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ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ ΚΑΙ
ΠΙΣΤΟΠΟΙΗΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ
ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC

H.Q.A.

HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

Department of Mechanical Engineering

Technological Educational Institute of Serres

23 June 2012



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External Evaluation Committee

The Committee responsible for the External Evaluation of the **Department of Mechanical Engineering of the Technological Educational Institute of Serres** consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. Professor Tassos G. karayiannis _____ (Coordinator)
(Title) (Name and Surname)

Brunel University _____
(Institution of origin)

2. Professor George Vatistas _____
(Title) (Name and Surname)

Concordia University _____
(Institution of origin)

3. Dr Dimitis Kyritsis _____
(Title) (Name and Surname)

University of illinois _____
(Institution of origin)

4. Professor Dimitris Lagoudas _____
(Title) (Name and Surname)

Texas A & M University _____
(Institution of origin)

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

The External Evaluation Committee (EEC) had a first introductory meeting in Athens with members of Hellenic Quality Assurance Agency (HQAA) on June 18. The EEC travelled on the same day to Serres to begin the evaluation of the Department of Mechanical Engineering of the Technological Educational Institute (TEI) of Serres, based on the guidelines of HQAA. The EEC had already received the Departmental Internal Evaluation Report (IER), the Study Guide, and staff curriculum vitae.

In the first evening the EEC had an initial introductory meeting with the Vice Rector for Academic Affairs, the Head of Department and members of the faculty, especially those that helped prepare the IER. The two-day visit to the TEI/Department (June 19 and 20) was broadly divided in two parts; the first day started with formal presentations of the various aspects of the work of the Department including detailed presentation by the two division leaders (Manufacturing and Energy) on the objectives, curriculum and teaching methodology in their divisions. This formed the basis for a very detailed discussion on curriculum, teaching methodology and its evaluation/effectiveness, student performance and academic support.

The list of documents provided and examined by the EEC included:

- (i) Internal Evaluation Report (2009/10 and 2010/11)
- (ii) Study Guide (2009/10 and 2010/11)
- (iii) Detailed course syllabi
- (iv) Samples of graded examination papers
- (v) Samples of graded student theses
- (vi) Samples of support material including theoretical and laboratory parts
- (vii) Curriculum vitae of both full and part time staff
- (viii) Publications of staff
- (ix) Text books written by staff.

The second day of the visit was spent meeting students, the part time members of staff and the departmental administration staff. Subsequently, the EEC visited:

- (i) The mechanical engineering laboratories
- (ii) Lecture theatres and lecture rooms
- (iii) The library
- (iv) The TEI placement Office
- (v) The TEI Student Guidance and Support Service
- (vi) Student refectory
- (vii) Office of the IT support service of TEI

In addition, the EEC requested information and written opinions of companies

accepting students of the Department on placement or employing them. Members of EEC also had telephone conversations with senior staff (sometimes involved as industrial student supervisors) of such companies.

The whole visit was conducted in an extremely friendly, engaging and professional atmosphere. The senior staff and members of the Department seem to embrace and welcome such an extensive external evaluation, considered it a constructive meeting and as a means of improving both their teaching delivery and overall provision. It also offered them a chance to benchmark their work against international standards and discuss future plans for their Department and receive direct feedback.

In general the view of the EEC, is that the Mechanical Engineering Department of Serres has a lot to offer to the local community and generally the Greek student cohort. The overall working atmosphere is excellent, academic and administrative staff and student relations are excellent and the infrastructure, on the whole, adequate, although improvements can be made. The aspiration of the Department to establish a postgraduate programme is strongly encouraged by the EEC. We also believe that the closer collaboration that will emerge with the changes in relation to the future structure of the School will be a step in the right direction, not only because it will bring academics from different disciplines working together to explore cross-discipline developments (teaching-research) but will also improve staff utilization time with some common teaching.

The rest of the report is structured along the lines requested by HQAA. Each section includes an analysis of the findings of the EEC and recommendations. We hope that these recommendations will be viewed in a constructive manner by the management and staff of TEI/Mechanical Engineering. We also expect them to find creative ways of facing the challenges in an ever-changing academic system both in financial terms and within the framework of a centralized and rather bureaucratic Greek educational system.

A. Curriculum

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

APPROACH

The stated objective of the Departmental curriculum is “to promote the development and dissemination of knowledge in the technology and science of Mechanical Engineering through teaching and to provide the students with the necessary background that will secure their effective education and training towards their scientific and professional career and development”. In order to achieve this objective, the Department has established a 4-year undergraduate curriculum in Mechanical Engineering that in general abides by internationally recognized standards. The curriculum is cohesive and well structured, it clearly serves the departmental objective and a reasonable-quality student who enters the Department and diligently works along the lines of the curriculum should be able to successfully work in the industry or be (self)-employed in a small business. Of course, this does not unfortunately exclude the probability of admission of students of unreasonable quality, as discussed in the sections below.

The curriculum is reviewed on a continuous basis by a committee comprising members from both the particular Department and the higher administration of the TEI, with student participation. It is noted here and discussed in detail below that the charge of this committee is review of curriculum and not of teaching effectiveness (e.g. failure rates etc.) A satisfactory process of evaluation of the curriculum has been established that has led to curriculum revision in the recent past. The curriculum has been decided based on a series of factors. The main factor is, as it should be, effective training of the students. Understaffing, especially in the Energy Division, was also a consideration, which is also legitimate. However, we noticed that, on several occasions, the decisions on curriculum were unduly constrained by requirements imposed by national law that seems to be as rigid as it is unreasonable and ineffective. As such occasions, we notice:

- (a) The requirement that the two technical divisions of the Department have approximately the same teaching load, which has led to several repetitive, if not redundant, courses offered by the currently understaffed Energy Division.
- (b) The excessive requirements for courses of non-technical content that increase the teaching load without obvious benefit to the students.
- (c) The legally imposed number of courses as well as the limitations on their distribution in the curriculum, which again limits functionality at no obvious benefit.

Recommendation 1

It is strongly recommended that less rigidity be imposed by the central government on matters of curriculum design. We note that the proper role of legislation and the government when it comes to state university curricula is not to write them into law but to set minimum accreditation standards and then let each unit arrange the curriculum according to their needs and capabilities. Once a department decides a programme of study, then it should be submitted for accreditation to officially recognized authoritative (expert) organizations as practiced in many countries.

(Given the ineffective and rigid framework that they have to work in, the staff are to be commended for their success in drafting and serving a high-quality curriculum.)

IMPLEMENTATION

The curriculum is basically implemented through distribution of the teaching load among the three sectors or divisions of the Department, identified in this report as: Division of Scientific Fundamentals, Manufacturing Division and Energy Division. The courses of the Division of Scientific Fundamentals are mandatory for all students and so are several courses in engineering fundamentals that are offered by both technical Divisions (Energy and Manufacturing) throughout the curriculum. From the sixth semester on, the students are required to specialize in one of the two technical Divisions through the appropriate selection of specialized courses. In the eighth semester, the curriculum is completed with an undergraduate thesis, whereas the students are also required to complete an internship during their studies.

The Division of Scientific Fundamentals is responsible for providing instruction in the scientific fundamentals of Mechanical Engineering in terms of Mathematics, Physics and non-technical courses of general education. Notably, Thermodynamics is also covered by this and not the Energy Division. Although perhaps too numerous, the non-technical courses are in general well structured. Particular reference is deserved to the course in Engineering Law, an absolutely necessary piece of knowledge that is sometimes missing from the curricula of even the best schools. After a recent curriculum review, it was decided to eliminate Chemistry, Statistics, and English from the curriculum. The removal of Chemistry was motivated by the unfortunate demise of the colleague who taught the subject, whereas the reason for the removal of the two other topics was not entirely clear. As far as Chemistry and Statistics is concerned, the Department is cautioned that their complete removal can cause accreditation problems. As for English, knowledge of its fundamentals is a “must” for the modern engineer. We feel that both these decisions ought to be revisited as per our recommendations below.

The Manufacturing Division serves a well-structured curriculum on Mechanics, Manufacturing, and Structures. The Division also serves the perhaps weaker but in any case sufficient part of the curriculum that relates to Controls and elements of Industrial Engineering. The Manufacturing part of the curriculum is well-articulated and well served. The recent removal of Statistics from the curriculum left metrology and measurement technologies for a new course termed “Industrial Measurements and Automatic Control” which is offered as a specialization course in the sixth semester. Notions of measurements and statistics should be offered earlier in the curriculum to all students perhaps through collaborations with the other two Divisions, e.g. Statistics can be re-introduced as part of a Mathematics course.

The Energy Division serves the part of the curriculum on Fluid Mechanics, Heat Transfer, Energy, and the Environment. It is noted that the Division is currently severely understaffed, with only two permanent full time (FT) faculty members. As a result, the employment of two recently elected faculty members that has been pending for years emerges as a pressing need. When asked about parts of the energy curriculum that seemed repetitive (e.g. Heating- Refrigeration- Air Conditioning I &II – Industrial Refrigeration, Electric Machinery I & II, Renewable Energy –

Environmental Technology, IC Engines I & II), the faculty of the Division stated that this was because of a legal requirement on having approximately the same teaching load with the much better staffed Manufacturing Division. If this unreasonable requirement cannot be circumvented, it may be better served by members of the Energy Division offering other courses that will serve the students' needs more effectively than a triplet of classes in Refrigeration. After all, the osmosis with the Division of Scientific Fundamentals has already started with Thermodynamics been taught outside the Energy Division. The process may also work the other way for some aspects of Chemistry for engineers and its relation to, for example, combustion processes and perhaps relevant aspects of Statistics for the benefit of the students.

The curriculum is delivered through the efforts of a severely understaffed tenured-track faculty and the support of committed and highly qualified part time (PT) instructors. Even after the drastic reduction of their number, the PT lecturers carry almost 60% of the teaching load. This generates the need for a Programme Director and a Board of Studies as explained in detail in the "Teaching" Section B of the report. It is noted that teaching loads for tenure-track faculty that exceed 10 contact hours a week and in some cases can reach as much as 16, are simply unreasonable for institutions that aspire to achieve a good balance of teaching and research activities/output. Also, it was conveyed to us that the annual contracts of the PT staff diminish commitment to the teaching work and this inevitably reflects on curriculum quality. Longer contracts, e.g. two- or three-year long should be contemplated, although it is realized that this may require a decision at higher level.

Particular reference is deserved by the quality of the teaching laboratories, which is in most occasions very good. The manufacturing labs are equivalent to the ones of good schools of Mechanical Engineering in the world, and in general most of the teaching laboratories are of very good quality. In some cases some up-date is necessary, see also Section B. Recent reductions in staffing have unfortunately led to high numbers of students per lab section, but hopefully this will be soon reversed. The teaching facilities are of very high quality. The students of the TEI as well as the TEI administration are to be commended for the respect with which they have treated this outstanding infrastructure, which unfortunately stands in stark contrast with what happens in the majority of AEIs and TEIs in the nation.

Along these lines, it has to be stated that the committee was impressed by the quality of the faculty/student interaction that has been established in the Department. Also, in their meeting with us the students had an overall positive attitude towards the curriculum and offered constructive and reasonable input. This is an asset that we are confident will contribute towards curriculum improvement.

Recommendation 2

1. Proceed immediately with the appointment of the elected faculty members in the Energy Division.
2. Re-institute English as part of the curriculum and introduce Chemistry for engineers and aspects of Statistics possibly as part of other courses (e.g. Mathematics).
3. Employ part time academic staff on longer-than-annual contracts in order to increase commitment to their curricular activities.

RESULTS

The Department meticulously records the results of the educational effort and has provided ample data to this extent. Several of the data indicate a positive trend, although they are on occasion difficult to read because of the effect of inactive students on the numbers. (We understand that the phenomenon of inactive students will soon be eliminated through long-overdue new legislation.) The success rates in laboratory courses are acceptable by international standards. However, the success rates in lecture-type courses need to be continuously reviewed by the appropriate committee and the whole faculty, see Section B. An issue that has been identified is that, because of the admission process, students are often admitted that are entirely unprepared for studies in a science-based technical discipline (e.g. students that focused their high-school education on the humanities.) The result of trying to convey Mathematics and Physics to these students is expectedly problematic. This caveat is treated basically through a very healthy and collaborative student/ faculty interaction. However, the admissions process has to be revisited. Students that are admitted to a technological institution unacceptably low grades in subjects like Mathematics and Physics strain the system and themselves, most probably without hope for a positive result. This is one more example of centrally (mis)conceived mandates and laws that make the work of a dynamic and ambitious Department difficult.

The gradual increase of the graduates' average entry qualifications, the parallel substantial decrease of the time the students take in order to complete their curriculum (it has dropped to about half from the class admitted in 1989 to the class admitted in 2006), as well as anecdotal data that we collected from our interaction with students stating that they chose the Department for its good reputation, and the enthusiastic endorsement of the educational work by employers of recent graduates that we received through both emails and telephone calls, convince us that achievement of the curriculum results is to a significant extent successful. There is, of course, substantial room for improvement and this is achieved through the continuous work of the Curriculum Review Committee, (see section B, re: Board of Studies).

Recommendation 3

1. Elevate admissions standards so that students who do not have the necessary background for a science/technology-based study in Mechanical Engineering are not admitted to the Department.

IMPROVEMENT

The Department has in place a process for curriculum improvement that satisfies the highest possible international standards. Specifically, a faculty committee reviews the curriculum in a continuous manner and reports to the entirety of the faculty. In fact, the Department has recently completed an extensive overhaul of their curriculum that in most cases constituted a substantial and successful improvement. An old "Metal Structures" course was converted to a modern course on finite

elements for structural analysis, technical drafting courses were modernized in order to include CAD (it is not clear why a part of the course remains that still requires manual drafting), courses were introduced in modern topics such as Robotics, Environmental Technologies, and Alternative Energy. The manufacturing syllabus was modernized and is now supported by really outstanding rapid prototyping laboratory capabilities. In most of the cases, the curriculum improvement process was guided by the quest for excellence and had positive results.

However, there were just a few occasions where convenience for students and faculty was perhaps subconsciously preferred to well-established standards and the related decisions have to be revisited. These relate first to the entire elimination of Chemistry, Statistics, and English courses, as mentioned above. As far as English is concerned, it is realized that most of the students come with some knowledge of the language, but a minimum has to be secured. The way to do this is probably to re-establish the requirement, but waive it for students that can present appropriate certification of medium knowledge of the language (equivalent for example, to the First Certificate in English of Cambridge University).

The same motives seem to lie behind the elimination of pre-requisite courses. Much as it is true that an exaggerated use of pre-requisites can delay graduation, it is also true that carefully selected prerequisites may actually help the students keep a focused pace early in their studies that will eventually not only help them acquire a structured understanding of the material, but also graduate in a timely manner. The issue should be revisited in the near future.

Recommendation 4

The Department is encouraged to maintain their good job in Curriculum review and improvement. As in most times so far, academic excellence should be the dominant criterion for actions. To this extent, a carefully selected set of pre-required courses should be re-introduced in the curriculum.

PROPOSED MSc PROGRAMME

The Department has recently submitted a proposal for an MSc programme in Renewable Energy Systems. The rationale behind the proposal was to utilize the postgraduate programme in order to leverage quality by attracting talented and motivated students, thus compensating in part for the student-quality problems generated by the undergraduate admission process. In order to achieve this, the Department proposed a postgraduate programme in a subject that is currently in high demand, namely renewable energy. This would be a programme mostly carried by the Energy Division, as evidenced by the proposed curriculum. However, given the current level of staffing, it looks that the main strengths of the Department lie in the Manufacturing Division. This discrepancy has to be somehow bridged, especially given the fact that the competition in the topic of renewable energy will be strong. It is noted that renewable energy and sustainability have a strong component that includes materials and controls. This opens the door for courses on “green” manufacturing, light-weight materials, materials for hydrogen-economy, and fuel-cells, as well as optimization of energy systems that can be served by the Manufacturing Division. This is important and probably a niche that is not covered

by many competing programmes. Reasoning along these lines, the Department may want to re-focus the proposed MSc curriculum in order to efficiently leverage current strengths of the Department and maximize probabilities of success.

Recommendation 5

The Department is encouraged to proceed as planned with the MSc programme in order to institute **a center of excellence**. The proposed postgraduate programme has to be re-focused in a manner that takes into account the strengths of the current teaching and research staff of the Department.

Moreover, an Industrial Advisory Board has to be instituted for the programme that will secure connection with current industrial needs, especially before the programme commences, see also Section B. A systematic “market analysis” before the programme commences will undoubtedly boost its value and potential for success.

B. Teaching

APPROACH

The programme of studies consists of three main areas, namely, the basic general subjects (identified in this report as courses) the core courses and the specialist courses. The Department offers two specialist study areas, i.e. Manufacturing and Energy. It has an established teaching methodology and approach broadly designed for the delivery of a curriculum, which is a mix of theoretical and applied areas. The committee evaluated this approach based on (i) documents provided – Internal Evaluation Report, Programme of Studies and other documents, see Introduction (ii) Presentations made by the staff of the Department and (iii) Discussions with staff and students.

The teaching methodology follows a well-established approach used in many mainstream universities. This combines sets of well-defined lectures with tutorial questions aimed to further the knowledge of the subject matter and prepare the students for assessment. However, where there is some difference from other institutions is in the delivery of laboratories. These are taught and assessed as completely separate courses (by different staff). Inevitably the students treat them as separate and often fail to see the connection of theory with practice. A plus here is the fact that the students have to pass both the theoretical part and the laboratory exercises so as to complete the learning outcomes and pass the course. The final mark is a combination of the two.

Recommendation 6

The now separate theory and laboratory parts of a subject should be considered one course. The laboratory part should be examined by a (small) number of assignments (not by examination) spread throughout the semester. The mark from these assignments should be combined with the theoretical part (assessed through final examination) for the final mark of the course. Students should still be expected to pass both parts.

The staff/student ratio is not acceptable for typical mechanical engineering departments. During 2010-11 there were four professors, three associate professors, one assistant professor and four professors of technology. The Department was also supported by four technicians. The committee examined the CVs of all full time staff and considers them to have adequate academic background that enables to perform their teaching duties in the most appropriate manner. The committee also read the CVs and met with a good number of the part-time staff. The conclusion reached was that the PT staff were very well qualified – contrary to the impression given in the self-evaluation report. They are very dedicated to their duties and the particular courses that they deliver. It was also clear that they contribute with an equal or even larger share of the teaching contact time. However, it was also clear that they could be more involved and their opportunities to contribute to the overall teaching/development effort could be enhanced.

Recommendation 7

It is recommended that part time staff be integrated in the Department and be included in departmental meetings and in all relevant meetings relating to the development of curriculum and course delivery.

Recommendation 8

It is recommended that several additional permanent faculty appointments be considered beyond the currently elected faculty waiting for their official appointments. These are not only essential at the current stage of the Department, including appropriate course delivery and administration, but also necessary in order to enable further developments such as fundamental and applied research and postgraduate education.

The committee concluded after discussions with staff (FT and PT) and students that the collaboration between them was very good. The faculty was considered approachable and available/helpful during and after their teaching hours. The PT staff responded by email to students queries but also and very importantly kept office hours (beyond their contact time). The fact that the PT staff were offered shared office space is an excellent practice.

Recommendation 9

All part time staff should have shared office space with personal computer facilities.

The committee was satisfied with the available infrastructure and the state of the laboratories. However, in some cases effort should be made and resources secured for up-dating the facilities.

IMPLEMENTATION

The Department offers two streams, Manufacturing and Energy and it become obvious during the discussions that more central coordination is necessary to optimise delivery of the courses and offer better choice to students.

Recommendation 10

It is recommended that the Department appoint a Programme Director (PD) that will assume overall responsibility for the programme and will have day-to-day responsibility for the smooth delivery of all the courses. The PD will also be a focal point for students.

Recommendation 11

The Department should establish a “Board of Studies” chaired by the PD. The membership should include all the teaching team plus student representatives (possibly four – one for each year of the programme). The agenda of the board of studies should focus on curriculum development (see Section A above), the teaching

process and suggestions for improvement. This could meet once or twice a year.

The Department has an unacceptably high number of registered students (1701 for 2010-11). The intake in 2011 was 149 which looks more reasonable and could be managed appropriately if students progressed through the Department in a timely way, i.e. mostly in four years.

It was very clear from the detailed data provided in the reports and the discussions that the committee had, that student attendance and the actual number of students taking part in the examinations at the end of every semester is extremely low and would have been seriously questioned in other overseas university departments. (Members of the committee have experience of similar terribly worrying statistics in other Greek institutions and hence can confirm that this is not unique to the Department of Mechanical Engineering in Serres.) Furthermore, the success rate on a course by course basis was unacceptably low. This may be exacerbated by the very low entry standard (8.3/20) not typical or acceptable in Mechanical Engineering departments in other countries.

Although, as we mention in the previous paragraph, the above observations may relate to other similar departments in Greece, the committee would have liked to see a continuing debate among staff seeking ways of improving both the participation rate and the success rate of the students.

Recommendation 12

A proper evaluation is carried out of student performance in each course at the end of the year at the Board of Studies, followed by an action plan.

Recommendation 13

Re-examination of a failed course should be mandatory (unless mitigating circumstances are provided) at the first available examination opportunity. The number of failed attempts should be limited (to possibly two).

The Department/TEI does very well in seeking the opinions of students through a very established student questionnaire process – better than many overseas institutions. This should be extended and combined with an overall evaluation of the course.

Recommendation 14

The Department should establish a programme of end of year Annual Monitoring Process, which can include the student questionnaires and the results of the examination process plus any other quality issues. Membership of the panel should include staff from other departments/schools. The minutes and recommendations of the Board of Studies should also be included at this annual meeting.

RESULTS

As mentioned above, during the visit, the committee met a number of students. The

group of students expressed general satisfaction with the programme of study and its delivery, as well as the two specializations streams offered. As also mentioned above, they were satisfied with the support they received from the FT and PT members of the faculty. Furthermore, some of the students placed TEI Serres/Mechanical Engineering high on their preference list and were pleased that they have done so.

In addition the committee viewed written statements and had telephone conversations with representatives of companies employing or accepting placement students from TEI/Mechanical (Kleemann, R A and Associates, Doppler, EAB, Nestle S.A.). All company representatives expressed their complete satisfaction not only with the performance of the students but also their overall attitude and professionalism, provided unreserved support for the work of the Department, and stated that they will continue to accept students either for internships or as employees, when vacancies arise.

Areas of concern in the results or performance of the Department remain the low participation rates in the examinations, the high failure rates and the length of the study period. The younger and first-year students present at the meeting appeared to be appreciative of the need to complete their studies in the normal four year period which seems to be a trend and a step in the right direction.

Recommendation 15

The Department/TEI should collect data of student employment after graduation (including type of employment). This could be also used in departmental publicity material as employability is a key performance indicator in most established universities. The Department should also seek to keep a register of its graduates and occasionally invite them back to the TEI as keynote speakers. This will not only be a source of (industrially relevant) information but also a source of inspiration and motivation for the students.

IMPROVEMENT

The staff of the Department seem quite aware of the possibilities for improvement and are eager and able to actively engage with this process.

Recommendation 16

It is considered essential that the Department seeks to establish a closer collaboration with its industrial partners in terms of teaching, consultancy and research. This could be facilitated through the establishment of an Industrial Advisory Board (typical of departments overseas). This could meet with staff members and consider aspects of curriculum development/relevance and aspects of research, including applied industrially relevant projects. Such a board will be particularly useful for the proposed new MSc, see also Section A above.

C. Research

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

The Department of Mechanical Engineering of TEI in Serres has a noteworthy teaching-focused engineering programme of work. Its research activities however were more or less *ad hoc*, undertaken by academic staff either on a voluntary basis or as means to advance through the academic ranks, and as such it lacked strong connection to the main theme, cohesion, and synergy. Based on the documents provided to us, as well as our discussions with the faculty and administration officials, it appears that the Department has not established thorough policies that define their research objectives, or set benchmark standards in assessing research. The reason for this deficiency is simple and common to most of the Technological Educational Institutes in Greece. The previously mentioned central mission of teaching students the engineering trade through the application of science did not officially include the generation of new knowledge as one of the required academic components. Consequently, with some noticeable exceptions, past research output of faculty members was found to be below the expected international metrics *vis-à-vis* similar programmes operating within good overseas universities (an average of 2 high-quality journal papers and some well regarded conference publications per year per faculty member). This points to the need for establishing research criteria to direct the evaluation in academic staff promotion and recruitment. There are faculty members who have already retired and some are expected to retire soon. This is an opportune time where the Department could take advantage of and employ new members with strong research potential and expertise relevant to the main future research thrust of the unit.

As a result of our visit we now understand that the Department is enthusiastically aspiring, committed, looking forward, and ready to substantially augment its research component. To this end, the committee finds that the Department possesses all that is required to meet, through a well thought-out strategic plan, the internationally accepted university research benchmarks. In fact, we find that the uncommonly strong expertise in fundamental physics and mathematics possessed by a good number of faculty members could serve as the catalyst that will bring all disciplines together and thus shape the anticipated focus and synergy among various engineering research groups within the Department. If the long-term research goal is properly identified, an effective plan of action is designed, and properly executed, then it could result in interdisciplinary contributions of great value.

The Committee is impressed with the recent funding success regarding the major grant “Improving Surface Properties of Titanium Alloy”, funded under the National Research Programme ARCHIMEDES III, 2012-2015. This grant along with others and the recent acquisition of advanced instruments could very well act as a catalyst triggering the previously mentioned interdisciplinary research activities that will increase research productivity within the Department. In addition, it is anticipated that the establishment of the MSc programme and collaboration with other institutions within and outside Greece will greatly augment research.

In order to achieve the abovementioned goals the committee recommends:

Recommendation 17

The Department should explicitly layout their long-term research objectives and establish guidelines for the assessment of research performance, to which all faculty members should commit.

Recommendation 18

Include in the revised departmental planning additional steps towards the achievement of overall objectives by defining guidelines that include explicit criteria for academic staff progression and future faculty recruitment that ensures that the incoming member is research active in a topic relevant to one of the areas in which the Department aspires to excel. In addition, the Department should take advantage of the pending positions and fill these appointments with faculty having proved expertise in the areas needed for its new role and mission.

Recommendation 19

The Committee urges researchers to increase their research output and publish their contributions in learned journals (peer-reviewed) that are included in Thomson's citation index (or equivalent) and are of high international reputation and quality, as measured by appropriate metrics that are relevant to good foreign universities.

Recommendation 20

The Department is encouraged to publish an annual Research Report that will showcase the recent research activities of the faculty. This could be distributed or mad available electronically to new applicants (including the MSc students) to final year undergraduate students, other academics and in particular the local industries.

D. All Other Services

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

APPROACH

The Department places a high priority to the various services provided to faculty, teaching staff and students, including the secretariat (administration) of the Department, teaching laboratories, the Library, electronic services, webpages, course syllabi, course evaluations, internships with industry, career opportunities and employment services.

The Department strives to simplify administrative procedures and provide the flexibility of offering many services electronically. Most of the administrative procedures are processed electronically, including registration, course selection, grading, student course evaluations, library functions and various databases.

The Department specifically and the TEI in general have a policy to increase student presence on campus with a number of academic activities and social and cultural events. This will only be enhanced next year with the addition of the dining facilities and in the future by adding a dormitory for students.

IMPLEMENTATION

The secretariat is staffed by two full time members and it is highly streamlined using an electronic registration system (Egram) from Cardisoft, which manages the personnel files of all students and their enrollment to courses. Other services, including textbook assignments and student identification cards used for discounted tickets are issued using Eudoxus electronic services. The delivery of textbooks is completed through distribution centers and affiliated bookstores.

During orientation, students are informed about housing, health insurance, library card, food coupons, recreational facilities, opportunities for campus employment, establishing e-mail accounts, applying for study abroad opportunities and opportunities for scholarships. The staff of the secretariat are highly trained and willing to help students with additional questions. An upcoming change due to the new law for the administration of TEI is the consolidation of Departments into a unified administrative unit.

The Library is well organized with journals, books, and electronic access to journals and some publishers' databases and also computing equipment for accessing the databases including handicapped access. In the mechanical engineering section the standard undergraduate textbooks are mostly available. However, in cases, new editions of some textbooks were seen to be missing. Common areas for study are available as well.

The office of student services, including career opportunities in industry, counseling services and enrichment programmes are very well organized, including a psychologist among other professional staff. According to the student services staff,

mechanical engineering students are utilizing the services offered less frequently than students from other Departments.

Dining services are available during the day with light snacks and drinks, mostly a pleasant gathering place for students. There is a plan to open the new dining services facility during the Fall of 2012. There is also long-term planning to build a dormitory for students and further enhance the presence of students on campus.

Cultural events, including lectures, theatrical plays and concerts, are organized, often in collaboration with the city of Serres and take place in in-doors and out-doors facilities. Such events combined with a well-maintained campus, provide an enriched life experience for the students, faculty and staff together with the citizens of the city of Serres.

RESULTS

Most of the administrative and other services are adequate and functional. Full dining services will start operating from the next academic year, while housing on campus is not available yet, except for a small number of housing units for visitors. There is a multiuser facility for conferences, short courses and presentations, while the guesthouse and these facilities will be used for the summer school on composite materials to be organized during summer 2012.

The Department is proud of providing a supportive environment to the students, faculty and administrative staff. It is a student friendly Department overall, even though the student/staff ratio is very high.

IMPROVEMENTS

The Department has not identified specific ways and methods to improve the services provided. It is currently done with the initiatives of its faculty through the division heads, the Department head and the director of the School in coordination with the president and other administrative staff of TEI. Student organizations are often involved with student related issues.

Specific initiatives undertaken to improve services include the new dining facility that will start operating next Fall. Private landscaping crews have been hired to take care of the campus. There is also a newly established multi-purpose facility. Finally, joint activities and efforts with the city of Serres have the potential of improving services provided to the students, including transportation, housing, dining and cultural events.

Recommendation 21

Plan for the upcoming centralization of the administration of the Department under a unified administration for all Departments of the School. Identify an experienced administration staff member as the link to the Department even if s/he is located centrally.

Recommendation 22

Increase the availability of textbooks (and other teaching material) electronically to all registered students, hence abating problems associated with publishers and delivery of textbooks.

Recommendation 23

Encourage mechanical engineering students to use more often the career and student services office.

Recommendation 24

Continue efforts for updating textbooks available in the Library and expand the availability of postgraduate textbooks in anticipation of the new postgraduate (MSc) programme.

Recommendation 25

Implement the dining services plan to open the Dining Hall in Fall 2012 and include in the long range-planning for infrastructure the construction of student dormitories, especially for first year students.

Collaboration with social, cultural and production organizations

There is a close collaboration with the local community and the city of Serres, which uses the TEI Library, the amphitheaters (in-doors and out-doors) and the conference rooms for many cultural and scientific events organized by the city and/or TEI. There have also been joint events with other countries, most notably with Cyprus. The existing facilities provide a unique opportunity for cultural events with the surrounding communities, cultural organizations and neighboring countries as well.

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.

The **strategic vision** of the Department of Mechanical Engineering of the Technological Educational Institute of Serres states that it has a crucial role to play in solving the important problems of today and tomorrow - energy, climate, water, poverty - through the use of science and technology. It further states that the Department can set a path towards the future for Greek manufacturing, through innovative systems, processes and materials, and by educating the professionals that will drive the next wave of economic growth.

There is a realization among faculty, staff and students that the Department has strengths and a role to play in the economy and further technological development of the region of central Macedonia, the nation and furthermore the Balkan countries. They aspire to be a technological University with strong connections to industry, providing quality education and training at the undergraduate and postgraduate levels and creators of new technologies and innovation.

Strategic Goals

Goal 1: Maintain and strengthen a quality undergraduate programme on energy and manufacturing

The challenging economic environment in Greece requires a more effective management of human capital and for industry to employ engineers who can create a competitive product development cycle using modern technologies, within an environment where energy efficiency and cost of manufacturing are the main challenges. Therefore, the Department has established as a strategic goal to maintain a strong undergraduate programme with two objectives:

- **Objective 1:** Focus the undergraduate (BSc) degree on energy and manufacturing using the latest technology tools for education and training.
- **Objective 2:** Engage industry in curriculum design, teaching methodologies and practical training in order to increase the readiness of graduates for industrial employment.

The Department has already demonstrated a dedication to undergraduate education and successful placement of its graduates in industry and, provided there is continued support by the Greek government, this goal is achievable. The support by the Greek government is a major challenge given the negative economic indicators and loss of revenue, academic positions, technical support and reserves, which is a systemic problem with most government agencies.

The Department's curriculum is fairly well organized structurally and adequately delivered with the assistance of many temporary engineers and scientists (see Section A for specific comments for possible changes). Nevertheless, the Department faces the danger of not being able to support its educational/subject basis, given the small number of permanent faculty and the diversity of its subject area.

Moreover, the current number of technical personnel is clearly inadequate to cover the total needs of the Department and especially those of the teaching laboratories, taking into account the large number of students attending the laboratory sessions.

Goal 2: Establish a well-regarded postgraduate programme (MSc) on Renewable Energy Systems

High oil-prices and a persistent threat of a worldwide energy crisis have resulted in an increasing support for power generation from renewable energy sources. As a consequence, new government policies are helping the renewable energy industry with a long term potential for competitive growth and need for technology development.

In this context, the newly proposed postgraduate programme in Renewable Energy Systems, to be offered by the Department of Mechanical Engineering of the Technological Educational Institute of Serres, aims to:

- Objective 1: Educate and train graduate students in the development, design and optimization of renewable energy systems, in order to fill the gap between the growing industry demands for specialized expertise and the skills currently available in the job market.
- Objective 2: Develop new technologies and transfer them to industry with the assistance of government agencies in central Macedonia, Greece and surrounding countries that support applied research and technology development for harvesting, storing and distributing the vast renewable energy sources of the area (solar, wind and geothermal).

The second strategic goal is important for the long-term sustainability of the Department and its establishment as a technology hub in the region. In planning for the implementation of this strategic goal, the Department has already established important collaborations with national and international institutions (Academy of Athens, IIMEC, Texas A&M University, Aristotle University of Thessaloniki, Engineering School of Crete, University of Ioannina, Democritus University of Thrace, University of Western Macedonia) and international companies (Alpha Star Co. USA), which will help develop a more international orientation.

It is important that the Department strengthens its continuous efforts to produce high quality relevant applied research to become a recognized technology center. This would require the gradual renewal of the research staff and research laboratories, including state-of-the-art research infrastructure and facilities. There is no doubt that more investment in new faculty members is needed to reach acceptable student/staff ratios.

Recommendation 26

Given that the strategic plan requires the establishment of a postgraduate programme, additional faculty and the necessary technical support staff should be hired and research laboratories should be established to serve this strategic goal of the Department.

Recommendation 27

A restructuring of the research groups within the two Divisions of the Department, enabling a closer collaboration, should be established that would improve the coherence in the Department and the interactions with other international centers of research.

Short and Long Term Objectives

The objectives of the strategic goals are all short-term and mid-term objectives, while the approval by the ministry of education of the establishment of the postgraduate MSc programme is the most urgent short-term objective.

Inhibiting Factors

A key obstacle to the implementation of the Department's plans in order to achieve its goals is the lack of a stable framework for the educational sector in Greece. Among others, indecisiveness regarding the status of TEI and constant deterioration of the academic level of admitted students due to centrally decided admission strategies, are inhibiting factors.

In the middle of the current economic crisis, funding by the Institute's Administration is uncertain at all levels. While the Department is functioning relatively well with available resources, recent budget cuts have not allowed the employment of newly elected faculty members and many temporary technical staff positions have been eliminated.

The rigid centrally guided decisions and budget cuts are the two main inhibiting factors to achieve both goals of the strategic plan. Overcoming of the first factor is beyond the means of the TEI Serres and involves political decisions, while the second inhibiting factor can be overcome by implementing tuition for the postgraduate MSc programme and by promoting strategic partnerships with industry.

Implementation Plan and Actions

- Maintain the physical environment of the campus, quality of classrooms, teaching laboratories, library and other student services.
- Establish research laboratories with state of the art equipment to support the newly proposed postgraduate programme.
- Expand on collaborations to support research infrastructure proposals with other regional technology centers, industry and global partners.
- Appoint new faculty and technical staff to maintain the quality of undergraduate programme and establish the newly proposed postgraduate programme.
- Use resources from industry, sponsors, research and teaching grants and also tuition from the postgraduate programme to improve the support of academic

programmes and research.

- Intensify efforts with the newly re-established Ministry of Macedonia and Northern Greece and of course the ministry of education to secure resources.
- Network with other TEI and universities in for example, Kavala, Thessaloniki and Kozani to more effectively use resources. Establish collaborations with regional universities and technological institutions and reach out globally through conferences and summer schools.
- Reduce the number of incoming students to provide quality education, improve the standards of accepted students and balance the workload of faculty between teaching and research.
- Recruit students for the postgraduate programme following a market analysis and in coordination with industry.
- Provide incentives to faculty for proposal writing efforts to increase funding levels.
- Start planning the technology park with the assistance of the newly elected governing board.
- Establish and implement metrics of success for the Department in terms of achieving its goals.

F. Final Conclusions and recommendations of the EEC

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

The committee, having spent two days in the Department and the TEI and having had discussions in Athens, has reached the following main conclusions:

The Department of Mechanical Engineering has obvious strengths including facilities, high-quality of full-time, part-time teaching and administrative staff, and the full support of the management of the School and the TEI administration. It has a large number of students compared with its capacity and the reduction in the incoming first year students is a positive trend, which is also helping elevating the quality of its students.

The committee believes that the Department is now ready for the next stage in its development, which involves the establishment of an MSc in Renewable Energy Systems. The proposed MSc programme will allow for the completion of advanced studies to a qualified smaller group of students and will enable better integration of teaching and research activities. In addition, note that the Bologna Agreement calls for a three plus two model (a total of five years for the first and second cycle) to graduate qualifications for chartered professional engineers. The four plus one model, possible here (4 undergraduate years plus a 1-year masters programme), can provide this length of study for some of the good TEI graduates and others and hence considered equivalent and appropriate for professional recognition. Resources from industry, tuition, and support from the national government and the European Union should be sought in order to support the proposed MSc Programme and input from industry and academia should be pursued to successfully establish it.

The Department should endeavour to increase the quality of the entry point, i.e. the academic performance of the incoming students. A reasonable way to achieve this is to reduce the number of incoming students. Similarly, good-quality first-degree qualifications should apply for entry to the MSc programme.

The evaluation committee also believes that the TEI administration and the School should strive to reduce the student/staff ratio towards internationally acceptable levels for Mechanical Engineering Departments by appointing more full-time faculty.

The academic curriculum should be streamlined by removing redundancies and re-introducing core courses, also reflecting current strengths of the Department. Also some synergy between the teaching effort/curriculum and research should be established. A record of the research output of staff should be introduced and possibly be extended to a Departmental Research Report.

A formalized process of internal review of teaching practices is not present currently and should be initiated. The Department should ensure that they put in place quality assurance measures as highlighted above in our recommendations.

Good practices and weaknesses in the Department have been identified above in detail in relevant sections and specific recommendations for improvement have been

made.

The Members of the Committee

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