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 ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

Department of Mechanical Engineering

**UNIVERSITY OF WESTERN MACEDONIA
 (KOZANI)**

January 2014

(Based on Version 2.0 of the HQA Template of 03.2010)



European Union
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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Mechanical Engineering of the University of Western Macedonia (Kozani) consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. ***Professor em. George Yadigaroglu***
ETH-Zurich, Switzerland (President)
2. ***Professor Hector Iacovides***
School of Mechanical, Aerospace and Civil Engineering, Faculty of Engineering and Physical Sciences, University of Manchester, UK
3. ***Professor Nicos Ladommatos***
Department of Mechanical Engineering, Faculty of Engineering Science, University College London, UK
4. ***Dr. Stephanos Theodossiades***
Wolfson School of Mechanical and Manufacturing Engineering, Loughborough University, UK

N.B. The structure of the “Template” proposed for the External Evaluation Report mirrors the requirements of Law 3374/2005 and corresponds overall to the structure of the Internal Evaluation Report submitted by the Department.

The length of text in each box is free. Questions included in each box are not exclusive nor should they always be answered separately; they are meant to provide a general outline of matters that should be addressed by the Committee when formulating its comments.

Introduction

I. The External Evaluation Procedure

- **Dates and brief account of the site visit.**
- **Whom did the Committee meet?**
- **List of Reports, documents, other data examined by the Committee.**
- **Groups of teaching and administrative staff and students interviewed**
- **Facilities visited by the External Evaluation Committee.**

The External Evaluation Committee (the *Committee*) received from HQA the academic-year 2012-2013 Internal Evaluation Report (IER) of the unit being evaluated that contained the data for that academic year but limited discussion of the results. During the visit, the Committee was given very extensive documentation in electronic form about all aspects of the Department, that included also the 2007-2011 IER containing a much more detailed and critical evaluation; the Committee learned that extensive evaluations were conducted every four years. Lists of doctoral dissertations and diploma projects were also given to the Committee.

After the usual briefing session at HQA headquarters in Athens on Monday morning, December 16, 2013, the Committee took a flight to Kozani where they were met by members of the Department of Mechanical Engineering (the *Department*) of the University of Western Macedonia (the *University*) and taken to their hotel where they had a brief meeting before being accompanied to the Department.

In the late afternoon of Monday, December 16, an extensive briefing about a variety of subjects of relevance to the Department and the University took place from Prof. A. Tourlidakis, Head of the Department in the presence of Prof. A. Tomboulidis, representing the university-wide QA unit (MOΔIII) and Prof. N.S. Sapidis, representing the departmental QA unit, (OMEA). Very cordial, candid and open discussions took place during not only this meeting but through the entire visit.

During the Tuesday morning meeting with the faculty of the Department, the President of the Governing Board of the University, Prof. T. Chatzipandelis, joined the participants and provided a briefing about the problems of the University as a whole. The Dean of the School of Engineering, Prof. I. Bartzis was also present, in his dual capacity as member of the Department and Dean. The Dean made a presentation of his views regarding the future of the School of Engineering at the end of the day.

According to the detailed plan prepared by the Department following HQA guidelines, the Committee met on Tuesday morning to hear presentations of the Department, its sections and laboratories, and brief introductions of its faculty. The internal evaluation system of the Department was also presented. Followed a lunch at the University student restaurant. On Tuesday afternoon, discussions took place with the faculty regarding various topics, including the Curriculum and teaching, departmental strategy, the future of its graduates, innovations, contacts with the local government and organizations, international relations, etc. A brief meeting of the Committee to discuss first impressions and further plan the evaluation work took place at the hotel at the end of the day that was followed by dinner at a local

restaurant with the entire faculty and staff.

On Wednesday, December 18, the Committee had separate meetings with the undergraduate students (six fourth- and fifth-year students, including elected student representatives), three doctoral candidates and all available members of the administrative and technical staff. These were followed by visits to all the laboratories in all three locations where they are based. A light standing lunch and a general meeting with the faculty took place at the last location to discuss the departmental research strategy. After a brief coordinating meeting of the members of the Committee to agree on the main first conclusions, these were presented to the faculty that added useful comments and in general agreed with the assessments made.

The Committee is grateful to the mayor of the city of Kozani for the meeting on Thursday December 19, at noon, at his office and for the very interesting exchanges that took place.

The Department kindly arranged for adequate report writing space and facilities at the local Technical Chamber of Greece (*TEE*) near their hotel, where they wrote the draft of the present evaluation. The final version of the document was produced by extensive email exchanges and successive reviews after the end of the evaluation mission.

The visit took place in a highly professional and open but equally cordial and collegial atmosphere. The Committee members are unanimous in wishing to express in writing their gratitude and appreciation to all the Departmental faculty and staff for their excellent hospitality, support and help with all aspects of the evaluation and to HQA for the logistical support.

II. The Internal Evaluation Procedure

- **Appropriateness of sources and documentation used**
- **Quality and completeness of evidence reviewed and provided**
- **To what extent have the objectives of the internal evaluation process been met by the Department?**

The extensive IER prepared every four years presents a wealth of well organized, complete information and critical, candid comments about the performance of the Department and ways of improvement.

The Department used available funding to hire three Information Technology (IT) specialists and create an excellent and extensive web-based system of data collection and statistical evaluation (including student evaluations of teaching) that could even find commercial applications. A live, on-line demonstration of this system was made during the meeting with the faculty. The system guarantees anonymity. The system has links to the alumni statistics. *The Committee commends the Department for this effort.*

Student evaluations of teaching are conducted systematically and the results given to the faculty member and to OMEA (only), that can discuss them with the instructor. The Departmental general assemblies are the forum for discussion of Curriculum and teaching improvements in general and take place in the presence of student representatives. There are also on-line student evaluations of the administrative services of the Department.

Recommendation: the instructors could present and discuss the evaluation results with the class to promote instructor/student dialogue.

The Committee concludes that the goals of the internal evaluation of the Department have been met.

III. GENERAL REMARKS – HISTORY AND DEVELOPMENT OF THE DEPARTMENT

The Department was created in 1999 with a different name and has struggled valiantly to develop under often difficult and uncertain conditions. It is making very commendable

efforts to reach a critical and sustainable size under the new catastrophic economic conditions of the country, with the University located at two different cities (Kozani and Florina), and the Department spread all over town in Kozani, at four different buildings.

At the time of its creation, in 1999, the Department was an independent unit of the Aristotle University of Thessaloniki (AUTH). It was attached to the University of Western Macedonia (UWM) in 2004, contrary to the wishes of the faculty that preferred its former status. The merger of the various departments in Florina and Kozani created a highly inhomogeneous University at two different cities, governed, due to its insufficient size, by a Governing Board, rather than being autonomous.

The Department was renamed in 2008 from *Department of Engineering of Energy Resources and Management* to *Mechanical Engineering (ME)*. The reasons included professional ones (degree recognition by the Technical Chamber of Greece, *TEE*); adjustments of the Curriculum were required to make it compatible with the name of the Department. The strong emphasis on energy in teaching and research remains, however. The region of Kozani plays a dominant role in energy in Greece, as is the centre of production of a very high fraction of the electricity and it is also involved in the production or transit of other forms of primary energy, including renewable ones. The Department keeps close contacts to the national utility, the Public Power Corporation (*DEH* for short) as well as to other heavy industries and local organizations. DEH is participating in several activities of the Department, most recently by remarkably funding three chairs for four years, something rather unusual in Greece, for which the Department should be commended.

There are plans – and the corresponding implementation studies were completed – to build a campus on designated, available land, but for reasons that are unclear to the Committee – and to other officials too – in spite of the existence of substantial funding from the National Strategic Reference Framework (*ΕΣΠΑ* or *ESPA* for short) nothing has been realized so far.

The recent re-evaluation of the higher education needs in Greece (the *Athena* plan) has brought new uncertainty regarding the future of the University and the Department that has seriously impacted the student body and the faculty. The announcement of plans to “confederate” the Department with the local educational institution, the TEI of Western Macedonia, has created (for the first time!) protests from the otherwise very peaceful and content student body. This uncertainty about the future of the Department has made hiring of new faculty difficult and has resulted in a number of resignations (two elected faculty members did not accept their appointment and one resigned). (Under the present economic situation, Greek universities have greatly lost their attractiveness for prospective faculty, in general.)

The Department is rarely designated as first choice in the national entrance examination system (for geographical and other reasons). The possibility of transfer (*μεταγραφές*) of a certain category of “disadvantaged” students to other universities has created a haemorrhage of the student body in Kozani.

The geographical separation of the various facilities of the Department creates many practical difficulties to the faculty and to the student body. In Kozani, the University is spread in six different locations (mostly in rented buildings that burden the budget in rents and heating costs – about half of the total budget!). There is serious lack of administrative and support personnel, perhaps even more serious than in other comparable departments.

In spite of these great difficulties, the Department has grown from its initial rudimentary state to an acceptable one and is managing well its activities.

The University *has* implemented the Law 4009/2011 bringing several reforms to the governance of the universities that will also benefit the Department.

A. Curriculum

APPROACH

- **What are the goals and objectives of the Curriculum? What is the plan for achieving them?**

The goals and the objectives of the Curriculum - as stated in the departmental Study Guide - are to nurture the education, scientific research and accrued knowledge related to the subject areas of the mechanical engineering (ME) profession. The main emphasis though is on *energy production, management and storage*, as well as on the *associated effects on the environment*. The plan for achieving the objectives is through an extensive range of courses at undergraduate level, where the students can obtain specialization in three areas. The content of the courses covers a great deal of ME subjects, putting weight on energy-related areas, as expected. *The entrepreneurship aspects of the Curriculum are novel in Greece.*

- **How were the objectives decided? Which factors were taken into account? Were they set against appropriate standards? Did the unit consult other stakeholders?**

The Curriculum objectives were decided by considering relevant programmes from other national and international engineering schools. In addition, consultation has taken place with the Technical Chamber of Greece (TEE), regional stakeholders (such as DEH), other professional bodies and government authorities. Three reforms have occurred, with the most important one taking place after the Department changed its name to Mechanical Engineering, by introducing a stream of courses directly related to the subject area of manufacturing (referred to as *Constructions and Materials*).

- **Is the Curriculum consistent with the objectives of the Curriculum and the requirements of the society?**

The Curriculum is in full accordance with its objectives and the requirements of the society. The geographical location of the Department and the societal needs (at local and national level) call for an engineering department that focuses on energy-related issues.

- **How was the Curriculum decided? Were all constituents of the Department, including students and other stakeholders, consulted?**

The Curriculum has been decided in the General Assembly of the Department which includes student representatives. There is a regular process to assess the harmonization of the Curriculum to its objectives via: i) annual evaluation of the applications of potential students, ii) frequent informal discussions with local stakeholders and ex-students of the Department and iii) annual feedback forms that the students are completing per module taught.

- **Has the unit set a procedure for the revision of the Curriculum?**

The Curriculum has undergone a rigorous internal evaluation process during the last three years. As a result, the total number of modules/courses needed for the degree completion has been reduced to 55 in addition to a final-year project and report. Weekly meetings between the faculty members and the administrators of the Department, as well as the preparation of the IER constitute the main mechanisms for Curriculum revision (a bottom-up approach).

IMPLEMENTATION

- **How effectively is the Department's goal implemented by the Curriculum?**
- **How does the Curriculum compare with appropriate, universally accepted standards for the specific area of study?**

The Department's goal is implemented through the following main features of the Curriculum: i) a compulsory core of engineering courses, ii) three different thematic regions (each one comprising a set of compulsory and optional courses) and iii) the compulsory final-year diploma project. This is an effective approach, which generally conforms to standards set by leading national and international ME departments. The Committee wishes to highlight that there is a cycle of courses in the fifth year, dedicated to energy production and management, which brings additional value to the Curriculum. There are no opportunities though to take courses outside the Department (due to the fact that there is no Polytechnic School in the University). *The Committee considers as good practice the increase of visibility of the diploma projects.*

- **Is the structure of the Curriculum rational and clearly articulated?**
- **Is the Curriculum coherent and functional?**

The structure of the Curriculum is overall rational and clearly articulated through the sets of compulsory and optional courses offered, as well as the thematic areas. *The Committee is pleased to note that the plethora of courses dedicated to energy related engineering principles and applications support effectively the main goal of the Department.* On the other hand, there is some lack of courses in the construction and materials engineering subject area, which is mainly reflected in the relevant thematic region (year four of studies). Sometimes there is high concentration of energy related courses in the same semester and a degree of overlapping (thematically). In addition there are no prerequisite courses; thus, students can take courses in arbitrary order, which makes the Curriculum less functional. Finally, the Curriculum can be sometimes inhomogeneous due to different difficulty levels among courses (as the students have stated).

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

The material and time offered for each course are appropriate for the Curriculum and the objectives. Nevertheless, they do not provide broad coverage of topics in the area of construction and materials engineering.

According to statements by students, often the amount of the actual workload for courses is higher than what was anticipated. Another factor that contributes to the high workload is the large number of courses required.

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

The Department (with four new additions) has now 18 members of faculty (ΔEII), three postdoctoral scientific personnel ($\text{EE}\Delta\text{III}$) and three administrative and support staff, a number that could be considered relatively low. *The Committee noted that the Department has been operating with 12-14 faculty members during the last five years.* In most cases, the scientific backgrounds of the academic personnel have a common denominator: energy and environment. In addition to purely ME backgrounds there is some multidisciplinary diversity (which includes chemical engineering, physics and electrical engineering) in the expertise offered, an element that supports the energy related curriculum objectives. Although energy thematic areas are covered well, the Committee has noticed that the Department lacks human resources in the construction and materials engineering thematic area (currently four members of staff are involved in the relevant teaching activities). The laboratory premises, computer labs and library facilities offered seem to be sufficient for implementation of the curriculum. However, there is no qualified technical staff in the laboratories.

RESULTS

- **How well is the implementation achieving the Department's predefined goals and objectives?**
The educational goals and objectives of the Department are broadly achieved. However, the

Committee has noted that both faculty and students seem to have heavy workloads for different reasons that could impact negatively on the Curriculum. There are limited options in the Curriculum for subjects outside the main addressed field of energy.

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

The approach followed to refine the Curriculum is through weekly discussions between the faculty members (the size of the Department allows to do so). Thus, this is a bottom-up process for Curriculum improvement and lacks external inputs. In addition, the feedback comments of the students are evaluated and used for the improvement of the courses offered.

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

The Curriculum content is quite dense, which is a factor that is also prolonging the graduation of the students quite further than the nominal study time (only a minute percentage of students graduate on time). The limited human resources available, in addition to the relatively recent transformation of the Department to ME (which has led to Curriculum reform) are introducing additional difficulties. Due to the breadth of the Curriculum, the considerations made above have overstretched the efforts to deliver it. *The Committee commends the Department for the delivery of the program of studies in spite of these difficulties.*

IMPROVEMENT

- **Does the Department know how the Curriculum should be improved?**
- **Which improvements does the Department plan to introduce?**

The Department recognizes the need to continuously review and update the Curriculum. They aim to achieve so by establishing clear academic ownership through a dedicated committee that will review the Curriculum and will examine the feasibility of reducing the overall number of courses. *The Committee fully agrees.* Moreover, with the addition of the new members of staff and the expansion of the laboratory facilities, the Department aims to broaden its Curriculum and expand its scope thematically.

GRADUATE STUDIES

The Department offers a regulated doctoral program (without any graduate courses). The requirements for entering and completing the program are demanding. The performance of the doctoral candidates is regularly monitored through yearly reports and measurable outcomes (publications in peer reviewed journals and announcements in conferences). The General Assembly of Special Membership (Γενική Συνέλευση Ειδικής Σύμβασης) is responsible to ensure the application of the program regulations.

B. Teaching

APPROACH:

Does the Department have a defined pedagogic policy with regard to teaching approach and methodology?

- **Teaching methods used**

The Department tries to advance the knowledge and develop the analytical design and practical skills of the students through the blend of teaching techniques used in well-taught engineering programs. These include formal lectures, which, along with the development of the theory, include tutorial examples, laboratories, design exercises, coursework exercises and two major individual projects. The academic staff make support material available on-line, via e-learning platforms. Moreover, the Department organizes industrial visits during the term and also funds via the national programme three-month industrial placements (πρακτική άσκηση) out of term, both of which are most commendable and highly valued by the students. The students are attracted to industry/practice-oriented courses and wish to have as many contacts with industry as possible.

- **Teacher/student collaboration**

The Committee has found with pleasure that there are exceptionally close links between staff (both academic and administrative) and students. The students met confirmed that academics of all rank and administrators adopt an open door policy and students have access to staff at all times. Students are able to seek help and discuss with staff problems related to teaching or course administration on a regular basis.

- **Adequacy of means and resources**

The Department suffers from lack of both human and material resources. The number of academics is far too low for the number of units that need to be delivered for a five-year engineering course. In the topics of construction and materials, staff numbers are especially low and need to be increased to make this part of the curriculum sustainable. The lack of a campus in general and of a purpose-designed building in particular, lead to some practical difficulties for students, who have to move between several buildings, and also deprives them of a university campus experience. The latter was felt most acutely by the students who met the evaluation committee. There are a number of lecture rooms of different sizes, which were in good shape, equipped with modern projection equipment. Many of the labs were well equipped, largely due to the dedication, resourcefulness and success of the staff in attracting income. There were also small computer clusters and a small library/study space, but the provision of such vital auxiliary space is severely curtailed by the lack of purpose-designed buildings and resources.

- **Use of information technologies**

The committee is pleased to note the widespread use of information technologies in teaching, primarily for the provision of support material, but also for other purposes, which include the submission of coursework, communication with students and assessment through multiple choice tests.

- **Examination system**

The Committee is pleased to note that assessment of students, through both coursework and examination, is rigorous and of a high standard. Students, though they feel that examinations are of a higher level of difficulty than those of other Greek universities, nevertheless acknowledge that they reflect the material covered in the lectures. One problem in the

current examination system, which is entirely outside the control of the Department, arises from the fact that students who fail a course are allowed multiple re-sits in subsequent years. This, in some cases, can lead to a situation in which the order in which they take the courses is entirely different from that in the course Curriculum. Consequently, many of the planned educational benefits are lost. *This is perhaps a matter that HQA could make the relevant authorities aware of.*

- **Teaching staff/ student ratio**

This five-year program with more than 50 individual units is delivered to a total of 470 registered students, with a faculty of 12-14, augmented with a few external lecturers. This results in higher teaching loads (about 10 hours per week) than in other departments. *The Committee finds this remarkable, especially given the positive student comments and high degree of student satisfaction.*

IMPLEMENTATION

- **Quality of teaching procedures**

The Committee has questioned both staff and students on how teaching, in all its forms, is conducted. Its conclusion is that, with a few exceptions, this is mostly of high standard.

The Committee wishes to highlight an especially commendable practice (possible thanks to the small student body) followed in the return of marked coursework, where the students have one-to-one meetings with the relevant member of staff in which they get comments and advice on their work.

- **Quality and adequacy of teaching materials and resources**
- **Quality of course material. Is it brought up to date?**

The Department provided the Committee with the course material made available to students. In most cases this appears to be extensive, up-to-date and of good quality.

- **Linking of research with teaching**

The committee was pleased to note many examples in which teaching is linked to the research of the faculty and also to the close collaboration between the Department and DEH, especially, in labs, coursework and the two individual student projects. This certainly adds value to the programme.

- **Mobility of academic staff and students**

The Department offers the students mobility opportunities through programmes like Erasmus, in which the students can spend 6 to 12 months at another European university (a total of 21 students participated to this day; no faculty exchanges so far), or IAESTE, an international industrial placement mutual exchange program (where the School of Engineering is running one of the four IAESTE offices in Greece, supported by the students).

The Department has also developed a double-degree agreement with Cranfield University, a postgraduate training centre of strong international reputation, in which students take one of the 12-month MSc programs at Cranfield in place of their final year in the Department and are awarded degrees from both institutions. This is proving to be very popular with the students. Most members of the faculty have research collaborations with other institutions within and outside Greece.

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

The committee was pleased to learn that the Department has now introduced student

evaluation questionnaires for all courses and that it had devoted considerable resources to develop an IT system for the efficient processing and documentation of the resulting information. It was also important to learn from the faculty, and later to have it confirmed by the students, that there are a number of informal but highly effective quality assurance measures, through the input of student representatives at Departmental meetings, regular student meetings with the chairman of the Department and through the open door policy of all staff, which ensure that most problems that arise are quickly addressed and good practices are disseminated across the Department. *In order to ensure that these excellent practices are maintained, the committee advises that the Department formalises some of these interactions. The committee invites the Department to consider the introduction of some structural changes, perhaps by assigning to one of the academics the overall responsibility for teaching, to ensure that most of quality assurance interactions with the students are formally recorded and that all academics reflect on the student evaluation questionnaires and report their response to the Department.*

RESULTS

- **Efficacy of teaching.**
- **Discrepancies in the success/failure percentage between courses and how they are justified.**
- **Differences between students in (a) the time to graduation, and (b) final degree grades.**
- **Whether the Department understands the reasons of such positive or negative results?**

The committee finds that most of the teaching that takes place in this Department is of a high standard and highly effective. The examination papers are also of a high standard.

The Department currently takes the view, not uncommon in Greek and other universities, that the examination of each course is entirely in the hands of the academic in charge. This can potentially lead to disparities in student assessment and progression. Members of this Committee feel that since the Department has the overall responsibility for the programme as a whole, it must also take charge of the examination process. *The Department is urged to develop the management structures that will enable it to overview the examination process, including preparation of papers and review of the examination outcomes and the investigation of any disparities.*

In the period 2007-2011 very few students got their diploma in five years, less than 50 % in six years or less, and about 70 % in seven years of studies or less; there are a few students who lingered 10-11 years. The Committee hopes that the new Law 4009/2011 will remedy to this.

The average final degree grade was 6.7/10 to the end of 2011 (375 graduates).

Attendance in classes is high in the first year (70-80%) but may drop to 40-50% in the last years.

IMPROVEMENT

- **Does the Department propose methods and ways for improvement?**
- **What initiatives does it take in this direction?**

Perhaps the single most important element to emerge from the evaluation of the teaching of the Department is the high degree of care of all staff for the student's and their learning.

In order for the Department to maintain this ethos as it grows in size and to further improve its teaching, *the Committee advises the Department to:*

- *take steps to formalize its current quality assurance activities*
- *make greater use of the student evaluation returns as a driver for further teaching*

- improvements through a formal mechanism of reflection and response*
- *take ownership of the examination process by overseeing the preparation of examination papers, reviewing the examination results and addressing problems arising from any disparities.*

GENERAL COMMITTEE RECOMMENDATIONS

Implement the necessity of having passed examinations in prerequisite subjects to be allowed to take the more advanced ones and limit the number of possible examinations in the same subject.

The minimum duration of the diploma project is six months; there is no upper time limit. An upper limit should be implemented.

C. Research

APPROACH

- **What is the Department's policy and main objective in research?**
- **Has the Department set internal standards for assessing research?**

The department's policy is to conduct research of high international standard, with the stated objectives of:

- (a) The generation of new knowledge
- (b) The training of graduate and undergraduate students in performing original research.

There is unanimity among the Department's faculty that research outputs, in terms of quality of publications and level of doctoral graduate dissertations, should be among the best nationally and internationally.

There is no explicit departmental strategy regarding the selection of research topics in the areas of specialization of the Department and certain research topics are chosen "bottom-up" and are certainly state of the art and of *international*, rather than strictly national interest; but also some of the projects are of direct interest to local industry and the community in general (e.g. environmental concerns, dispersion of pollutants, heat balance of buildings, reduction of noise in air-conditioning systems, etc).

The Committee feels that the Department should consider its key objectives in research and come up with a set of more specific and coherent research areas where it should concentrate its efforts and seek excellence.

The Department uses a common national list of peer reviewed journal rankings as a guide of quality of the journals in which faculty members publish.

Doctoral students are encouraged to publish and present the results of their research at national and international conferences and symposia and, on average, doctoral students publish two peer-reviewed journal papers from their doctoral research.

The Department uses the standard procedures of the Greek national system for monitoring the progress of doctoral students and for the examination of doctoral dissertations.

The volume and quality of research activity (i.e. the number and quality of peer-reviewed publications) is the main criterion for promotion of faculty members in the nationally regulated system; this is a strong incentive for conducting good research.

IMPLEMENTATION AND RESULTS

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

Younger faculty members, on their first academic appointment, are provided with a start-up fund from the Department, typically between 10,000 to 15,000 EUR for equipment and other activities required to establish their research. The distribution of research grants from local or central government (e.g. the National Strategic Reference Framework, NCRF or ESPA) follows collective discussion among the faculty and is transparent. In a recent example, the Department distributed a substantial proportion of a large ESPA grant strategically for the purchase of equipment for combustion research, where the Department has a high international profile. The resulting facility will enhance collaboration between some of the faculty members specializing in experimental research and faculty engaged in computational combustion research.

- **Quality and adequacy of research infrastructure and support.**

Funding for the Department's research infrastructure has come mostly from competitively won grants (EU and National programmes) and ad hoc grants from central and occasionally local government and to some extent from income generated by industrially sponsored projects. *The Committee was pleased to note that a significant proportion of the Department's research infrastructure is state of the art and competitive at international standards.* The example outlined above will provide a combustion-research facility of high international standard, to the Committee's knowledge, unique in Greece. As further examples of good facilities, the Department is well endowed with equipment for the identification and evaluation of potentially hazardous pollutants emitted within the household environments – among the best internationally; likewise, there are excellent facilities for evaluation and reduction of atmospheric pollutants such as NO_x from combustion sources. There are also good facilities, complemented by those in collaborating institutions, which allow high quality research to be carried out in non-destructive evaluation, vibrations, and strength of materials.

- **Scientific publications.**

Publication in peer-reviewed international journals has remained steady over the period 2007-2013, averaging between two and three per year, per faculty member. Faculty members have also published 15 books and research monographs during the same period.

During the period 2007 to 2013 publications of faculty members received on average about 25 citations per year, per member of staff (based on the Web of Science and Scopus databases). In common with many other research-focused universities in Greece and internationally, the number of citations per member of staff varies significantly, from over 50 per year per member of staff to less than 10.

- **Research projects.**

The committee was pleased to note the significant inflow into the Department of competitive research funding from external sources.

The total external research funding between 2004 and 2013 was close to a remarkable (under Greek conditions) 13 MEUR. Most of the funds came from the EU Framework Programmes and from national competitive programmes (e.g. Thales, Heraclitus) and, to a lesser extent, from industrially sponsored research projects and consultancy services to industry.

During the five academic years 2006-2011, a total of 17 candidates graduated from the Department with doctoral degrees. Doctoral projects are an important element of the

Department's fundamental research project portfolio.

Among the doctoral students on the Department's register, round 8 to 10 are engaged on their research full-time at Kozani; a further five or so spend only part of their time in Kozani, while a further six or so are engaged in collaborative projects based elsewhere; the remaining ones are inactive. *The Committee urges the Department to find ways to improve local presence of the doctoral students.*

- **Research collaborations.**

The Committee was particularly pleased to note the close collaboration that the Department has enjoyed for several years with DEH. This has culminated recently in the endowment by DEH of three Chairs, to support teaching and research. For each chair, DEH will meet the employment costs of the Chair holder and provide an additional 20% overhead. The Department and the University are in the process of filling these posts. The challenge for the Department will be to produce added value for DEH via these arrangements.

The Department has a substantial number of additional collaborations with a wide range of external organisations internationally, such as universities and research institutes, within and outside Greece (EU, USA). There are examples of collaboration with industry and recently one has led to filing a patent application in 2013.

- **Efficacy of research work. Applied results. Patents etc.**
- **Is the Department's research acknowledged and visible outside the Department? Rewards and awards.**

Almost all faculty members of the Department serve on editorial boards of international journals and scientific committees of national and international conferences. The Committee wishes to highlight that a faculty member of the Department has recently been appointed the Chair of the Executive Committee of ERCOFTAC, the high-profile international organization for promoting academic and industrial research in flow, turbulence and combustion. The Committee also noted that another faculty member has served as Vice President of the European Cooperation in Science and Technology (COST) programme.

IMPROVEMENT

- **Improvements in research proposed by the Department, if necessary.**
- **Initiatives in this direction undertaken by the Department.**

The Department has two major research targets, the improvement of some of its laboratories and the increase of doctoral students based at Kozani.

The achievement of the first target is mainly reliant on continuation of the successful external research funding mentioned above. The Department plans to establish four annually awarded doctoral scholarships that will increase the number of doctoral students based in Kozani by an additional dozen or so. This will create a stronger sense of doctoral student community at Kozani. The Department plans to secure funding for these scholarships from DEH and the development fund of the regional authority.

The Department has advanced plans in place for the offer of postgraduate degrees at Masters level (e.g. in clean energy technologies and protection of the environment) and this will help with the recruitment of doctoral students.

The Department is also developing plans to strengthen its existing collaboration with EKETA (Centre for Research and Technology, Hellas) and DEH in the area of solid fuel combustion.

Recommendation: The Department has a strong research focus, alongside its teaching

focused activities. The Committee is of the view that the Department could benefit from the development of an explicit research strategy for the next 5 to 10 year period, which identifies a small number of coherent specific research themes which will act as the Department's research focus. The plan might include the actions to be taken to secure the necessary resources, a faculty appointment strategy to ensure that each theme has sufficient number of faculty and resilience when faculty leaves.

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?**
- **Does the Department have a policy to increase student presence on Campus?**

There is no central campus in Kozani and the Department is housed in four different buildings. In spite of this practical difficulty, the Department is offering necessary services to the faculty and student body.

The Department is implementing modern means to simplify administrative procedures; prominent examples are the web-based collection of statistical data for the periodic internal evaluation of the Department and the effort for automation of other administrative procedures.

IMPLEMENTATION

- **Organization and infrastructure of the Department's administration (e.g. secretariat of the Department).**
- **Form and function of academic services and infrastructure for students (e.g. library, PCs and free internet access, student counselling, athletic- cultural activity etc.).**

The Committee met with the departmental administrative and support staff and learned that, with the exception of certain temporary bottlenecks, the administrative activities were running smoothly. *The Committee commends the administrative and support staff for making this possible, in spite of the already mentioned difficulties.*

There is a sufficient number of modern work stations, WiFi access to the Internet in buildings and a rudimentary library.

RESULTS

- **Are administrative and other services adequate and functional?**
- **How does the Department view the particular results?**

The administrative services are functional, in spite of the lack of personnel and physical separation, thanks in part to modern approaches and implementation of IT.

IMPROVEMENTS

- **Has the Department identified ways and methods to improve the services provided?**
- **Initiatives undertaken in this direction.**

The Department is unable to improve services without additional means. Remaining improvements depend mainly on the development of the University.

Collaboration with social, cultural and production organizations

Please, comment on quality, originality and significance of the Department's initiatives.

The Department has good contacts with local authorities and organizations.

The Committee was pleased to learn that, in times of unemployment, the Department had opened entrepreneurship courses to the local community.

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.**
- **Short-, medium- and long-term goals.**
- **Plan and actions for improvement by the Department/Academic Unit**
- **Long-term actions proposed by the Department.**

Departmental planning and goals have been inhibited by uncertainty regarding its future, by the general economic situation, and by central-government bureaucracy. *The main issues regarding the whole University and its structures and infrastructure have to be addressed urgently, to produce a framework for further sustainable growth of the Department and the University.*

The Committee agrees with the Department's priority to collaborate with heavy industries, in particular DEH, the most appropriate energy-related organization and with the emphasis on matters of energy in teaching and research, something that has the potential of establishing the Department as a centre of excellence in this area.

The educational goals of the Department are directed to the practicing engineer of the region who should be in demand when the economic activity picks up again (as opposed to the graduate that could be accepted in top foreign institutions for further education or research). *The Committee endorses this approach.*

When the financial conditions permit this again, the Committee recommends a re-examination and potential strengthening of the area of construction and materials to make it sustainable in the long term.

F. Final Conclusions and recommendations of the EEC

- **the development of the Department to this date and its present situation, including explicit comments on good practices and weaknesses identified through the External Evaluation process and recommendations for improvement**
- **the Department's readiness and capability to change/improve**
- **the Department's quality assurance.**

Specific conclusions that resulted from the evaluation can be found in the preceding sections throughout the report, in italics. The most important conclusions and recommendations are summarized here and extended with additional general conclusions (in italics).

In spite of the difficulties outlined in the Introduction, the Department has managed to move from its initial very rudimentary facilities to much better equipped modern classrooms and laboratories and is managing well its activities. Academic expectations are high, faculty/student relations are excellent (the Department being small, has an open-door policy and very close contacts with the students that are highly appreciated), the student body is

academically satisfied and the faculty is aware of the efforts needed to improve the situation (e.g., minimize movements of students between facilities). There have been no activities that disrupted the academic life, except in one instance.

Several members of the departmental faculty managed to consistently attract over the years important funding from European Framework programmes and elsewhere that has filled the gap in the inexistent state budget.

The faculty of the Department is mostly young and has a variety of backgrounds and specializations (mechanical, electrical, materials, etc.). The dynamic faculty and the small size of the Department have been factors that have created numerous links and collaborations with other research and academic institutions in Greece and abroad.

Departmental planning and goals have been inhibited by uncertainty regarding its future, by the general economic situation, and by central-government bureaucracy. The main issues regarding the University itself and its structures and infrastructure have to be addressed urgently, to produce a framework for further sustainable growth of the Department and the University.

The Committee feels that there is a local political will to maintain the University locally in Kozani. However, the State should provide in this case the necessary resources for its further development to a sustainable state. A merging of the Department with the local TEI would have strongly undesirable consequences for its development, its mission, for the student body and the development of faculty and staff.

The Committee is pleased to learn that some of the local-development funds of the regional authority are allocated to the University and the Department.

INTERNAL EVALUATION PROCEDURES

The internal evaluation process is conducted systematically and a very good web-based system has been created to administer it. The 2007-2011 IER was thorough and complete and contained all the necessary information; together with the 2011-2012 update they meet the purpose of internal evaluation.

CURRICULUM

The educational goals of the Department are clearly specified in the Study Guide. The Curriculum is in full accordance with the Departmental objectives and the requirements of the society. The plethora of courses dedicated to energy-related engineering principles and applications support effectively the main goal of the Department. *The Committee agrees with the emphasis in the last years on energy, consistent with the Departments' particular geographic location, tradition and history.* Minor shortcomings and possibilities for improvement have been noted in the Curriculum section of this report.

The Committee commends the Department for the effective delivery of the program of studies in spite of many difficulties.

The committee recommends reinforcement of the construction and materials area with staff and courses when funds become available.

TEACHING

The Committee commends the Department for the exceptionally close links between staff (both academic and administrative) and students due to the open door policy established and finds it remarkable that a broad ME Curriculum is delivered effectively by the small

Departmental faculty.

The committee advises the Department to:

- *take steps to formalize its current quality assurance activities*
- *make greater use of the student evaluation returns as a driver for further teaching improvements through a formal mechanism of reflection and response*
- *take ownership of the examination process by overseeing the preparation of examination papers, reviewing the examination results and addressing problems arising from any disparities.*

The Committee encourages the Department to implement post-graduate (MSc) programmes as soon as possible.

RESEARCH

The Committee was pleased to note that:

- a significant proportion of the Department's research infrastructure is state of the art and competitive at international standards
- there is very significant inflow of competitive research funding from external sources into the Department from the EU and national research programmes
- there are high publication records of many members of the faculty.

The Committee agrees with the Department's priority to collaborate with heavy industries, in particular DEH, the most appropriate energy-related organization and with the emphasis on matters of energy in teaching and research, something that has the potential of establishing the Department as a centre of excellence in this area.

The Department has a strong research focus, alongside its teaching focused activities. There is no explicit Departmental strategy regarding the selection of research topics and these are selected "bottom up". *The Committee recommends that the Department develops an explicit research strategy for the next 5 to 10 years, which identifies a small number of coherent specific research themes to act as the Department's research focus.* The plan might include the actions to be taken to secure the necessary resources, a faculty appointment strategy to ensure that each theme has sufficient number of faculty and resilience when faculty leaves.

The Committee urges the Department to find ways to improve local presence of the doctoral students.

ALL OTHER AREAS

The administrative services are functional, in spite of the lack of personnel and physical separation, thanks to the dedication of personnel and to modern approaches and implementation of IT.

The Members of the Committee

Name and Surname	Signature
1. _____	
2. _____	
3. _____	
4. _____	
5. _____	