibilities: Environmental Systems Technologies, Natural Environment & Energy Management, and Molecular Technologies & Pollution Control. The administration staff is mainly available for administrative duties imposed on the Department, while other procedures relating to purchases for research and teaching are largely performed by faculty and teaching/lab staff. These procedures should be streamlined and accounting aspects, particularly those relating to research grants, should be undertaken by competent personnel of the University administration when the UWG becomes fully operational.

Technical support is needed by the University to address specific safety issues and improve safety in general and in particular in the laboratories of the Department.

Recommendation 27: The EEC recommends that procedures relating to purchases for research and teaching should be streamlined and accounting aspects, particularly those relating to research grants, should be undertaken by competent personnel of the University administration in close collaboration with the technical staff of the Department.

- *Form and function of academic services and infrastructure for students (e.g. library, PCs and free internet access, student counseling, athletic- cultural activity etc.).*

Despite the lack in financial and human resources, the student secretariat is quite efficient and the library is well organized. Good sport facilities are available within the university campus. However, there is a lack of student counseling by the university students welfare office for those students who face severe financial and academic performance problems.

RESULTS

- *Are administrative and other services adequate and functional?*

See comments above.

Overall, the administrative and other services are offered with professionalism and commitment despite the lack of resources.

IMPROVEMENTS

- *Initiatives undertaken by the Department to improve the services provided*

The Department provides support to students exhibiting low academic performance through extra individualized instruction.

The major issues that depend on the University's central administration and appear not to be functioning (student mobility through Erasmus and other programs; support to research-oriented faculty members through the Research Committee; link of students and faculty to the economy and enterprise sector via the Liaison Office for employment, job and start-up creation; etc.) have been pointed out by the Department, but seem to be in suspense, until the status and viability of UWG is clarified.

The Department has shown a certain willingness to be extroverted and contribute to local and regional development. Although relatively little interest has been shown until now by local authorities, the Department's efforts appear well-poised to continue with a national and international focus.

Collaboration with social, cultural and commercial organizations

Since 1998, when the first students were admitted, the Department has developed substantial collaboration with local and national commercial enterprises such as co-operatives, industrial and private sector companies as well as public sector regional and state organizations. Several members of the Department have been participating in a large number of joint projects which relate to the specific needs of such enterprises. Members of these enterprises participate in the educational process by giving seminars, supervising "field project" courses and as ad hoc instructors. In addition, members of the Department present various public outreach services (lectures, articles in local and national outlets, etc). The Department recently organized a workshop on the occasion of its 10 years in operation, where representatives from several social, cultural and industrial organizations participated.

A number of faculty members actively participate in various Hellenic and international scientific union councils, and as expert evaluators of national and international scientific programs.

E. Strategic Planning, Perspectives for Improvement and Dealing with Potential Inhibiting Factors

- *Potential inhibiting factors at State, Institutional and Departmental level, and proposals on ways to overcome them*

Inhibiting factors, some of which were also mentioned in earlier sections, are:

(a) The lack of appropriate and ample enough spaces for research and teaching and the lack

of proper offices and laboratories for junior faculty members (most faculty members with the exception of full and associate professors do not have their own labs); according to its president who met with the EEC, the University Administrative Committee of the UWG has plans for the establishment of extensive buildings and grounds designed to accommodate the Department (200,000 sq.m. of land leased by the Department of National Defense), but there are apparent problems in the perception, by the Department, of their availability and timing;

(b) The lack of funding opportunities and negligible support from the Ministry of Education and the General Secretariat of Research and Technology of the Hellenic Republic. The lack of fellowships and teaching assistantships for the MSc and PhD programs is of particular concern and duly noted;

(c) the small number of technical staff (1 member for 496 students);

(d) the long delays in the approval and hiring process for new faculty;

(e) the lack of a start-up granting system for new faculty members, and bare minimum state funding to cover absolutely basic necessities for research consumables and equipment;

(f) the apparent lack of transparent metrics for the distribution of funds from the University Administration Committee;

(g) the lack of a central Institutional administrative structure (e.g., Research Committee, Erasmus Office, Safety and Hygiene services, etc);

(h) the lack of appropriate support for securing intellectual property rights through patents;

(i) the lack of response by the Ministry of Education to the repetitive requests of the Department relative to criteria of selection of incoming students, accreditation of the engineering degree, space needs, and financial support for the postgraduate program;

(j) lack of visibility of the Department in the local community and national society since the administrative change from the University of Ioannina to the University of Western Greece;

(k) the newly established University of Western Greece is scientifically, administratively and geographically isolated from other research and higher education facilities. The University does not currently have a School of Engineering nor other Natural Sciences departments (e.g., Mathematics, Physics, Chemistry and Biology) that could act synergistically to the goals of the department. Furthermore, there are no locally situated research institutes with which collaborations could be established.

Before everything else, an immediate clarification of the current status and future prospects of the Department is needed. The EEC believes that this Department, which, in its short lifespan, has emerged as a leader in Environmental Science and Engineering, deserves a viable future. The Department would thrive within a fully functional University, where synergies would be possible with other Schools and Departments, particularly in natural sciences and engineering. This would be feasible in Agrinio if an expansion of the University of Western Greece were envisaged in the very near future. Failing that, the EEC believes that the Department could accomplish its drive towards excellence as a unit in another University where it could both offer its unique expertise and graduates profile and could benefit from local synergies and complementarities. For example, thanks to its recent administrative links with it, the Department could become again part of the UoI within its envisaged future Faculty of Engineering. Alternatively, thanks to its existing collaborations, it could become part of the University of Patras Faculty of Engineering.

In addition to previously offered itemized suggestions, specific recommendations of the EEC

on strategic planning, improvements and overcoming inhibiting factors include:

Recommendation 28: The introduction of criteria based on excellence at the University and Departmental level for the distribution of funds for educational and research needs. The distribution of funds needs to reflect (i) the high quality of research and teaching programs, (ii) the documented excellence and recognition in research, and (iii) the continuation and enhancement of excellent achievements which keep departmental faculty members competitive with their peers at the international level.

Recommendation 29: The Department should explicitly formulate internal transparent and measurable guidelines for the timely promotion and tenure of academic staff, based on excellence in both research and teaching.

Recommendation 30: The State should establish a mechanism to evaluate the administrative structure of the newly established University of Western Greece.

- *Short-, medium and long-terms goals/plan and actions for improvement by the Department/long-term actions proposed by the Department*

Some of the short-, medium- and long-terms goals and action plan for improvements are outlined by the Department in the Internal Evaluation Report. In addition, some of these items were also discussed briefly during the site visit. These are considered well thought out and are steps in the right direction to improve education and research within the Department. In particular, given the continuing economic crisis, the EEC is of the strong opinion that the number of incoming students per year must decrease to the level of about 50 at the undergraduate level, considering the present and near future needs of the Greek economy in this specialized field.

Previously articulated recommendations regarding the decrease in the number and increase in the background quality of incoming students (Recommendation 22) as well as the need for additional specialized technical staff (Recommendation 7) are fitting here.

- *Long-term actions proposed by the Department*

The recently enacted law by the Hellenic Republic for higher education, long-term strategic plans will have to be reconsidered within the new Academic Unit (School). This School will be an Engineering School of the UWG, which will include two degree programs: “Environmental Engineering” (currently taught) and “Biological and Ecological Engineering”.

Finally, if the Department is to operate smoothly within the new UWG, especially since it constitutes its flagship, it is important to overcome what appears to be a systemic issue of communication and interaction between the two.

Recommendation 31: The EEC fully endorses the long-term actions proposed by the Department, and strongly recommends that the central administration of UWG makes this a central priority and specific actions should be taken shortly.

Recommendation 32: Overcoming some of the most important inhibiting factors and successfully achieving the goals of the strategic plans strongly depends on the communication and collaboration between the Department and the central administration of UWG in Agrinio. The latter should recognize the quality in research and teaching of this

Department's faculty members under particularly adverse conditions and should establish reward mechanisms in order to avoid the almost certain loss of this important human capital if the perceived gap between UWG Administrative Committee and Department remains.

NOTE: It appears that due to the uncertain future of the Department and the UWG, the inhibiting factors outlined here (Section E), and the apparent administration dynamics, there have been developed centrifugal forces that may even lead to dismantling of the Department and the important efforts that have already been invested – thus, the remarkable achievements accomplished until now are in danger.

F. Final Conclusions and Recommendations of the EEC

Conclusions:

In little over a decade, the Department of Environmental and Natural Resources Management of the University of Western Greece has established a high quality research and teaching program that is commensurate with international standards. The Faculty, although keenly aware of the dysfunctions of Hellenic Universities, has identified improvements, has a realistic vision for the future, is well-equipped to implement changes and is encouraged by the EEC to do so.

- The great majority of faculty members have active and very successful research programs.
- The group of young faculty members (albeit small in number), lead vibrant research initiatives.
- Most faculty members pursue creative and modern teaching initiatives.
- To conduct state-of-the-art research and teaching, State/University funding is absolutely necessary for personnel, instrumentation and technical infrastructure.
- The need for appropriate and ample space for research and teaching, in conformity to international standards of safety, is a *sine qua non* if the faculty members are to continue in their pursuit of excellence in teaching, research and service to the community, the nation and the region.

In summary, the strengths of the Department are the commitment to excellence in the broad areas of teaching and research covered and the presence of active and dedicated faculty members working as a team. The main weaknesses are the constraining space limitations and dangerous lack of safety and hygiene features, the lack of fellowships for students at the M.Sc. and Ph.D. programs, the limited number of technical staff, the very limited financial support provided by the State/University and the poor student attendance particularly at the undergraduate courses.

Recommendations:

The EEC members make the following recommendations to safeguard its achievements and to enhance the future development of the Department. Some of these recommendations are intended for the Department, while others are directed at the University and State authorities (these are the ones mentioned at the particular sections above and are collected as a set below):

Education:

Recommendation 1: Reduce by at least 20% the current number of courses offered in the

curriculum, while at the same time respecting the European standards (number of ECTS to graduate) and quality. In achieving this: (i) avoid overlaps and duplication of subject matter; (ii) move relatively more specialised material to a flexible menu of elective courses.

Recommendation 2: Increase the homework and project load of the students; introduce mandatory mid-term exams and a mandatory internship; create a logical progression of courses based on prerequisites (chain courses); increase computer and computing literacy (e.g., MS Office, Matlab, SigmaPlot).

Recommendation 3: Consider offering complete experimental courses covering material from several theoretical principles within specific areas (e.g., physical chemistry, mass and heat transport, chemical and biochemical processes).

Recommendation 4: Increase the experimental portion of the ECTS lab load without increasing the overall ECTS of the curriculum, including field exercises, industrial visits, etc. For example, cost benefit analysis and guest lectures from industry accompanied by complete project assignments. This will facilitate employment opportunities for graduates.

Recommendation 5: Investigate the possibility of introducing a capstone, final-year design course (e.g., see accreditation required design courses in US and UK environmental engineering schools).

Recommendation 6: Currently, a lack of fellowships exists for non-permanent teaching assistants who can support the instruction work of the academic staff during their laboratory courses. Funding and provision of these teaching fellowships by the State and/or the University is necessary and urgently recommended, on a priority basis.

Recommendation 7: Currently, a lack of technical staff exists to maintain and run the instrumentation of the Department that is a basic requirement of the curriculum. The EEC recommends the employment of new technical staff (e.g., technicians). Additional instrumentation is also needed for training and laboratory exercises.

Recommendation 8: The EEC strongly recommends the implementation of homework assignments, group projects, and mid-term examinations (see also Recommendation 2). In addition to the final exams, these items should contribute to the final grade. This will largely improve the quality of the educational experience.

Recommendation 9: The implementation of required prerequisite courses (“chain system” of instruction) is essential for the more effective development of the curriculum and the quality of the educational experience (see also Recommendation 2).

Recommendation 10: The EEC supports the proposal of the department to establish its own new MSc program entitled “Management of Environment and Natural Resources”. Within this program, emphasis should be given mainly to core courses and to a lesser extent to elective ones.

Recommendation 11: The EEC recommends the establishment of a mechanism to obtain financial support for postgraduate students through merit-based fellowships. Such support could come from instituting tuition fees, of which a significant portion should be given as fellowships. Another source of support could come from the return to the department of part of the overhead earned by the department’s academic staff through competitive research grants. It should be noted that significant responsibility for the implementation of this recommendation lies with the central administration of the University of Western Greece.

Recommendation 12: There is a need, also strongly requested by the students (MSc/PhD) to increase the practical courses, site visits and field-trips with the appropriate logistical means.

Recommendation 13: The central administration of the University of Western Greece should urgently provide: (i) additional laboratory space for the PGP, (ii) additional office

space for the PG students and PhD candidates, and (iii) shared research equipment for teaching needs (e.g., microscopes and analytical instrumentation). In addition, mechanisms for financing the work of Ph.D. candidates should be sought: it is unacceptable that only about 12% of the current Ph.D. students are receiving remuneration.

Recommendation 14: The present safety and hygiene conditions of the teaching and research laboratories emerged as dramatically deficient and potentially dangerous. This requires the immediate attention and action of the University of Western Greece, starting with a site inspection by experts.

Recommendation 15: One specialised technician is required to run the maintenance of all the infrastructure of the teaching and research laboratories of the department.

Recommendation 16: The EEC highly recommends that either the Department or the University review the existing student questionnaires, develop and administer a uniform questionnaire approved by the University, which should remain mandatory for all courses. The results of these questionnaires should be used in a timely manner by the Department to improve teaching effectiveness. This evaluation process should be done via access to a secure internet University site at which each student will provide his/her comments anonymously.

Recommendation 17: It is strongly suggested that special efforts should be given to the use of computer-based tools within the courses. The department should actively search for and implement methods to improve and maintain the computer literacy of the students.

Recommendation 18: It is suggested that the undergraduate and MSc students create awards for the best teachers annually, where the nomination, assessment and selection process is exclusively student-controlled.

Recommendation 19: The EEC strongly recommends the recognition by the Hellenic Republic of the professional rights stemming from the curriculum and the designation of the final degree as an Engineering Diploma.

Recommendation 20: The EEC strongly recommends that the Department should expend considerable effort to find effective ways of increasing classroom attendance for the undergraduate students. For example, classroom assignments will only be handed to those attending and would need to be completed before a student is allowed to conduct the experimental part of the course.

Recommendation 21: The EEC strongly suggests that a significant increase in the quality of the incoming students will be guaranteed only if the admitted secondary school graduates come with a background in natural (currently known as «Θετικές») and technology (currently known as «Τεχνολογικές») sciences. In addition, the highest number of admitted students should not exceed that of 50.

Research:

Recommendation 22: The EEC fully supports the prioritized equipment list set up by the Department. As the highest priority, the EEC members suggest the purchase of the following equipment: (1) Off-road vehicle; (2) Shuttle mini-bus (7-9 seats) for small groups of researchers and students; (3) Spectroscopy instrumentation for the characterization of solid samples and surfaces (X-ray photoelectron spectroscopy, XPS); (4) Spectrophotometers in the UV/visible/near IR; (5) System for cell sorting (FACS); (6) Pyrosequencing system (MiSeq personal sequencer); and (7) System for ecotoxicity measurements based on bacterial luminescence.

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Other Services and General Recommendations for Strategy, Improvement and Overcoming Hurdles:

Recommendation 26: The University should create a centralized e-system to handle student admissions, student grades and other student-related inquiries. This will alleviate the heavy load currently handled by the Department secretarial staff. The grades for a given course should be available on line through a secure internet site to address student inquiries.

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Recommendation 29: The Department should explicitly formulate internal transparent and measurable guidelines for the timely promotion and tenure of academic staff, based on excellence in both research and teaching.

Recommendation 30: The State should establish a mechanism to evaluate the administrative structure of the newly established University of Western Greece.

Recommendation 31: The EEC fully endorses the long-term actions proposed by the Department, and strongly recommends that the central administration of UWG makes this a central priority and specific actions should be taken shortly.

Recommendation 32: Overcoming some of the most important inhibiting factors and successfully achieving the goals of the strategic plans strongly depends on the communication and collaboration between the Department and the central administration of UWG in Agrinio. The latter should recognize the quality in research and teaching of this Department's faculty members under particularly adverse conditions and should establish reward mechanisms in order to avoid the almost certain loss of this important human capital if the perceived gap between UWG Administrative Committee and Department remains.

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