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HELLENIC REPUBLIC

H.Q.A.

HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

Department of Energy Technology

Technological Educational Institution of Athens

June 2012



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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Energy Technology of the TEI of Athens consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005:

1. Professor Yannis Hardalupas (Chair)
Imperial College London, UK
2. Professor Costas Xydeas
Lancaster University, UK
3. Professor Irimi Angelidaki
Technical University of Denmark, Denmark
4. Professor Elias Siores
University of Bolton, 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.

II. The Internal Evaluation Procedure

Please comment on:

- 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 External Evaluation Committee (EEC) visited the Department of Energy Technology of TEI Athens on Tuesday 12th, Wednesday 13th and Thursday 14th of June 2012. On Tuesday morning, Committee members were first briefed by H.Q.A.A. Athens staff on the Greek Academic Quality Assurance Review framework and general QA evaluation procedures. They then travelled to the TEI of Athens campus in Egaleo and they were welcomed by Professors Ioannis Gelegenis (Head of Department), Anastasios Sakarrellos, Maria Samarakou, Panagiotis Tsiligieris, Antonios Moronis and Antonios Chatziapostolou.

This was followed by a short introductory meeting with the Rector Professor D. Nino, Professor I. Chalaris, Vice Rector and chair of MODIP and other senior management staff of the Institution. During the visit, EEC members had meetings with permanent and non-permanent Departmental Academic, Secretarial and Technical staff in general and i) staff in charge of internal quality evaluation preparations leading to this evaluation exercise, ii) leaders and members of teaching and research laboratory facilities, iii) departmental administrative staff and iv) selections of undergraduate, postgraduate and Alumni students. EEC members also visited all teaching and research laboratories, some lecture theatres, the central library, and other spaces used by students.

A number of detailed presentations were provided to the committee, commencing with an overview of operational structure, activities, and general aims of the Department. This was followed by teaching activities at undergraduate and postgraduate MSc levels and an outline of Research activities. In addition and in the areas of teaching and research, procedural rules were explained and information on topics such as student admission, progression, and achievements provided.

EEC members interacted with staff throughout the visit. Questions and requests for further information were promptly addressed.

In particular this QA evaluation visit to the department of Energy Technology encapsulated the following activities:

- i. Meetings with:

- Rector and Vice –Rector of Academic affairs;
 - Head of the Department;
 - Heads and members of various Undergraduate and Postgraduate Teaching Committees;
 - MODIP Academics responsible for the internal assessment report;
 - Leaders and members of Teaching and Research Laboratories;
 - Laboratory technical support staff;
 - Research staff and Postgraduate MSc students;
 - Undergraduate students. Alumni
 - Administration personnel.
- ii. Visits to:
- 10 teaching and research laboratories i.e. Heat Transfer, Steam boilers and Turbines, Internal Combustion Engines, Heating and Air Conditioning, Hydro Engines, Electrical Circuits and Measurements, Electrical Machines/ Power Electronics and Power Distribution, Renewable Energy Sources, Applied Informatics.
 - University Library,
 - Department Secretariat,
 - Other facilities used by students.

EEC members were provided with the following documentation:

- Original and updated (May 2012) Internal Evaluation reports,
- Program of Undergraduate Studies,
- Program of Post Graduate studies,
- Examples of examination scripts,
- Examples of textbooks produced by departmental staff and also other external recommended books,
- Examples of Undergraduate and Postgraduate dissertations,
- Examples of student questionnaires and related statistics,
- Examples of General Assembly minutes,
- Graduate employment/career report,
- Student questionnaire reply statistics,
- Information on Social and Cultural activities,
- Erasmus and International collaboration activities.

Most of the aforementioned documentation is of high quality and was made available to EEC members promptly prior and during the QA evaluation period. Additional information, when requested, was provided along with appropriate explanations. Several academic issues related to Departmental aims, objectives and strategy were raised and discussed during the visit.

A. Curriculum

To be filled separately for each undergraduate, graduate and doctoral programme.

APPROACH

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

The Department's Undergraduate (UG) program aims at offering high quality education/training to students in the important, multidisciplinary subject area of Energy Technology (ET). This implies the training of high quality graduate engineers, in order to meet the recruitment needs of Industry and employers in this area in general and in the rapidly evolving area of Renewable Energy Technologies (RET) in particular.

Furthermore the sustained investment and innovation observed in recent years in the subject area facilitates rapid changes in the nature and application of such technologies. This, in turn, indicates the need to update the Department's program curriculums frequently, in harmony with international trends and always in a way that reflects the needs of employers. The department has clearly indicated its desire to take all the necessary steps required to achieve the above highlighted aims and goals.

Postgraduate teaching is represented by a collaborative arrangement with the University of Heriot-Watt in UK. Thus the Heriot-Watt MSc in Energy is delivered in Athens by TEI staff and under the complete rules and regulations, operational procedures as well as monitoring and quality assurance and control procedures of Heriot-Watt.

There is no official PhD programme degree award capability by the TEI educational institutions of Greece. Nevertheless, Academic staff in the department co-supervises PhD students who are often supported by departmental externally funded projects but are formally registered as PhD students in other collaborating Greek and International Universities.

- How were the objectives decided? Which factors were taken into account? Were they set against appropriate standards? Did the unit consult other stakeholders?
- Is the curriculum consistent with the objectives of the Curriculum and the requirements of the society?
- How was the curriculum decided? Were all constituents of the Department, including students and other stakeholders, consulted?
- Has the unit set a procedure for the revision of the curriculum?

It seems that the UG programme objectives were mainly defined by academic staff and according to their knowledge, experiences and understanding of what is considered to be the norm of offerings of similar programmes in similar departments nationally and internationally. The EEC did not find evidence of a wide consultation process taking place that involves all internal and, particularly, external stakeholders (e.g. potential employers). However, there has been stated during presentations as well as in the answers given to questions from EEC members, that the programme will be frequently reviewed and updated in the future in a proactive rather than on a reactive manner related to requests. It should be noted here that severe limitations on significant curriculum changes were imposed in the past by the State. However, recent changes in the overall framework of the Greek Higher Education system should allow the department to easily modify the curriculum and, thus, maintain the quality and relevance of its teaching programmes over time.

EEC stresses the importance of regular curriculum reviews as a tool for achieving excellence in providing students with a complete and valuable educational experience for the benefit of individuals and the Society at large.

The department has significant experience in the delivery of graduate education at MSc level

via its collaboration with the University of Heriot Watt in UK, in general, and the delivery in the department of the Heriot Watt one-year MSc programme entitled “Energy”. This is a well-designed and run full time (1 year) or part-time (two-year) MSc programme that meets the research and development needs of the UK (and Greek) employment markets in the rapidly expanding area of Energy technologies. The programme enabled departmental staff to acquire important teaching and co-supervising experience at graduate level and acted as a catalyst in the establishment and use of appropriate quality assurance procedures and mechanisms. The Department is therefore well positioned to create and successfully support its own MSc course. This is significant due to current plans by the State to only allow the existence of truly joint (i.e. double Degree) MSc courses between TEI and International HEIs.

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?
- Is the structure of the curriculum rational and clearly articulated?
- Is the curriculum coherent and functional?
- Is the material for each course appropriate and the time offered sufficient?
- Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?

The main driver underpinning the department’s Undergraduate (UG) curriculum design process has been the education and training of students into competent Energy Technology Engineering graduates, for fulfilling the needs of Industry.

The Department’s Undergraduate program extends over a period of 8 semesters, 7 allocated to theoretical and laboratory based studies and 1 term on a major project as well as a full time working period in Industry (practical internship). Thus a student is required to take 32 compulsory modules and 8 selective. The total number of offered modules is 48. 15 modules cover Mechanical Engineering aspects of Energy Technologies, 15 cover Electrical Engineering aspects of Energy Technology and 5 are contributed by other TEI Departments.

The program of undergraduate and postgraduate studies is satisfactory regarding breath, depth and appropriateness; it combines well theoretical and practical aspects of training in Energy Systems and Applications. Moreover, members of staff are appropriately trained and thus ensure that a high quality delivery of teaching material is achieved.

Thus, permanent academic staff is highly professional with considerable educational experience and ability, whereas hired/non-permanent staff is appropriately selected to enhance departmental knowledge and expertise. Although numbers in this second category of staff is decreasing over recent years, the department must ensure that the predicted further erosion in hired staff numbers will not affect its teaching activities. This, in turn, indicates the value of curriculum restructuring in a way that generates further implementation efficiency and savings of scale. Thus combining existing modules, removing module overlaps and possibly trivial content will not only free time for both students and staff, but it will also allow the inclusion or focus of the curriculum into new state of the art Energy Technologies and applications. For example, there is considerable amount of “historical” information and according to students, trivial information in the 5th module of Informatics. This can be replaced with more useful material or alternatively module 5 could be combined with module 11. Another restructuring example concerns modules 26 and 32, which could be enhanced with inclusion of more material in the application of these technologies. Another example of an important module whose content will benefit from the inclusion of state of the art techniques is 27 (the numbered courses are according to the 2010-2011 curriculum).

Available laboratory spaces and equipment are in general good and, as expected to be, in a

successful for its teaching Department. However, there is scope for improving few Laboratories facilities by adding more modern and relevant industrial equipment, e.g. i) Modern efficient car engines, or ii) expand Laboratory activity in new and important topics such as Bioenergy systems.

Overall the department's current UG curriculum compares well with that found at similar UG courses of other Greek and International Universities, and meets the accepted undergraduate technological education standards.

Furthermore, EEC shares the belief with the department that the current UG curriculum meets the above general objectives and requirements imposed by employers and the society in general. This belief has been formed from informal feedback information and opinions obtained from consultations with stakeholders. However, the department should put in place well defined and regularly applied procedures for monitoring and taking into account stakeholder opinions.

The Department's "Heriot Watt" MSc Programme in Energy is considered by EEC to be of high standard in its design and implementation/delivery.

RESULTS

- How well is the implementation achieving the Department's predefined goals and objectives?
- If not, why is it so? How is this problem dealt with?
- Does the Department understand why and how it achieved or failed to achieve these results?

Overall, the committee believes that the current curriculum implementation is more or less sufficient in achieving the department's goals and objectives. However, due to the implementation issues raised in the above section, there is room for change and improvement in response to current and future prevailing social economic conditions and requirements. The department must protect and enhance its applications oriented and also applied nature of teaching and training students. The often attractive, as seen by some, notion to shift TEI applied (i.e. Development or Research & Development) type of education towards that observed in traditional and possibly more Theoretical/ Research driven Universities, must be resisted. The "applied element" must be always there to act as clear differentiator. At the same time, however, the State must clearly specify the level of professional rights and status of TEI graduate so that quality improvements are achieved in both (i) admitted UG students and ii) graduates.

The quality of the students at the time of entering the degree course is not as uniform as it will be normally expected. In particular, there is every year a significant number of "special case" students, who are accepted/permitted to register the department's UG programme without the appropriate level of background knowledge. [Note that this may be happening due to legal obligations]. The department should pay extra attention to this problem and devise appropriate solutions even if some extra resource/effort is required. This will definitely improve student attendance numbers, reduce failures and decrease the often excessive period of time students take to graduate.

Finally it is recommended that the TEI in general and department in particular is allowed to have more control on the number of students admitted every academic year, which takes into consideration available resources. This in turn will enhance the educational experience of students and raise overall quality.

The department has a complete understanding of most of the above-raised issues and needs external help and support, particularly in terms of appropriate changes of rules and regulations.

IMPROVEMENT

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

The Department/TEI should seriously consider the following:

- i. Reducing the number of contact hours and allowing at the same time students to develop their knowledge through an extended period of personal study. This practice is established widely at higher education overseas institutions.
- ii. New progression rules so that students may proceed to the next semester only after the successful completion of certain “core” courses, which are defined by the department for each semester.
- iii. Students to be allowed to take laboratory work only after completion of the theoretical component of a mixed course.
- iv. To introduce support classes for those who need it, particularly in the first year where the spectrum of background knowledge and ability can be particularly wide.
- v. To enable the involvement of Industry and all stakeholders in all phases of curriculum design and development.

B. Teaching

APPROACH:

The teaching approach and pedagogical policy of the Department is appropriate. The departmental pedagogic policy is based on continuous interaction with, and feedback from, students, and is underpinned by desire for continuous improvement.

Teaching methods used

The teaching methods include conventional lectures, tutorials and highly interactive laboratory activities for selected courses. Each module runs for a period of 13 weeks, as required by law. The conventional lectures are supported by 13 laboratory exercises for many courses, which appropriately demonstrate the theory. Attendance at conventional lectures is optional, attendance at tutorial exercises (which happens for few courses) is at the discretion of each course leader and attendance at laboratory exercises is mandatory. Students spend approximately 40% of their time in the laboratory, with the remaining 60% attending lectures and occasional tutorials. Tutorial exercises may have an assignment, e.g. for the module on Internal Combustion Engines II (MEK II), where students are requested to solve specific questions and submit them for assessment within a few weeks (this cannot be compulsory because it is illegal). The introduction of additional assignments, provided that they can become compulsory, and tutorial activities may improve student learning. The EEC had the opportunity to visit some laboratory exercises during teaching. This involved obtaining measurements and discussing the results using a blackboard and individual discussions with the students. In general, the comments provided by students on teaching methods and quality were positive.

Teaching staff/ student ratio

The Department consists of 15 permanent members of teaching staff, appropriately supported by around 34 contract-based, temporary staff, which varies according to needs every year. Overall, the staff / student ratio, when considering permanent members of staff only, is high. However, the support of temporary/visiting teaching staff significantly addresses this matter. The current ratio of permanent and temporary staff over attending students is 1/17, which is quite good. There seems to be a healthy cooperation between active students and teaching staff. The permanent members of staff are available for student enquiries related to their courses at a number of weekly-predefined hours, which are announced outside their offices. There seems to be mutual respect between staff and students. The average teaching load for permanent and temporary staff is around 14 and 8 hours/week respectively. The number of permanent members of staff has been reduced by around 25% over the last 6 years and the forthcoming retirement of 2-3 members of staff over the next few years requires new appointments in order to maintain a similar staff/student ratio. The potential risk is higher due to the reduction of the number of recruited temporary staff as a result of the financial crisis affecting the country. This matter was also raised by the representatives of the students, who reported some issues in the orderly and effective running of the laboratory classes.

The EEC is concerned about the impact of future changes in staff number on the quality of education delivered to the students, especially if the number of admitted students per year is not capped to a maximum according to available resources. In addition, the permanent staff must consider changes to the curriculum and their approach of delivering the teaching to ensure that the quality of education is maintained. This needs to be complimented by an evidence-based analysis of the overall load of staff in the Department versus its target student intake.

Teacher/student collaboration

The communication between teaching staff and students is at an appropriate level. There are clear pathways that the students can communicate their views to the teaching staff. These are as follows:

- Questionnaires at the end of each term that request the views of the students on the

curriculum and the quality of teaching and acquired knowledge for each course. The students respond to a list of questions and can provide additional comments.

- Teaching staff is available at certain hours during the week for questions by students and this schedule is circulated in advance.
- Student representatives participate at the general assembly of the department and can express their views on teaching improvements.

Students are satisfied with these arrangements, although they thought that some questions in the questionnaire required additional clarity. The staff may want to consider the simplification of the questionnaire and possibly the reduction of the number of questions. In addition, students suggested that they do not get fast feedback on the way that their views are implemented in order to improve teaching quality. It would be good to inform them about the outcome of the questionnaires quickly after the survey and not after the end of the academic year while the staff outlines future plans for the courses. This can only be achieved through a fully electronic student survey. It should be noted that the students provide very few comments in these surveys, which does not help the communication between staff and students.

In our discussions with both teaching staff and students, moderate and sometimes low levels of attendance were reported particularly at the lectures. Students are encouraged to participate and, indeed, the positive relationship between staff members and student body was clearly conveyed during the EEC's visit. In particular, the comments of alumni of the department to the EEC were very positive for the teaching staff and additional evidence is provided by the continuing links between staff and graduates after graduation.

Adequacy of means and resources

The EEC visited selected teaching and research laboratories. It was observed that all teaching laboratories have been refurbished recently and they are modern and pleasant for students and staff to work in. New laboratory equipment has also been purchased recently, which is a good start and it may be good to invest into additional new equipment, for example, a new modern internal combustion engine that may be used to demonstrate modern sustainable energy technologies to students. It should be noted that EEC is not familiar with safety regulations in Greece, however it is recommended that rules of conduct are given to all students for every laboratory in a well-documented way to avoid liability issues in the unlikely event of an accident. In addition, a risk assessment of current and future experiments should be performed and properly recorded. The presence of trained technical staff is important to ensure safe operation of experiments and there is concern that the reduction of the technical staff from 5 to 2 over the last 6 years may have consequences on safe operation of some laboratory experiments.

A systematic evaluation of the educational value of the laboratory experiments offered for each course within the Department should be carried out, considering the practical skills that the students need to acquire, in order to identify and prioritise areas of improvement in the Departmental planning. This review may offer possibilities to merge laboratory experiments of two courses into one course and introduce new experiments related to *sustainable* energy technologies. This may also feed into an enhanced range of practical and experimental topics for the graduation thesis (usually called 'diplomatiki').

Use of information technologies

Computing and Network facilities are well organised and used. Laboratories related to training in programming (e.g. 'C' language) are available and are all well equipped. The EEC witnessed one of the programming training activities, which worked well. In addition, the technical drawing laboratories include training on AUTOCAD, which is a drawing software commonly used in industry.

The students also praised the electronic communication 'e-class' system. Its use should be expanded to include online communication with all students and provide electronic surveys of teaching quality, which can be processed faster than the current paper-based approach and ensure anonymity. The inclusion of a simplified *electronic* questionnaire in the middle of the term will be able to identify and correct any major problems at specific courses prior to

the end of semester.

EEC believes that the departmental use of computing and network services is at a high level and comparable to other national and international institutions. In addition, the EEC observed that the material available for online access on e-Class lacks uniformity in the description of courses. It is recommended that the Department nominate an e-Class Coordinator who would act as a central point, thus ensuring Quality Control, with regards to the completeness and uniformity of the course description information on e-Class.

Examination system

The current examination approach is mainly based on written exams at the end of the semester and on the completion of laboratory exercise sheets. It is noted that the existing educational law does not allow for other forms of final examination (e.g. continuous assessment).

The examination of the project thesis is thorough and generally maintains a good standard. It was observed that, although the quality of the technical content of the graduation thesis was generally good, there were cases where some poor projects were allowed through the system. These were mainly related to students who have been within the course for many years. This should not continue, although it may be that the application of the new law that limits the available time for students to complete their degree will assist.

The practical internship is currently assessed and a mark is recorded. However, this mark does not contribute to the average mark of the final degree. It is recommended that the assessment becomes more formal and the involvement of staff in the supervision of the practical internship is increased to provide closer supervision, which may improve the quality of the final outcomes and student training and links between staff and industry. Under these circumstances, the final mark of the practical internship should be considered to the average mark of the final degree, which will make students more interested to achieve at a high level.

IMPLEMENTATION

Quality of teaching procedures

The quality of teaching procedures are considered to be high, as evidenced by the results obtained from student questionnaires, and at a level that will be considered appropriate at other international institutions. The EEC noted from the interviews with the students that they were complimentary regarding the level of technical knowledge, enthusiasm, availability and accessibility of teaching staff.

Quality and adequacy of teaching materials and resources.

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

The quality of course material is satisfactory as evidenced by student feedback (typical average score 'good' with top score of 'very good'). In general, the course material is up to date; however, the addition of latest technological developments at a few modules can improve their educational value. The availability of the large and modern library with several books related to the taught courses assists student learning.

Linking of research with teaching

The EEC, after viewing several representative graduation project theses, formed a positive and complimentary opinion on the level and educational value of graduation projects to students. Some of these reports are linked with research projects and, in some cases, final year students were involved in Archimedes type research projects that teaching staff were involved, which offers a good educational value. However, the structure of the graduation project thesis may vary significantly from student to student and the number of references tends to be limited. The EEC has also seen some evidence of inappropriate use of material and absence of proper referencing to other work. The EEC recommends that guidelines be enforced on how a graduation thesis should be written and presented, which should also include a template of the final thesis for students and provide a marking scheme for different

activities related to the thesis (i.e. oral presentation, poster, report, technical component).

Mobility of academic staff and students

A few students (2 in the last 2 years) participate in mobility-related EU programs (e.g. the Erasmus program) and visit other universities in Europe. Also, students from Germany and France visited the department through the Erasmus program (4 in the last 2 years). Some faculty members have good international contacts and the long-term collaboration with the Heriot-Watt University has helped the department and its staff significantly, including developing research projects at a doctoral level (currently, 2 students are working on their research for a PhD degree using the Heriot-Watt collaboration).

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

The Department uses a variety of means to evaluate student learning, depending on the nature of the component, i.e. theoretical or practical, as described earlier. There is a formal procedure (mostly questionnaires) by which students regularly report on their teaching and educational experience. The staff leading each course should be given regular instructions to ensure that exam questions are convincingly able to measure the success of meeting the learning outcomes of the course. The EEC recommends the development of good-practice procedures for setting and evaluating examination questions. Such procedures could, for example, include verification by another faculty member of the validity, completeness and level of difficulty of proposed examination questions for each course. Additionally, a faculty member should oversee the process of exam correction and ensure that all examination sets are checked and possibly corrected. These procedures should be well documented and verifiable and compulsory for all courses.

RESULTS

Comments are provided on the following items, as requested.

Efficacy of teaching

In general, student evaluation scores on teaching quality are very positive. More specifically the vast majority of scores are well above average. However, the statistics from the evaluation questionnaires are based mainly on responses from students following the course regularly and it may be that, at certain cases, there are a small number of responses that increase the statistical uncertainty. However, it is commendable that the responses from students, who follow the course, are very positive.

Discrepancies in the success/failure percentage between courses and how they are justified

There are differences between the failure rate of different courses and the failure rate can be quite high for some courses. The academic staff identifies those and there is evidence that they have acted to improve courses with significant failure rates. This effort should continue in the future and be properly recorded.

The overall statistics indicate that the average graduation time is around 8.2 and 7.7 years for male and female students respectively, which is double the normal 4 year duration of the course. This is undesirable and the department should work towards the rapid reversal of this trend. The department has some firm views on how to achieve this, but needs legal permission to change some regulations. The recent change of the law, which limits the number of years available to students to complete the degree, has led to an increase number of students completing their degree in 2010-2011, while the average duration of study increased to around 9 years for this period. This provides some evidence that older students tried to complete their degree due to the new law. Therefore, the new law may assist the completion rate and reduce the number of students that remain in the course for a long time. This will also assist with the timetabling of teaching activities and efficient management of staff time.

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

The Department should consider the development of appropriate 'bridging' courses with the

necessary mathematical skills, taught on a compulsory basis, to support students with low entry grades in Maths, so as to improve their overall success. Overall, the Department must become more proactive by putting in place robust procedures to analyze poor examination results and progression statistics, so as to take rectifying actions, as appropriate, on an annual basis. However, it should be emphasized that students with low entry grade in Maths can satisfy the entry requirements imposed by the legal system and the department or the institution cannot change this. In some cases, these students have little interest in the area of study of their course and they found themselves in this position due to the way that entry to higher educational institutions is currently organized. Changes in the legal system to allow the institution and the department to decide on the appropriate level of entering students will increase the quality of the entry level students in the areas required by the course. In addition, many students do not participate at the course and this is probably a consequence of personal circumstances independent from the department. The enforcement of the new law that limits the number of years for completion of the degree is expected to increase attendance and speed up completion rates.

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

The EEC did not have access to individual examination results. However, inspection of the graduation statistics over the past 6 years demonstrated that there were no students who graduated with an overall grade in the range 8.5-10, while the percentage of students graduating with an overall grade in the range of 7.0-8.4 was 7.2% on average. The average overall grade in the period between 2005-2011 varied in the range between 6.17-6.29. This distribution of average marks is considered satisfactory at this stage.

Teaching staff mentioned that there is an improvement in overall examination statistics over the past year or so and an increase in the number of graduating students. However, it is not clear what specific procedures have been put in place to ensure good progression and graduation statistics. It is possible that the new law, that limits the number of years available for the completion of the course, is responsible for the observed improvement. Poor examination results have also been raised in the discussions with students, who identified courses of concern. It is possible that a sizeable percentage of entering students do not have a suitable mathematical background, as discussed above, and, therefore, find more theoretical subjects difficult to follow.

There are major discrepancies between success and failure percentages between courses (modules). Clearly, courses liked by the students scored well in student questionnaires. In contrast, courses that are not liked by students scored low. These statistics show evaluation trends that are the same for various subjects from year to year. This is successfully identified and, in turn, leads to revision of the courses. However, it takes a long time (year) to respond and bring changes to improve the course. This suggests that the objective to improve quality by utilizing quality evaluation tools, such as questionnaires, is not fully achieved by the Department and feedback is used as a statistical measure rather than as a means for continuous improvement. Such discrepancies are expected to improve by the introduction of the new law that provides flexibility to TEIs to change the curriculum accordingly.

There is a clear and evident link between time to graduation and final degree grades. Most students who complete their undergraduate studies within shorter time tend to also obtain relatively high final degree grades.

The department presented its own reasons in explaining both positive and negative results. In the former case, the department argued that positive results are due to good teaching practices, whereas, in the latter case, arguments pointed to the direction of student ineffectiveness and lack of relevant knowledge background. Students accepted during interviews that a large number of students are not present at the lectures and indicated at their relevant answers at the questionnaire that they put very little time and effort towards learning during their personal time outside the university throughout the year. Every effort should be taken from the State to assist through new legislation that limits the number of years for the completion of each degree.

IMPROVEMENT

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

The department has already implemented learning improvements, such as the organization and delivery of timetabled tutorials in some courses, sometimes with associated student assignments with credit, in order to supplement lecture materials. They have also suggested a number of potential opportunities for improvement in its teaching activities in the internal evaluation report and during the discussions with the EEC. These include mid-term examinations with credit, additional electronic interactive communication with students, more rigorous evaluation of the practical internship. The EEC fully supports such initiatives and in addition suggests the following:

- Review of the undergraduate teaching activities along the lines highlighted earlier in this section, so as to identify and eliminate systemic deficiencies (e.g. exam papers evaluation procedure, restructure of laboratory experiments, more uniformly structured final year projects). Such reviews of the curriculum have been recently allowed through the change of the law and it is important to enhance the quality of teaching and learning through such reviewing process that can act fast and implement changes.
- Introduce and implement the practice of using External Examiners (possibly academics from other institutions in Greece) for independent assessment of the quality of degree standards while formally participating in relevant teaching departmental committee meetings. This is an extension of the previous item.
- Establish an internal evaluation procedure of Exam papers to allow independent moderation of the examination level and marks.
- Establish an approach to consider Mitigation Circumstances for students who cannot participate at exams or submit coursework within certain deadlines due to medical or other personal reasons. This will become more important as the number of times that students can sit at exams for each module is reduced.
- Introduce student group activities with credit and examinable written and oral presentation components. This can provide additional tests throughout the term outside the traditional examinations, which can increase student attendance. Expanding the offer of timetabled tutorials on more modules can be linked with reductions in the scheme of communicating with students, where staff is available at their offices for student questions, which is inefficient.
- Introduce tutorials in Maths for the 1st year students to improve their background.
- Introduce a Personal Tutor responsible for the general well being and academic progress of a group of students. This can improve student attendance and general knowledge of where students who do not attend the course are. Even the knowledge of the latter can identify actions that can be taken to improve student attendance and reduce the number of years for degree completion.
- Improve evaluation and tracking of student progress during their practical internship and incorporate this assessment and final mark to the final degree mark.
- Adopt a number of relevant class visits to Industry and Public organizations in order to expose students more to the real working practices and organizational interests.
- Introduce rules on plagiarism with serious consequences to deter students.
- Provide rules of conduct to all students for every laboratory experiment in a well-documented way to avoid liability issues in the unlikely event of an accident. In addition, a risk assessment of current and future experiments should be performed.
- Obtain ISO Certification of Laboratories in order to be legally able to certify industrial equipment. This can assist the expansion of training seminars for industry as well as the teaching activity of the undergraduate course to include certification of industrial equipment. Such a teaching activity at the Undergraduate course will prepare students better to serve the industry.
- Finally, clarification by the State of the professional status of TEI graduates will assist the design of the modules and improve student learning. Staff and student alike have indicated that the lack of such clarification is a major setback.

It should be emphasised that many of the above recommendations are already implemented

at the postgraduate MSc course in Energy, which is delivered jointly with staff at Heriot-Watt university, which is discussed below. Since many of the above are an integral part of that course due to the requirements by the examining board of Heriot-Watt, the academic staff has already experience of how these have been implemented for the postgraduate course and they can easily transfer them with appropriate modifications at the Undergraduate course. Such an approach will make the course unique in Greece and improve the ability to attract students and enhance student learning. It is noted that some of these changes may require changes of the procedures at the institution level and possibly legal changes by the state. However, showing initiative in that direction and proving that it can bring positive results can assist the introduction of the full list of recommendations.

Comments on the existing joint MSc in Energy with Heriot-Watt University

The department has established successfully a self-funded postgraduate MSc course in Energy in collaboration with Heriot-Watt university. This is commendable and should be encouraged. This course has successfully graduated around 20 students every year for the last 4 years. It operates according to the quality assessment criteria of Heriot-Watt and there have been no problems related to the delivery, teaching quality, assessment and final year projects of the course. The collaboration between the academic staff of the two departments has been smooth and, although at the first year the exam papers were set by Heriot-Watt staff only, at later years the exam papers were set jointly between the two departments without any issues. This is an additional successful independent evaluation by Heriot-Watt of the quality of teaching and technical knowledge of the academic staff of the department of Energy Technology.

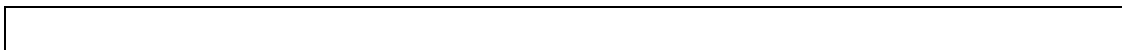
The fact that this course is self-funded is also an example of how fees can be introduced for studies at Greek universities, which may have to happen if the law is changed. The current and old postgraduate students were very positive about the course and the communication with the academic staff. The completion rate of these students is nearly 100%, which may be also related to the fact that the students pay fees for the course and they are more inclined to attend and ensure that they follow the course closely.

This course has also provided opportunities for joined research activities and the evolution of research for PhD degrees, which cannot be awarded from TEI at the moment. This has also benefitted the undergraduate teaching activities through the ability to expose them to research. It should be noted that a certain portion (around 30% averaged over 4 years) of the postgraduate students are from the undergraduate course of the department.

The department needs to rethink its strategy regarding this MSc program following the change of the law, which has not been implemented yet. The new law requires the award of joined MSc degrees rather than a degree awarded only from the collaborating international institution. This requires negotiations with Heriot-Watt in order to identify an approach in order to continue this successful course and satisfy the new law.

EEC would like to encourage the department to maintain and expand this course, which is self-funded and forms a good example of a successful course with fees at a Greek university. It is possible to increase the number of students, since currently the agreed maximum number of students is 32, while only 20 are generally accepted. This is a departmental decision, in order to ensure good communication with students. An increase in the number of students may justify employing new members of staff by using the income from the MSc course and some of these funds may also provide internal funding for initiation of new research activities.

During discussions with the academic staff, EEC became aware that a second MSc course with University of Bradford in UK is negotiated and this may provide additional expansion after the legal aspects and appropriate negotiations are complete. Therefore, the second MSc course can enhance further the potential for expansion in teaching and associated research within the department, as described above.



C. Research

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

APPROACH

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

Research areas and significance

The main research areas of the department of Energy Technology are related to energy technologies from fossil fuels and renewable technologies with an emphasis to improved energy efficiency. More specifically, the focus is in areas such as solar, wind, power electronics, energy efficiency, energy coproduction systems (combined heat and power), intelligent energy systems & coproduction and bioenergy. Considering climatic changes and energy resource shortage, renewable energy production and energy efficiency and sustainability are in high demand and impose important research needs for the society. Many countries have placed great attention in developing new and improving existing energy technologies in order to assist the environmental challenges the planet is facing. Greece could draw an important advantage by concentrating resources on energy research, which can link existing technologies with many types of renewable energy technologies and deliver and demonstrate innovative sustainable energy and environmental solutions. This can offer a unique opportunity for growth, employment, innovation and good chances to compete at an international level. Therefore, strengthening research in the thematic area of energy (especially renewable energy and coproduction with conventional energy production methods) is very important for Greece. Very few institutions are specialising in the energy area in Greece. Many universities and technological institutes throughout the world are adding renewable energy technologies and sustainability in their research mission in order to assist the urging needs of this area. It is certainly an advantage that the energy technologies are already well established as a department in TEI of Athens. Therefore, the EEC feels that in the light of the importance of the research area, the department should be given special attention and support in order to assist the potential that is available to flourish.

Objectives and means

The department is clear and aware of the research goals and the available means to reach the goals, although there is no formal departmental research policy and strategy. The EEC feels that a research committee must be established that will have the responsibility to establish the research strategy of the department and review it accordingly based on future developments. This will assist the department to negotiate better with the institution, for example, for the appointment of new members of staff by showing that there is a research plan and how a new member of staff can assist. The same applies to the ability to bid to external funding bodies for research through an integrated research plan rather than as individuals or request internal support for new equipment. This was discussed with the academic staff of the department with a positive response in forming a research committee in the near future. The research ideas exist currently at an individual level or small group level and an example was the recent appointment of a new member of staff with a plan to enhance the area of fluid mechanics in the department due to its applicability on many energy technologies and the ability to bring a collaborative critical mass on research between academic staff.

Constraints

There are considerable constraints in achieving the goals in research, which is the declining availability of national funding sources and the reduction in academic staff numbers leading to increased teaching load, if the same level of activities is maintained. An active strategic research plan based on weighing the balance of the load on staff and the potential of current activities can assist to readjust current activities, in order to reduce teaching load and provide more chances for developing research ideas. However, the EEC recognizes that the ability to initiate research ideas and write research proposals needs to be developed and, as a consequence, a mentoring system is proposed which will assist younger members of staff to

learn through their association with a more experienced (and successful) mentoring member of staff.

The department can only accommodate PhD students by collaborating with other institutions that can award doctoral degrees. The department already utilizes this collaborative approach to carry out research at a doctoral level. A good example for this is the two joined doctoral students with Heriot Watt University. The EEC would like to emphasise the importance of changing the legal framework to allow TEIs to have their own doctoral degree, which will assist the growth of research.

IMPLEMENTATION

How does the Department promote and support research?

There is no formal written research policy. However, the current research activity is realized through the activities of individual staff and their preferred research interests, which are often related to their teaching areas and corresponding laboratory activities. Additionally, the department is actively involved in research applications to national and some international bodies. In addition, some funding is made available from the institution to assist staff to participate at conferences. This budget is too small and, sometimes, the academic staff has to use personal financial resources in order to participate at conferences and present their work.

Quality and adequacy of research infrastructure and support

There is very good research infrastructure with renovated laboratory space and equipment, mainly servicing teaching purposes, which also are used for research. The department possesses 10 laboratories divided in three areas, i.e. 1) Energy mechanical Engineering (hydrodynamic engines, heat transfer, steam and heat turbines, internal combustion engines, heating, cooling refrigerating); 2) Energy Electrical Engineering (Electrotechnology and measurements, and Electrical Engines and systems) and 3) the area of utilization of Energy Resources and Systems Management. The last area has more diverse character and includes besides renewable energy technologies and systems management, also applied computer programming and technical drawing labs. The structure of the three different areas is for the two first “vertical”, characterized by the weight of mechanical and electrical knowledge background, while the third seems to be “horizontal”, integrating the two others and providing service support and integration, although independent research could also take place there. The staff members, however, do not follow this distinction between the three areas of the labs and active strategy about the role and integration of the areas was not presented.

Scientific publications

Staff is well aware of the significance of publishing in internationally recognized, peer-reviewed scientific journals. All presented evidence support this. Staff is encouraged to participate in research conferences.

Research projects

Academic staff has been awarded a number of research projects and actively working to win more research grants from external funding sources. Several research proposals have been applied for and some have been won (6 active projects) although many applications have failed to achieve funding. The EEC is well aware of the difficulties of achieving external funding. Nevertheless, the department is clear that it is necessary to continue the efforts to achieve external funding. Other initiatives for implementation of research activities in the department are through promoting collaboration both internally and externally.

Research collaborations

There is evidence that the department fully exploits its international and national contacts to the maximum for research collaboration activities.

RESULTS

How successfully were the Department's research objectives implemented?

Since formally written research objectives were not available the EEC cannot quantitatively comment on the success of the department meeting its research goals. However, the research goals were described to EEC during the meeting with the academic staff. The committee would like to note that the staff is eager to be involved in research activities and that high-quality research outputs appear to be an important criterion for hiring new staff. However, as mentioned above, a research committee is required.

Scientific publications

There is active research in the department, some of which is at internationally good level and is published at recognized international journals. The department has published 8 peer-reviewed papers in 2011. The EEC finds the research output, considering the environment and constraints mentioned above, to be commendable. In addition to journal publications, an approximately equal number of conference proceedings and other publications have been presented. The latter is important in assisting staff to establish contacts with other researchers and develop new research collaborations.

Research projects

The department has a number of research projects related to different energy technologies that agree well with their research profile. The projects are mainly financed from the Archimedes scheme, and to a lesser degree from other funding schemes, such as Thalys etc. These are research projects that are awarded after peer review and in competition with other proposals, which demonstrates the ability of the academic staff. Since 2003, the department has been awarded approximately 30 research projects, including 6 recently awarded and, therefore, active projects. This has permitted active research, resulting in publications, conference presentations, collaborations, but also improvement of the research infrastructure in the form of purchasing new equipment.

Research collaborations

The department has international collaborations with renowned universities, such as with Heriot Watt, Imperial College London, UNESCO Bureau for Science and Culture, the Royal Institute of Technology and Lund University in Sweden, Technical University of Berlin and Helmut-Schmidt University of Hamburg in Germany and others. The collaboration with Heriot Watt University in particular is very active, also seen in the frame of their joint MSc program. The large number of international collaborations and willingness of the academic staff to initiate new collaborations is highly commendable.

In addition to the international collaboration, there is collaboration activity at a national level, which is also important. This is mainly with University of Athens, National Technical University of Athens, University of Patras and Technological Institutes of Pireus and Patras.

Also, internal research collaboration between the members of staff within the department is ongoing, which takes advantage of complementary skills for a particular project. An example related to this activity was a PhD project in the electrical engineering area, which was making use of fluid mechanics expertise of the mechanical engineering staff. However, such collaborations must increase and the infrastructure should be in place to promote and enhance them. As mentioned earlier, the formation of an active research committee will assist and may enhance the collaboration between different departments. An example on this is in the area of bioenergy that may be possible to bring together the biomass or biofuel activity in the department of energy technologies with the departments of food and wine technologies related to the successful production and recycling of plant production for food and alcohol.

Efficacy of research work. Applied results. Patents etc.

The efficacy of the research work is good, seen in respect to the research publications. Additionally, a number of patents are currently filed, as mentioned during discussions with staff members. The filed patents are currently at the individual inventor level and no

institutional involvement is present. The EEC recommends that a strategy and policy concerning IPR should be developed at the institution level.

Is the Department's research acknowledged and visible outside the Department? Rewards and awards.

It is evident that the department's research is acknowledged and visible outside the department. EEC was not informed of any special awards or rewards won by the academic staff.

IMPROVEMENT

Improvements in research proposed by the Department, if necessary.

The department has a good research level both in quality, innovation and productivity. However, the department needs to intensify efforts at the following areas:

1. Formulate a concrete research strategy, clearly identifying the research objectives, but also the means to reach the objectives. This can be achieved by establishing a research committee, which continuously monitors funding possibilities, informs people and organizes a departmental response when external or internal calls become available. The committee should also have the ability to consider and revise the research objectives as appropriate.
2. Increase departmental participation in national and, more importantly, international research projects. The department must intensify its attempt to increase its externally funded research projects. The staff is well aware of this need and accepts the importance of such pursuits. This must be supported with internal funds to initiate research in new areas that will assist staff to attract attention from potential international partners.
3. Increase the number of PhD projects awarded through research collaborations with national and international PhD-awarding institutions. The department wishes to introduce a doctoral program, which will strengthen research at TEI, but the law must allow this first. Currently, graduate students are formally registered at another University and are only co-supervised by a TEI staff member. This type of dependency on other Universities must be abolished in order to boost independent research at TEIs and generate new ideas, improve quality and income. Furthermore, more recruited PhD students could assist in teaching activities (with appropriate remuneration) and thus reduce the teaching load of academic staff in order to allow them to spend more time on research activities.
4. Establish research activity in the area of energy from biomass, which is a very relevant area for Greece. In addition to the potential beneficial environmental impact, this area of research can improve employment especially in rural areas. In order to strengthen this area, the teaching curriculum has to be strengthened in Chemistry and the area of bioenergy. In addition, collaborations with other TEI departments can assist this development.

Initiatives in this direction undertaken by the Department

During discussions with EEC, the department has been very open to new ideas and positive to pursue them, recognising the need to promote research. This is important due to the significance of sustainable energy technologies for Greece, including renewable energy. In addition, future financial challenges may be counterbalanced through research funding.

D. All Other Services

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

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?

The department understands the importance and contribution of administrative services in achieving its goals and aims. Currently, there are 2 administrative members of staff in the department, which have a wide variety of duties in addition to all administrative matters related to both undergraduate and postgraduate students. The administrative staff has been reduced from 3 at previous years.

The duties of the two administrative members of staff are as follows:

Head of Departmental Administration:

- Keeping minutes of several departmental committee meetings
- Keeping the Protocol of the department (both hand-written and electronic)
- Filing documents and maintenance of departmental records
- Statistical analysis
- Formulating relevant documents
- Remaining informed on relevant past and new Legislation
- Administration of Scientific and Laboratory visiting staff
- Monitoring departmental Finances
- Deputy Administrative Head of the department of Electronics of TEI Athens

Administrative member of staff:

- Maintenance of student records
- Student Support (including supplying student academic certificates, detailed list of marks, transportation student tickets, archive of documents, archive of graduates of Department of Energy Technology, student scholarships, graduation ceremony, statistical information on students and graduates, circulation of exam marks to permanent and temporary teaching staff, uploading exam marks to electronic e-class system)
- Administrative support for training courses on energy matters for industrial staff
- Administrative support for postgraduate MSc course

Secretarial and other departmental staff use an advanced web based system e-class, while dealing with requests and activities related to students and staff, e.g. student registration to courses, newsletters, provision of syllabus for the courses and other information to students. However, electronic processing can be introduced in some areas (e.g. students feedback forms for teaching quality and curriculum, study certificates), which will save time for the overloaded administrative staff. Also, there are some areas (e.g. protocol) that the law requires to maintain a hand-written record, which also will save time if it becomes only electronic.

Career services and student support office exist at TEI level. The career service office can become more active in generating links with potential employers and get more feedback from them for their requirements. This information will assist the career office to provide updated advice to students.

General IT support is provided centrally by the institution and includes the management and running of the IT networks.

Student support services are provided by TEI and include help with accommodation, the provision of free meals, the possibility of students to obtain loans and a level of medical insurance. There is also a separate financial account to support students in greatest need. The department places considerable emphasis in the electronic process and provision of administrative tasks. Furthermore, there is an ongoing desire by the department to further enhance and simplify its administrative procedures.

The department is encouraging students to undertake other than academic activities (e.g. cultural, sports).

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 counseling, athletic- cultural activity etc.).

There is a useful level of support that is provided from the centre (TEI) regarding general administration activities, financial activities, academic studies and student support and some other departmental activities. The department itself provides extra administrative support with two secretaries allocated to undergraduate and postgraduate support administration matters. There is no clear allocation of administrative/secretarial support to academic staff.

The perceived relationship between the departmental administrative staff and other staff/ students is healthy and productive. Responsibilities are allocated and tasks executed efficiently. The administrative staff should be commended for the effort that they put in order to provide appropriate service to students. It is unfortunate that the promotion structure of the administrative staff is mainly based on years of service and it is not possible to reward the positive attitude of staff in a more direct way.

ICT services to students and staff are sufficient. Computers, networks, Internet room and WiFi connectivity exist. However, the IT support does not extend to the laboratories within the department. A central IT service for the installation of required software for teaching on the laboratory computers should be in place, which will update the software with the appropriate new version every year.

The central library facilities are of high standard and the building is new, while staff is highly professional and helpful to users. Facilities in the library include a teleconference room.

The department mentions a number of cultural and sports activities organised for the students but of course the EEC could not easily validate this.

Career advice and consultation to students is a central provision but it seems students are not using this service. It seems that links between the central office on career advice and the department need to be strengthened. The career service office should become more active in generating links with potential employers and acquiring more information on employers' requirements. This information will assist the career office to become more relevant to students and, as a consequence, students may use it more.

RESULTS

Are administrative and other services adequate and functional?

Administrative services are reasonably effective mainly due to the use of web-based systems, but there is always room for improvement. For example, the reduction from 3 to 2 administrative staff serving all the undergraduate and postgraduate students and staff means that if one of them is unwell, the other becomes highly overloaded and it is difficult to cope. It is recommended that temporary staff is brought in under these circumstances by a central

administrative pool.

Technical support services are reasonable but not advanced. Reduced numbers from 5 to 2 over 5 years has made it difficult to provide appropriate service to the teaching laboratories and maintain appropriate levels of student support and supervision that may be required for safety. This must be considered carefully within the department and at the institution level.

IMPROVEMENTS

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

The functionality and characteristics of the relatively new e-class system used by the department is quite sophisticated and as such it should be used by academic and support staff in a more effective manner (e.g. a wider use of mailing lists to certain group users, electronic feedback from students for teaching quality).

The exposure of students to the services and help offered by the central Careers Office should increase and the appointment of a member of staff in the department to act as liaison officer with the centre is recommended. In addition, the central careers office should become more active in building links with potential employers.

Finally, some additional secretarial support to academic staff will be particularly beneficial and will increase staff productivity and effectiveness in carrying out academic duties.

Collaboration with social, cultural and production organizations

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

The department has been active in establishing relationships with social cultural (city halls, scientific societies, secondary education schools) and industrial organizations via past and current programs. In addition, academic staff has significant links and collaborations with industrial organizations.

Members of academic staff are active in the promotion of technologies via public lectures and presentations, while aiming to expand the knowledge of non-informed in the subject members of the society. The enthusiasm of academic staff towards this type of collaborative activities is particularly noted. They have delivered lectures at local schools and are collaborating with the local council for the delivery of talks for the non-informed public in the area of energy and its sustainability.

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

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

Potential inhibiting factors at State and Departmental level, and proposals on ways to overcome them.

At undergraduate level, the Department of Energy Technology in 2002 developed and established an undergraduate study programme based on 4 years, full time. This course is an amalgam of two distinct disciplines, Mechanical and Electrical, which have not achieved full integration in the curriculum. The subject area of Energy Technologies is not underpinned by the relevant basic applied sciences, including materials, physics and chemistry. The syllabus needs to be redesigned with focus on new technologies that clearly reflect the needs of the Greek industry sector of Renewable Energy, with clear focus on both modern Systems and Technologies. Emphasis must also be placed on project based learning and outcomes driven teaching.

At postgraduate level, plans are in place for the introduction of a postgraduate Masters degree (MSc in Energy) that will replace the currently running collaborative offering with Herriot-Watt university in UK. It is advisable that a masters degree program must have the necessary depth of knowledge needed to be learned in a specific area, rather than being as diverse as in its current form. Strategically, a new offering by the Department alone, at postgraduate level with fees that are on par with those charged by Herriot Watt university, may not yield the desired results in terms of attractiveness to potential students and, thus, its long term sustainability is questionable. A proper market survey needs to be undertaken first, followed by the inclusion of relevant externals from industry and academia in the design of the new offering that is focused in a carefully chosen area and the associated in depth syllabus.

At PhD study level, students who undertake such research degree matriculate in another university and are being co-supervised by research-focused staff from the Department. This is due to the fact that the State has not provided TEI with Doctorate degree awarding power. Such limitation should not prevent applied research inclined staff from the Department to embark on co-supervision of PhD students in areas that are beneficial to industry.

Short, medium and long term goals.

The Department has developed short to medium term goals but there is a lot of uncertainty in the current economic climate, State indecision to implement the new legislation and stagnant industry developments. However, these goals are not officially recorded, although the academic staff is aware of the goals.

Emphasis in the goals has been placed on E-learning activities and the use of computer based technologies for electronic communications between staff and students as well as for administrative functions including student evaluation reports. Worth noting is the need for the establishment of mechanism and processes that will help the continuous improvement of the Department in the four main functions of Teaching and Learning, Research and Development, Administration and Management, and Community and Industry engagement.

The plan is described in the Internal Evaluation Report with very general statements and broad terms. The details need to be worked out and policies must be developed at both Department and Organisational level. In times of high uncertainty, different scenarios and plans must be devised.

Plan and actions for improvement by the Department / Academic Unit.

Immediate plans must be developed and implemented for cost cutting and rationalisation of degree offerings (undergraduate and postgraduate subject chains and credits) and associated resources (hourly paid academic staff followed by full time staff and laboratory space and

equipment). Efficiency and effectiveness maximisation by focusing on the core activities that deliver the aims and objectives of the Department are of paramount importance, as is the continuous quest for external funding aiding the long term sustainability agenda. If this goal is not achievable, the Department needs to reposition itself and look for economies of scale and scope based on efficiencies that can be obtained with other Departments including sharing subjects and laboratories.

If the MSc degree proves to be successful, then the model can be extended to a number of offerings at postgraduate degree level including collaborative offerings with other Departments and other Organisations.

Long term actions proposed by the Department / Academic Unit

The good work of the Department in industry placements and industry-based projects at undergraduate level should continue and expanded so that more industries participate in the scheme. The establishment of an Industry Alumni will help the Department with the acquisition of external funding and the employability of its graduates. Also the establishment of a number of industry awards to outstanding undergraduate and postgraduate students will recognize excellence, encourage student effort and assist with the recognition of the outstanding graduates outside the department.

F. Final Conclusions and recommendations of the EEC

For each particular matter, please distinguish between under- and post-graduate level, if necessary.

Conclusions and recommendations of the EEC on:

- 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.

The Department of Energy Technology is viewed by EEC *as one of the leading technological departments in Greece in the area of Energy*. The department has progressive views and its staff strives for improvements in the quality of operations and the learning experience offered to students. The EEC offers the following recommendations and commendations within the form and spirit of this evaluation process as a means for reflection and further developments towards excellence. EEC felt that some of the recommendations could not be implemented due to legal limitations. Therefore, the EEC provides recommendations for the State, the Institution and the Department, since some departmental recommendations may be hindered by current legal status.

STATE

The State must provide the necessary legal environment to allow the TEIs to serve better the students and potential employers and remain competitive with similar institutions in the European Union and other countries.

- The change of the legal status of TEIs to Higher Educational Institutions (HEIs) has not been completed. The State must either allow the TEIs to develop their courses to be of similar length of time as the old HEIs and have similar responsibilities to award doctoral degrees or reverse the original decision.
- EEC feels that the old status of the TEIs and the service that they provided by generating well trained graduates with practical skills to support industry was important to the country's economy. Therefore, careful consideration should be given to the decision to proceed with the further development of TEIs to HEIs.
- Clarify the professional status of TEI graduates. This is crucial for all TEI graduates as well as those from the department of Energy Technology, who, in some cases, perform similar functions as engineering graduates from old HEIs without the recognition and the associated pay. It is important to establish the professional responsibilities of TEI graduates (they should not necessarily be the same as those of old HEIs graduates), in order to design the teaching curriculum of the course appropriately.
- Provide the legal status to TEIs to have freedom to design their courses. This means ability to select the teaching curriculum, award PhD degrees, adjust the number of students admitted to a course as necessary, restructure or join departments to provide more relevant education to potential employers.
- Establish legal limits on the number of times that students can sit exams for each module and determine a maximum period of time that students can complete a degree. This may need to be linked with ability to offer part-time courses or intensive teaching of modules over fixed short periods, say, two weeks, in order to assist working students to follow and complete a degree quickly.

INSTITUTION

The Institution should offer additional central services to assist the operation of the Department.

- Establish central pool of administrative staff to provide service to the limited number of dedicated departmental staff in order to support academics and student services at times of increased load (e.g. registration).

- Provide technical support through a central pool of technicians that can provide support to limited dedicated departmental staff, which will support laboratory teaching and maintenance of equipment as required.
- Establish central safety unit, which will determine general safety regulations for the institution and provide advice and evaluate safe operation of departmental activities (e.g. laboratory experiments for teaching and research purposes).
- ICT central service should become more involved to support computing for departmental laboratories with the responsibility to install and maintain the required software for teaching. This approach will enhance the ability of the institution to negotiate special rates for the purchase of software and reduce the operational cost of the institution.

DEPARTMENT

The EEC recommendations for the department are independent from the current legal status and it is possible that some of those cannot be implemented due to legislation. However, even for such cases, some progress can be made.

Space

The department has newly refurbished and adequate teaching and office space, which is vital for the correct operation and development of the department. Each permanent faculty member has a modest but private office. Some improvement can be made for the temporary teaching staff, who may need to have some common space that they can use to meet with students as needed. The laboratories, visited by EEC, were pleasant and with appropriate space for both teaching and research activities. Some new equipment has been purchased and it is necessary to continue this investment to purchase new and modern equipment for the laboratory experiments, which will assist the teaching quality and ability of the department to expand its research.

Technical infrastructure

The new teaching and research laboratories should be properly equipped, according to the needs of teaching and corresponding research groups and operate under a research planning and management structure that must be established and operated by the department. The teaching infrastructure should be used to the maximum, while offering students enhanced distance-learning opportunities, where possible. This infrastructure, in terms of i) hardware and software and ii) related support staff must be fit for purpose and satisfy safety requirements. Action should be taken to:

- Provide rules of conduct to all students for every laboratory experiment in a well-documented way to avoid liability issues in the unlikely event of an accident. In addition, a risk assessment of current and future experiments should be performed and properly recorded.
- Obtain ISO Certification of the Laboratory infrastructure in order to establish the legal status to certify industrial equipment. This will ensure that training seminars for industry and undergraduate teaching activity can expand on certification.

Administrative infrastructure

- As departmental quality assurance procedures are put in place and evolve, there is need for increased secretarial support, which may be absorbed by the current secretarial personnel or might require additional staff, possibly through a shared central service at the institution.
- E-services should be more efficiently used (e.g. maintaining lists for specific groups, electronic response for all student surveys and automatic processing) and updated according to departmental needs.

Funding

- The EEC believes and strongly supports the case that funding from the TEI centre to the department should be distributed in a manner that reflects the strategic plans and priorities of the department and also relates to the size and needs of the separate student groups and activities carried out within the department.
- Incoming research funds obtained via external government sources and from collaborative projects with industry and other organizations (e.g. FP7 projects)

should increase and develop into a major income stream for the department. This will provide the needed funds for maintaining continuity in the employment of research personnel in general and in-between project periods of time in particular.

- Funding support for international conference participation exists but should be strengthened and used as a staff development tool.

Teaching load

- Teaching load should be reduced in order to free time for academic staff to pursue their R&D activity, enhance links with Industry and develop other academic interests. This can be achieved by restructuring the current course delivery framework and reducing the number of available laboratory experiments, while limiting the number of times that students can sit exams for each module and complete their degree. The scheduling of teaching with so many students from different years is difficult and leading to time wasting and reducing the teaching experience of those students who follow the course.
- Teaching loads and allocations within the department should clearly relate and reflect the load of staff at other areas, such as research and administration.

Learning and teaching quality control

The EEC recommends the following:

- The department, in general, and the Undergraduate (UG) Studies Committee, in particular, must review the undergraduate teaching activities along the lines highlighted earlier in the report, so as to identify and eliminate systemic deficiencies and ensure teaching quality. This should include an evaluation procedure of examination papers, restructuring of laboratory experiments, specification of course curriculum and materials, uniformity of final year projects etc. The UG studies committee should formally review annually all teaching activities (examination results, student progression, student feedback, graduate achievements and statistics etc), identify appropriate actions and developments and act faster to implement changes and prepare an Annual Teaching Review (ATR) document. This can be used to effectively provide all the necessary information and evidence needed in future external evaluations.
- A regular and formal departmental meeting (once a semester) between student representatives and academic staff is required to discuss emerging teaching problems. This should help student development and satisfaction.
- Introduce and implement the practice of using External Examiners (academics from other institutions in Greece) for obtaining independent expert advice and for quality assurance purposes.
- Establish an internal evaluation procedure of Exam papers to allow independent moderation of the examination level and marks.
- Establish an internal procedure to consider Mitigation Circumstances for students who cannot participate at exams or submit coursework within certain deadlines due to medical or other personal reasons. This will become more important as the number of times that students can sit exams for each module is reduced.
- Introduce student group activities with credit and examinable written and oral presentation components. This can provide additional tests throughout the term outside the traditional examinations, which can increase student attendance. Expanding the offer of timetabled tutorials on more courses can be linked with reductions in the scheme of communicating with students, where staff is available at their offices for student questions, which is inefficient.
- Introduce a Personal Tutor responsible for the general well being and academic progress of a group of students. This can improve student attendance and general knowledge of where students who do not attend the course are. Even the knowledge of the latter can identify actions that can be taken to improve student attendance and reduce the number of years for degree completion.
- Evaluate and track better student progress during their practical internship and consider this assessment and final mark to the final degree mark.
- Adopt a number of relevant class visits to Industry and Public organizations in order to expose students more to the real working practices and organizational interests.
- Introduce rules on plagiarism with serious consequences to deter students.

Commendations

EEC commends the department for the following:

- the high degree of enthusiasm and commitment that all departmental staff exhibits when carrying out their academic and administrative duties.
- the quality of documentation and support provided to the committee for the purpose of this evaluation.
- the progressive attitude and thinking of departmental staff to accept changes and to consider new educational schemes and methods while striving for academic excellence.
- the successful introduction and operation of the MSc in Energy in collaboration with the Heriot Watt university in UK, which is of high standard in its design and implementation/delivery.

The EEC key findings are summarised in the table below:

	Curriculum	Teaching	Research	Services	Strategy
Approach	<p>Very good Well thought, detailed and sound. Comparable to curriculum at many international organisations.</p> <p>Limited Extend curriculum to include recent energy technologies</p>	<p>Very Good Tutorials are delivered at some modules and plan to increase in future</p>	<p>Very good Activity strong within the limitations of the current system. Many collaborations with national and international organisations.</p> <p>Very good Some collaborative supervision of PhDs with Heriot Watt in UK. Attempts to extend joint collaborative PhD supervision.</p> <p>Limited No formal departmental research strategy and no research committee.</p>	<p>Very good Web-based system with plans to extend its use</p> <p>Very good Student support services</p>	<p>Very good Appropriate for TEI and positive outlook for changes as required.</p> <p>Good Extend the practical internships in industry and establish industrial awards to final year students</p> <p>Restrictive State funds are required to implement plans for future</p>

Implementation	<p>Very Good Recently refurbished laboratories with a lot of new equipment. Good lecturing facilities.</p>	<p>Very good Quality of teaching, materials and approach, as established from student feedback.</p> <p>Very good Practical internships to external organisations with financial support.</p> <p>Limited Success rate at exams</p>	<p>Good Some attempts to generate focus research areas between different members of staff.</p> <p>Limited No clear research objectives across the department.</p> <p>Restrictive Limited funding for research is available.</p>	<p>Excellent Extensive library facilities; teleconference; WiFi available on campus.</p> <p>Limited No allocation of secretarial support staff to academic staff</p>	
Results	<p>Satisfactory Limited by the current regulations for higher education</p>	<p>Very good Student feedback scores are high.</p> <p>Limited Failure rate can be quite high at some modules. Student completion rate is also poor.</p>	<p>Satisfactory Within the current regulations for TEI, good output of publications.</p> <p>Limited Increase number of publications at peer-reviewed journals</p> <p>Restrictive TEIs are not allowed to award PhD degrees</p>	<p>Very good Administrative services are very effective in serving students</p>	

Improvement	<ul style="list-style-type: none"> • Reduce student numbers to a realistic level. • Change legislation to limit possible number of years of study and number of exam resits per module. • Deliver additional Maths tutorials at the 1st year student. • Establish procedure for regular reviews of curriculum with external input. 	<ul style="list-style-type: none"> • Provide TEIs with ability to award PhD degrees. • Increase participation at international projects • Establish system of external examiners to the course. • Establish internal exam papers review panels. • Ensure that joint MSc course in Energy with Heriot Watt in UK continues. 	<ul style="list-style-type: none"> • Provide ability to award PhD degrees. • Increase participation at international projects • Increase joint supervision of PhD students 	<ul style="list-style-type: none"> • Extend the use of the e-Class system to reduce work load. • Improve contribution of central career office to students. • Increase central ICT support to computer maintenance and support for teaching laboratories. 	
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The Members of the Committee

Name and Surname	Signature
1. Professor Yannis Hardalupas (Chair)	
2. Professor Costas Xydeas	
3. Professor Irini Angelidaki	
4. Professor Elias Siores	