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HELLENIC REPUBLIC
H.Q.A.
HELLENIC QUALITY ASSURANCE AGENCY
FOR HIGHER EDUCATION

EXTERNAL EVALUATION REPORT

DEPARTMENT OF MECHANICAL ENGINEERING OF

TECHNOGICAL EDUCATION INSTITUTE OF CENTRAL GREECE

According to Version 2.0 of the Template

December 2013

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External Evaluation Committee

The Committee responsible for the External Evaluation of the **Department of Mechanical Engineering of the TEI Central Greece,** consisted of the following four (4) expert evaluators drawn from the Registry constituted by the HQA in accordance with Law 3374/2005:

1) ***Dr. Anthimos Georgiadis***, Professor für Prozessmesstechnik und intelligente Systeme Leuphana Universitat Luneburg, Germany/ ***Coordinator***

2) ***Dr. George Vicatos***, - Biomedical, Absorption Refrigeration, Mechanical Engineering University of Cape Town

3) ***Dr. Pantelis Kelires***, Professor - Mechanical Engineering and Materials Science and Engineering Cyprus University of Technology, Cyprus

4) ***Dr. Philip Demokritou***, Associate Professor of Aerosol Physics Harvard University Center for the Environment, USA

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.**

HQA made available to the External Evaluation Committee (the *Committee*) information about the Department of Mechanical Engineering (*DME,* the *Department*) for early preparation of the evaluation. The Internal Evaluation Reports of the Department, (which were provided), covered the period 2009-2013, (the first evaluation was in 2009 with updates in 2010 and 2013). The internal evaluation report of 2013 is the accumulated evaluation of all previous reports. The Committee has carefully considered this report.

The Committee (constituted by Dr. George Vicatos, Dr. Pantelis Kelires, and Dr. Philip Demokritou - Dr. Anthimos Georgiadis joined the Committee later during the evaluation visit) visited DME of the TEI Central Greece (TEICG) from Tuesday 17/12/2013 to Thursday 19/12/2013. Upon arrival at Psachna in Chalkida, on Tuesday 17th December, the Committee

members were met by DME and faculty members.

The Committee met with the Department Chair, Prof. Michalis Vrachopoulos, and the rest of the staff of the Department. The meeting, which was informative, took place at the office of Professor Vrachopoulos. During the meeting the Committee briefly discussed with the Department Chair the visit details and schedule. Later the same evening, the Committee met with the Rector K. Anastasiou, the Vice Rector A. Kontoyiorgos (who is also the chairman of the academic program and the president of the Quality Assurance Unit "MO.DI.P"), other Faculty staff members and staff members of the DME.

During the meeting with the Rector, general issues about governance of the TEICG were raised but not discussed in depth. Professor K. Anastasiou, Rector of TEICG, travels between the two campuses (namely the campus at Chalkida and the campus at Lamia), which are 150 km apart from each other, and one and a half hours for a single trip. The Rector arrived for the introductory meeting and he left soon after. He was not present for any other meeting between the Committee and Departmental staff and it was reported that he was at Lamia.

After the meeting with the Rector and the other Faculty staff members, the Committee reconvened talks with Departmental staff at the office of Professor Vrachopoulos, shaping the procedure of the meetings to follow on Wednesday and Thursday.

During this meeting Professor Vrachopoulos informed the Committee members that the DME of the TEICG has about 2400 students in total with new student registrations increasing constantly every year since 2004. In 2004 the Department had about 1100 students and in 2013 this number had more than doubled. The new student registrations increased from 2004 to 2013 substantially from about 70 to 150 respectively, with an exception in 2010, in which there were about 370 new registrations. It was reported that of these new registrations, an average of 15% enter without exams (these are special cases, such as immigrants); and about 25% have basic knowledge from Technical Lyceums, which is insufficient to follow the courses offered at DME of the TEICG.

The staff members unanimously complained that they are too few teaching staff (only 10 permanent members, 5 technical staff and 5 ad hoc staff members) for such a large number of students, that there are no facilities to house the students and that there are too few laboratory sessions to cover the necessities of the laboratory courses. It was reported that the maximum number of students registered per lab session is 35 to 45. The rest lose a year due to insufficient places at the laboratories.

It was also reported that the staff were distressed by the fact that before 2005, the Department had 20 teaching staff. After the establishment and split away of the Department of Aircraft Technology in 2005, the staff of DME was reduced to 10, and while the Aircraft Technology Department still uses their lab facilities and teaching courses, they do not participate in any of the costs involved.

Professor Vrachopoulos elaborated on the structure of the Department, its Divisions and the academic staff responsible for each Division.

There are two formally declared operational Divisions, namely:

1) Energy (headed by Professor Orfanoudakis)
2) Construction (Headed by Professor Avlonitis)

It also consists of three Directions such as:

1 Construction and Treatment
2 Thermofluids
3 Environment and Renewable Energy

Professor Vrachopoulos introduced the teaching staff in terms of their corresponding teaching activities and laboratories.

On the Energy Division:

- Fluid Dynamics – Professor Vlachakis
- Steam Turbines and Boilers, Fuels, Lubricants – Professor Orfanoudakis
- Refrigeration and Air-conditioning, Heating, Renewable Energy - Professor Vrachopoulos
- Internal Combustion Engines I & II, Gas turbines – Professor Fatsis
- Information Technology – Professor Tsitmidelis

On the Construction Division:

- Quality Control, Production Management, and Desalination - Professor Avlonitis
- Design I & II and Drawing II – Professor Mavromatis
- Metallic Constructions, Strength of Materials – Professor Pavlou
- CNC, Mechanical Technology and Workshop – Professor Kapetanios
- Computerised Drawing (AutoCAD) – Professor Mantas

The meeting ended at about 19:00, which was followed by a welcoming dinner. The dinner on Tuesday night was attended by the Department Chair and members of staff of the DME of the TEICG. Intensive discussions about the situation of the department and its future taken place during this meeting.

According to the presentations, the internal report and the studies program, the Department offers the above courses and laboratories within 7 semesters. The award of the Degree requires the successful completion of 32 compulsory courses and a variety of optional courses depending on the direction of choice of each student and the completion of the student's research project and submission of their report. Lectures and support material for these courses have been reported to be offered as a hard copy distributed to the students and also on-line in the TEICG "eClass" system (however, it has also been reported that due to the merging with the TEI of Lamia, the eClass system is not satisfactorily operational yet).

Lectures for the theoretical part of the Degree programme occur in the lecture theatres (there are two theatres allocated, one large theatre with capacity of 400 seats and one small theatre with capacity of 70 seats). The teaching for the laboratory sessions occurs in the individual

labs which can accommodate between 35 to 70 students. CAD is taught in a specialised lab which is equipped with 35 PCs.

The resource profile of DME is insignificant and there is no budget allocation for the activities of the Department. It has been reported that the DME has received zero (0) funding from the Faculty for the last four years. The Committee has noted the lack of funds for the running expenses in all categories within the Department including teaching consumables (such as, white-board markers, photocopy papers and toners, etc.) and laboratory consumables (such as, gasoline for the gas turbines, petrol for the boiler, etc.) and for necessary repairs (such as, drawing-board equipment). The costs of these necessities, as it has been reported, are covered by the private monies of the academics themselves.

The research output of the Department was presented and it is deemed inadequate. However, there is evidence of significant activity between the staff members and the industrial sector in the vicinity and in the rest of the country. This is more evident in the Energy Division as industry has supported individualised interests.

The Committee had the opportunity to meet with representatives of the students from all years of the Department. It was noted that in spite of the fear that had been reported of other students boycotting those students who had volunteered to be interviewed, about 70 students joined in an informal meeting with the Committee members. The fear, as it was reported, was due to the political orientation of the students, but those who participated in the meeting, claimed that they were independent of any political affiliation. In this meeting the students provided detailed, valuable and totally unanimous feedback to the Committee and contributed to the forming of a better picture of the discrepancies which exist within the Department and TEICG in general. It was impressive that more students joined in the interview once the word went around that the Committee were having an open discussion on any subject concerning the student life at the TEICG. The specific points that were discussed will be covered in the following sections of this report.

Professor Vrachopoulos outlined the Internal Evaluation process, focusing on course evaluation using questionnaires based on the HQA template. The process for the completion of questionnaires was outlined and it was noted that due to the lack of administration infrastructure, the collection of the questionnaires and the capturing of data was done by the individual academic dealing with the specific questionnaire of the course. It was also noted by the Committee members that the evaluation results were kept in files by the individual academic, for future reference and not administered by a central office. The questionnaire completion rate ranges between 20% and 30% of those who attend the course.

The Committee's programme on 18th December started with meetings (in private) with each academic member of DME and discussed their individual activities in the theoretical teaching of their courses. The discussions that took place included information provided by the professors' assistants. The discussion was focused on the teaching method, teaching material and method of examination. A sample of good, medium and bad examination papers was submitted to the Committee and provided valuable additional information on the marking of papers and standard of students.

Professor Anthimos Georgiadis, the fourth member and co-ordinator of the Committee,

joined the final activity on 19th December which included the visit to the laboratories and interviews with the support staff. During the visit to the laboratories, in a similar way, each academic staff member together with their assistant, demonstrated the activities of their labs and also provided information on how their particular interests are linked with the industrial sector. The Committee noted that the majority of the academic staff members had this activity.

The Committee also met with the laboratory support ad hoc staff that as a group aired their concerns about the stagnation of their status, lack of funds to perform the basic duties in the labs, and the substantial extra teaching load which they have due to the number of students and lack of facilities. It was also mentioned that the majority of the lab equipment consists of constructions which are left behind by the graduates after they have finished their projects and obtained their degrees. There is no budget allocation for laboratory equipment.

The last meeting was with the administrative staff consisting of two members. The one is the head of the administration secretaries and is responsible for the registrations of the entire student body of DME except for the labs, (as it has been confirmed that registration for the labs is accomplished at the office of the individual academic). The other administrative member is present only 3 days a week, sharing the departmental duties between the DME at TEICG and the Centre of Renewable Energies (ΚΑΠΕ), in a totally different location from Chalkida. Thus administration is only available for students three days a week and only from 10:00 till 12:00

The Committee noticed that the condition of the building and the facilities is fair. The common places, refectory and cafeteria, lecture theatres and laboratories are clean and adequate for the functions they provide. However, some labs leak rain water due to stagnant water accumulated on the roof of the building.

It has been reported by the students that their campus accommodation is without hot water and they have to bath/shower in cold water even during winter months.

The security of the building is inadequate, as only one security person was seen during the entire duration of the evaluation visit, and this person was not part of the campus control staff.

In closing, the external evaluation visit functioned in a professional and cordial atmosphere and the Committee members are unanimous in expressing their gratitude and appreciation to all the staff and students of the Department for their hospitality, collaboration and help with all aspects of the evaluation visit. The Committee members are also thankful to HQA for the logistical support and co-ordination.

The Committee has considered all aspects of the academic program and functionality of the TEICG as an academic institution, and in spite of the lack of research activities, total lack of funding and poor administration duties, the Department performs an exceptional task in undergraduate teaching supported with strong industrial links. Therefore without hesitation the Committee has recommended an evaluation mark of 3+ (Sufficient Plus) with 1 being Poor and 5 being Excellent. The individual sections of this report substantiate the

observations and recommendations and the reasoning behind the Committee's decision.

II. The Internal Evaluation Procedure

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

The Committee was provided with adequate documentation on all relevant aspects of the Department's operations, and with a copy of the Department's most recent Internal Evaluation Report that was thorough, detailed, comprehensive, and informative.
The internal Committee (OMEA) responsible for preparing the Internal Evaluation Report had performed a good job in collecting the available data, organizing it in useful forms for the External Evaluation Committee, and summarily presenting it.

A. Curriculum

Undergraduate curriculum

APPROACH and IMPLEMENTATION

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

This is a new study programme supported by a range of teaching laboratories. The programme aims at teaching students about problems and challenges faced by manufacturing companies, engineering consultants and the service sector in relation, among others, to the utilisation and management of mechanical engineering systems; it is expected that DME students will become the graduate engineers able to assist them in this matter. The Internal Evaluation Report provided by the Department and the visit, showed that goals and objectives of the Curriculum need to be better defined in order to assist students, especially at earlier years, and other stakeholders of the Department to better understand them.

The objectives and structure of the curriculum follows that of similar programmes in the country.

It is expected that the curriculum will enable students to learn how to manage the

development, analysis and service tasks independently. As graduates of a cross-disciplinary programme, they will also gain a special competence sought after by many employers (especially small and medium size enterprises (SMEs), that dominate in the region and country in general), and the ability to bridge gaps and co-operate with people from many different academic as well as professional fields. Although the curriculum offers 55 modules covering certain aspects of engineering and production, providing a fairly good choice to the student, the current number of 10 faculty members of staff, supported by 4 technical officers and 5 ad hock collaborators, appears to be small to deliver and adequately support the programme, maintaining the standards expected of tertiary education, given the large number of enrolled students (currently reaching 2500) and the suggested additions/improvements to the curriculum (see below).

It is important for the Department to continuously update and renew the curriculum taking into account recent developments in the field and considering the views of students and industrial partners, and this is an area they need to considerably strengthen. For example, among other improvements to be listed in detail below, additional core, thermodynamics, materials, robotics, manufacturing and elective courses should be included in the curriculum to make it more modern and expand its relation with industry. Satisfactory procedures do exist for revising the curriculum although this is not entirely clear from the Department's Internal Evaluation Report. A teaching committee chaired by a senior academic and consisting of members from the various teaching themes, including student representatives, that regularly meet could make the process more efficient, reliable and accountable.

It seems that there are certain problems with the delivery of such a programme with an extensive number of modules, 55 in total, including several laboratory courses. As reported by the students, the most serious one is the inability of the Department to enroll all eligible students to some laboratory courses, due to the large number of students and limited space available. This may delay the enrollment of some students for even a whole year. As reported by the academic staff, this issue was alleviated by introducing more students per lab session and also by increasing the lab sessions.

From the data provided and the available information it appears that the curriculum followed is comparable to that of equivalent institutions with a similar student intake. The structure of the curriculum is fairly satisfactory; however, as noted above, certain improvements can be made to modernize the curriculum and give more background education to the students. Overall, the curriculum structure appears coherent and functional, although the large ratio of students to teaching staff (250:1) is out of proportion. This has evidently an effect on curriculum delivery and student support.

It is essential, for the students' benefit and for maintaining academic standards, to create a Teaching Committee and appoint Year Tutors, under the guidance of a Director of Studies or Senior Academic Tutor. Moreover, an external academic examiner from an equivalent academic institution could ensure maintaining consistency and standards.

The existing staff (10 permanent academics, 5 ad hock members and 5 technical support members of staff for an annual intake of 150 students) is appropriately qualified and well

trained. The Committee felt that there was a satisfactory level of commitment from the Department's staff to contribute towards the improvement of all aspects of the Department's teaching and learning activities and achieve the successful delivery of the curriculum, although better tutoring and closer supervision of the students is desirable.

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?**

Predefined goals and objectives are achievable, although new staff appointments at mainly the academic level would improve considerably the student experience, learning and training. This will also result in a better working environment for all.

Investment in new appointments (appropriate for the defined student intake) and better use of available resources can lead to improvements of the curriculum and the delivery of such a cross-disciplinary programme.

Many of the issues raised in this report have been identified by the Department's leadership and staff. Despite the difficulties, serious efforts are being made by faculty members, technical and administration staff to deliver the curriculum in a satisfactory manner, without affecting student experience.

IMPROVEMENT

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

The internal evaluation document doesn't provide sufficient awareness of issues related to curriculum and student experience. During the visit of the Committee these issues have been discussed with the academic staff. The following suggestions may help in improving the situation.

<u>Academic Level - Introduction of the following roles and Committees</u>

Roles: (i) Director of Studies who will be responsible for the management of the delivery of the undergraduate Programme of Studies; (ii) Academic Year Tutors, who will oversee all teaching and learning activities within each year of study and be the first points of contact for the students; (iii) bench marking with other sister departments.

Committees: (i) Teaching Committee, which will be chaired by the Director of Studies and will comprise the Academic Year Tutors and additional faculty members, with its aim being the structuring and overseeing of the teaching and learning process; (ii) Student & Staff Committee, which will comprise members of the Teaching Committee and student representatives from each year of study and its aim will be to improve the collaboration and coordination between faculty members and students in order to promote best practice and

account for the students' needs and requirements.

Administration & Support Level:

Some of the following suggested administration and technical staff could be provided at School level that the Department would benefit:

Undergraduate Student Experience Officer to manage the induction process and materials for new undergraduate students and ERASMUS students; *Information Technology Administrator* to manage all IT procurement needs, provide technical guidance to staff and students, provide technical support for IT systems and software, undertake IT training support for staff as required and manage internal communications IT development and support; *Programming Support Officer* who will assist the IT administrator to provide support for teaching technologies procurement and implementation, manage data back up and provide support for web developments; *Experimental Officer* to ensure the implementation of Health and Safety guidelines.

Additional specific recommendations are listed below:

Recommendation A1*: An explicit document showing how the curricular objectives are 'translated' into competency-based learning goals, and those in turn clustered into courses serving a meaningful whole is missing and is advisable.* These can be accomplished by a comprehensive ***Study Guide.***

Recommendation A2: *The core part of the curriculum needs improvement. The two courses in Mathematics seem quite ambitious in their description, but it is doubtful that are fully implemented, both in theory and in the laboratory (e.g., practising with Mathematica). No statistics is included. The Physics course is too condensed and should be split in two courses. One containing Mechanics and Waves and the other containing Electromagnetism and Optics. Also, the course in Thermodynamics can be split in two. One with the proper emphasis on the basics and the other as Applied Thermodynamics.*

Recommendation A3: *All modern ME curricula include courses (and even directions) in materials science and engineering. The present curriculum is poor in this respect. The Committee suggests the inclusion of a course covering all main types of Materials, examining their structure, mechanical, electrochemical and thermal properties and methods of synthesis and treatment, with more emphasis on materials used in applications relevant to the department. Also, the course and the related laboratory "Mechanics of Materials (Αντοχή Υλικών)" could be expanded to include, besides mechanical testing, measures of other material properties.*

Recommendation A4: *A number of other ME courses are considered by the Committee very important and should be included in the curriculum either as electives (see below) or as core courses. These are: (i) Automatic control & Robotics, (ii) Manufacturing, (iii) Micromechanical/Nanomechanical Systems (MEMS/NEMS), (iv) Mechatronics. Of course, this necessitates the creation of new laboratories and the appointment of new faculty members.*

Recommendation A5*: There are no elective courses in the curriculum. The Committee suggests its restructuring so as to include such courses in the fifth semester and beyond. This class may include some of the additional courses suggested above. These additions will make the curriculum richer and broader, and not too narrow within the two divisions*

(Energy and Construction) of the Department.

Recommendation A6*: There are no prerequisites for the courses in the curriculum, although there is a pyramidal structure between subsequent semesters. The Committee thinks that some minimum, completely necessary prerequisites should be utilized, for the benefit of the students, the quality of the programme, and for better control of the size of classes.*

Postgraduate curriculum

The department does not offer a postgraduate programme. A proposal is in existence but the Committee would like to stress that launching such a programme will further increase the teaching load of staff, at a moment that there is staff shortage. Also, it will necessitate the massive involvement of external teaching stuff, since many advanced topics in such a postgraduate curriculum cannot be taught by the present stuff.

Recommendation A7: The Committee recommends that the department should explore the possibility of establishing postgraduate program in collaboration with other departments within TEICG and/or with other institutions.

B.1 Teaching—Undergraduate level

APPROACH

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

- **Teaching staff/ student ratio**
- **Teaching methods used**

Staff/Student ratio

It has been reported by the teaching staff that there are about 2400 students at DME and there are about 150 new registrations every year. These numbers are modest if compared to the corresponding numbers recorded in the internal evaluation report. The records of 2013 indicate 3060 registrations in total and 208 new registrations respectively. However, it was understood that by these numbers, the teaching staff had tried to demonstrate and emphasise the flawed staff/student ratio at DME, rather than give actual numbers. Considering that the staff comprises of 10 academic staff members, 5 lab assistants and 5 supporting ad hoc, the staff/student ratio is totally unrealistic, unacceptable and unhealthy ranging from 1:150 and 1:300 (either taking into account all staff or only the teaching academic staff respectively). It was established that in actuality this ratio is less, because of the poor attendance which usually drops to about 25% of the registered students per semester. Unanimously the academic staff reported that although attendance is not compulsory for the theoretical part of their courses, attendance is compulsory in all practical and laboratory sessions.

Teaching venues

The Committee acknowledged that the DME of the TEICG is a teaching institution focussing the majority of its activities on the basic education of its students.
There are two lecture theatres housed in the building of the TEICG, one seating 400 students in an amphitheatric arrangement and the other, seating 80 students in flat surface rows and columns arrangement. They are both deemed adequate for the purpose

of teaching, equipped with boards and the possible use of projectors. Also it was apparent that both theatres were well ventilated and provided visible indications to safety exits.
With the exception of CAD teaching, which is taught in a specialised lab equipped with 35 PCs, teaching also occurs in individual labs which are equipped with white-boards and if deemed necessary, with overhead projectors and digital projectors.

Quality of teaching

The Committee visited each academic staff member in the DME, in order to assess the quality of teaching.
This task was spread over two days, i.e., on Wednesday 18th Dec the teaching of the theoretical part of the course was assessed and on the 19th Dec, the practical component was assessed, together with the laboratory facilities. Dr. Anthimos Georgiadis, the fourth member of the Committee, joined in on the last day of the evaluation.

The Committee focussed on the following pattern of assessment:

1. Teaching material and accessibility
2. Quality of teaching (including students' evaluation reports)
3. Evaluation of students' knowledge in the form of:
    a. Best mark in written test/exam
    b. Middle class mark in written test/exam
    c. Poor/bad mark in written test/exam
4. Feedback to the students after the test/exam

The Committee acknowledges that all of the 10 academics have comprehensive material available to the students, either in written notes or the academic's published textbook, which is made available to the students free of charge. Notes have been seen and they are invariably (those who give written notes) typed and well presented. The same notes are also available digitally via the eClass system, although, as it will be reported later, the students have a different opinion. It has been reported by the individual academics and also by the chair of the DME that all text books are also available through the DME's library, but this has not been established due to time limitations during the External Evaluation by the Committee.

Recommendation B1:

Until the eClass system is well established and in a working order continuously, the central administration must provide a solution for all students to have access to teaching material, as well as other information pertinent to the students' affairs.

Quality assessment

Each academic had made available for viewing the questionnaire for quality assessment of their teaching. This has taken the Committee by surprise as the collected questionnaires, filled in by the students, were in the possession of the academic staff and not of the central administration of the DME. However, each academic staff member had prepared the statistical representation of the teaching quality assessment and this showed a satisfactory distribution, although the assessment was from a rather small group of students compared to the size of the class. This quality assessment has been in progress for every subject since 2002 for the entire DME, but due to serious shortages in both staff and administrative assistance, it has been reported that there is no one else to collect, collate and assess the quality assessments, except for the academic staff members themselves.

Please refer later to the students' interview for further assessment on this particular issue.

Recommendation B2:

Until the questionnaire for quality assurance is established electronically, the academics must not collect nor have any access to the students' assessments. These assessments must be processed by an independent administrator and be kept in the Department's records for reference and action. The academic members should only know the results of this process, presented to them in a written report by the chair of the Department.

Marking of exam scripts

The Committee had the opportunity to view three reports selected at random from the returned scripts of exam questions. It was noticed by the Committee that, apart from one academic, no correction markings appeared whatsoever on the scripts, giving the impression that the mark allocated was "just a gut feeling". However, it became also apparent that the marks given were justifiably correct on all evaluated scripts, and the academic members were available to discuss the mark given when challenged by the student. It was reported that no student left such a feedback discussion thinking that the script had been improperly marked.

Recommendation B3:

The Committee feels that scripts should have clear indications where the student has gone wrong in answering the exam/test questions. There must also be a sample solution (rubric) against which the exam is marked and assessed. This will avoid problems associated with an uneven marking structure. The sample solution must be available to the students for revision purposes.

- **Teacher/student collaboration**
- **Adequacy of means and resources**

Teacher/student collaboration

It is reported that every effort is being made to establish a good relationship between the teaching staff and the students. Of those students who follow the lectures, there is a portion that asks for further assistance. Due to the number of students and the limited free time that the teaching staff have available during the day (if any), it is almost impossible to provide this extra service, although some try their best to do so. Please refer later to the students' interview for further assessment on this particular issue.

It has also been reported by both the academic and support staff that there is a good collaboration with the students especially during their 7th semester. Academics invariably assist the students to find adequate projects and links with the industrial sector which eventually become job availabilities for the students after graduation. It is felt by the Committee, as it was also reported by the staff, that this is one of the paramount functions of the DME of the TEICG, i.e. to provide jobs for the graduates and to supply Industry with immediate employees, knowledgeable in the functions of the particular industrial sector.

All projects considered for the 7th semester students, pass through a committee of departmental staff members and are evaluated for their efficacy.

Recommendation B4:

The Committee feels that the academics and supporting staff must provide a set time during the week in which students, by appointment, can ask questions pertinent to their

courses and other departmental functions.

Resources

The Committee has been made aware of the fact that due to no funding whatsoever being available for the last 4 years, the teaching staff uses their own private monies to purchase important teaching consumables, such as white-board markers, paper and toner for photocopies, gasoline and petrol and heavy oil for the gas-turbines, internal combustion reciprocating engines and boiler burners respectively. Important repairs to lab equipment are also channelled through the individual academic's family monies, such as lab experimental equipment, drawing board precision perpendicular rulers, cutting tools for the manufacturing machines, lubricants for the same etc. The Committee was, however, surprised that in spite of the "no-budget" situation, all labs were well equipped, clean and functional, and as it was reported by staff and confirmed also by students, no classes or labs were omitted due to lack of equipment or consumables.

It was acknowledged by the Committee that specialised lab-equipment, was built by students during their final year project (διπλωματική) and was left behind for the benefit of furbishing the labs for future classes. This was evident in all labs at the DME.

During the same meeting, it was reported by the chair of DME, Professor Vrachopoulos and also by Professor Vlachakis, that any allocated budget goes to the Central Administration of TEICG and it does not reach the DME. They sometimes have the impression that resources are spent for wrong priorities or are not effective.

Recommendation B5:

The DME must be represented during Faculty or Central Administration meetings when budget allocations are discussed. This representation must include the Chair and two senior academics of the DME who have the vote and can influence the decision of the Central Administration.

- **Use of information technologies**
- **Examination system**

Library and IT

Regrettably, the Committee was unable to visit other centrally supported services such as the library and IT facilities and therefore has not formed an opinion on its availability and efficacy of service. However, it has been reported that course material and notes are available on the eClass system, but also that it is not efficient yet. Students are unable to have access to the system.

Examination

It has been reported that each theoretical course has a final 2-hour written examination and also depending on the individual academic, there is a progress test. One academic, sets an exam at the end of each semester and also weekly class examples. Each experimental lab project is examined by submission of a lab report. In addition, depending on each academic staff member, there is also an oral test. In the seventh semester, each student selects a topic either from an existing pool, or together with an academic, a topic suggested by industry. The Degree is given after the student has passed all the exams for the theoretical courses, as well as all laboratory exams and has submitted a successful project report (διπλωματική).

To the question about cheating in the exams, it was categorically stated by the teaching staff, that such behaviour is not tolerated. The academic staff member reports the incidence and invariably the student is excluded from writing exams for a number of examination periods, or permanently, depending on the seriousness of the offence.

STUDENTS' INTERVIEW

The Committee had the opportunity of interviewing students at random and asking them sporadic questions about their lives in general at TEICG. It also asked them to form a large group and attend a more formal interview where they could air their opinions.

About 70 students were gathered voluntarily in one of the labs; they were concerned about the quality of teaching at DME. They were particularly concerned that although they submit teaching quality assessment reports year after year, there has still been no improvement of lab facilities, accessibility to the eClass system, teaching facilities, tutorial classes, better system in approaching the teachers, better system in registering for the labs (it costs them a year if they are not able to register, because it is a first-come first-served system for a limited number of seats), better administration facility to service students more frequently than only 3 days per week and only for 2 hours on those days, better housing facilities, such as hot water availability in the residence buildings of the TEICG.
It became apparent to the Committee that the students had a different opinion to what the academic staff had expressed on the staff/student quality assessment. On this particular point the students expressed that 40% of the academic staff do not care about their teaching capability, or about students' concerns in general, and that they are unapproachable. The Committee made sure that this interview remained anonymous and took note on the issues raised.

Recommendation B6:

The Committee is aware that many of the students' concerns stem from the lack of funds in the Department. However, the Chair and senior academic staff must meet with students' representatives every year and resolve academic issues within the Department. Every year a report for such reconciliation meetings is to be kept in the records of the Department and be made available to the External Examination Committee during the next Quality Assurance Assessment. A copy of these yearly reports is to be sent to the students' representatives.

IMPLEMENTATION

- **Quality of teaching procedures**
- **Quality and adequacy of teaching materials and resources.**
- **Quality of course material. Is it brought up to date?**
- **Linking of research with teaching**
- **Mobility of academic staff and students**
- **Evaluation by the students of (a) the teaching and (b) the course content and study material/resources**

In the opinion of the Committee, the Department promotes good teaching ethics and practice via the following mechanisms:

- Printed course notes and books are made available to students. The books are written by the academics themselves, are of reasonably good quality, and cover material for the needs of the DME. Some of the books are of University standard and could be used as references or teaching material in other Universities in the country.
- Tests/exams/oral tests and lab reports provide a good structure for examining the students' knowledge.
- Academic staff interests attract industrial projects which are directed towards student projects.
- Academic staffs are dedicated to the task of preparing the students for an immediate

job settlement in the industrial sector and also provide a platform for further education at a University level for students that excel at TEICG.
- There is a continuous teaching evaluation by the students

RESULTS

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

The overall performance of the Department in terms of teaching theoretical and applied courses is satisfactory, as described in the previous section, and is provided by dedicated academic and support staff.

IMPROVEMENT

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

The DME, as a group of all its staff members, is aware of the difficulties which all stem from the total lack of funding in the department.

Every year there is an application for monetary support.

The Committee's Recommendations are to be obeyed and implemented.

B.2 Teaching—Postgraduate and doctoral levels

Postgraduate studies have not started at DME as yet.

Doctoral program – This is not existent at DME of the TEICG

C. Research

APPROACH

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

The Committee acknowledges the fact that research is not the main activity of the Department which focuses primarily on carrying out its multifaceted educational programs. The research activities carried out within the Department relate to the individual activities of its faculty members at multiple levels and in very diverse areas. Based on the information provided by the Department, only 50% of the faculty have been actively involved in research. Summarising these activities and taking into account the lack of post graduate programs and graduate level students in the Department and the status of research infrastructure in general, the Committee considers that research in the Department is at fairly satisfactory

level.

There have been a few competitively funded national projects involving collaborations with other Greek Universities and a number of industrial contracts provided by the domestic public and private sectors. Mainly undergraduate students (through diploma projects) are involved in the research projects, something that the Committee considers as good practice. It is also worth noting that the faculty have developed over the years strong ties with regional industries and private sector, which is a very positive element for further research development. On the other hand, it is noted that there are limited interactions and networking with faculty from national and international Universities which is an important element in developing the necessary research ethos and culture within the Department. As a result, there is limited participation in Cooperative research within the frame of European and National projects

According to the information provided by the department and the discussions with individual faculty, the Department has no strategic plan in place for research improvement. The Committee also feels that the faculty have no clear understanding in terms of Department's research directions and priorities. It has become apparent that the majority of junior faculty and some of senior faculty are keen in improving their research activities. It is worth noting that for the case of junior faculty, research output and results are built into the process of tenure and promotion of individual junior faculty members.

It was also conveyed to the Committee that the two main priorities of the Department are: a)recruit new faculty members in order to improve the quality of teaching and research; b) the establishment of postgraduate programs. At this moment, most of the existing laboratories are equipped primarily for teaching activities and the research infrastructure both at Department and University level is not adequate to pursuit research activities. There is also no evidence of coordination among faculty both within the department and across the university, an important element in establishing multidisciplinary, cooperative research activities.

Recommendation C1:

The Committee recommends that the Department should formally define its research strategy to provide clarity to its members in terms of its research direction and priorities. The Department could introduce means and measures to explore appropriated strategies using also external experts.

According to the information provided to the Committee, the Department does not appear to have a formal policy or standards in terms of the evaluation of internally conducted research. However, it can be argued that the Departmental policy in terms of research evaluation can be directly inferred from the Departmental practice and requirements in terms of publishing papers in international Journals and other peer-reviewed Conferences and Symposia. Indeed, the Internal Evaluation Report includes evidence that some research laboratories are internationally recognized due to their research activities, publications and citations. Further, from the CVs of the faculty staff there is evidence that some faculty members are well respected internationally by their peers. There is also an assessment of research output

and results built into the process of tenure and promotion of individual faculty members.

The Committee also believes that the Department needs to establish a long term strategic plan for research development. Emphasis should be given to: a) the improvement of the Department's internal collaborations within its existing laboratories; b) Networking with other Universities at National and European level; c) outreach activities to engage public sector and industry at regional level; d) infrastructure improvement for existing laboratories

Recommendation C2:

The Committee recommends the establishment of an Annual Activity Report of the Department and the creation of internal research evaluation benchmarks and the identification and dissemination of best practice. Ideally, this should include the peer review of research processes and outputs in order to establish a shared understanding of research impact and quality.

IMPLEMENTATION

- **How does the Department promote and support research?**
- **Quality and adequacy of research infrastructure and support.**
- **Scientific publications.**
- **Research projects.**
- **Research collaborations.**

In the opinion of the Committee, the Department promotes research primarily via the following mechanisms:

(i) The operation of the Research Laboratories

(ii) The creation of an inclusive research ethos within the Department that involves faculty, and students.

(iii) Cooperative research within the frame of European and National projects.

The Committee notes a significant lack of dedicated staff for research support in almost all operating laboratories. In some cases, a laboratory cannot operate because of lack of suitably qualified personnel and graduate level students.

Recommendation C3:

The recommendation of the Committee is that the Department would need to improve the equipment/instrumentation levels in all existing research laboratories in order to reach the state of the art level and gradually to ensure that all laboratories are equipped to initiate research activities.

From the information provided by the Department, the Committee considers that, in general terms, the research equipment is variable across the various research laboratories and it is not suitable for research. With the exception of one or two laboratories, most laboratories have not reached a critical mass point both in terms of stuff and instrumentation/infrastructure that allows them to generate independently funded research.

The Department is active in terms of publications with an average of one Journal paper/ refereed Conference paper per member of faculty, per annum. These are fairly low

publication figures, and include papers with multiple faculty members as authors and are primarily the result of collaborations with principal investigators from other universities .

Based on the information provided by the Department, four R&D projects have been performed or are active in the Department during the period (2004 -2013). Additionally, nine projects have been performed in collaboration with industry. The average budget per project is low for the size of the department. The number of competitive EU projects are limited and belong mainly to the area of renewable energy. There is no evidence of planning applications in terms of establishing a more stable acquisition of R&D income and ensure international visibility in selected fields. Very few members of the faculty are aware of the on-going Horizon 2020 activities.

In terms of research collaborations, the Department appears to have a number of active collaborations with Universities primarily from inside Greece. The Committee notes that the level of collaboration with industry is well developed and many faculty members appear to have strong ties with regional industry and public sector.

RESULTS

- **How successfully were the Department's research objectives implemented?**
- **Scientific publications.**
- **Research projects.**
- **Research collaborations.**
- **Efficacy of research work. Applied results. Patents etc.**
- **Is the Department's research acknowledged and visible outside the Department? Rewards and awards.**

The overall performance of the Department in terms of applied research and technological applications is satisfactory as described in the previous section. In addition to the aforementioned comments, the research projects undertaken in the Department involve external research partners, including other EU countries but there is no evidence of stable cooperation outside the funded projects (such as networks, concerted actions, planned research applications. etc.).

***Recommendation C4**:*

The Committee notes that the faculty members' level of participation to professional organisations that is relevant to the Department's objectives and its international visibility is not as well developed and the Committee recommends improving participation of faculty staff to relevant organisations and international conferences in order to establish stable networks in their filed.

IMPROVEMENT

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

While the level of research is satisfactory in terms of quality and quantity for some faculty, especially considering the lack of post graduate programs/students, the Committee notes that several faculty have very limited involvement in research activities. It is worth noting

that several faculty members have produced well-cited publications. However, the Committee also notes that research in the Department is spread across the activities of each faculty member, covering a large number of topics with little synergy in research activities between laboratories and/or faculty members. This behaviour hinders reaching the critical mass of staff and resources required to deliver outstanding research.

Recommendation C5:

The Committee strongly recommends that the Department identifies a small number (three to four) of major research topics and focuses its research in order to combine resources, enhance collaboration and deliver research excellence.

D. All Other Services

APPROACH

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

The Department is taking initiatives, within the constraints of the centralized procedures of the institution to maintain and improve services to the academic and student communities. The Department`s head with two secretaries (one of them shared with another department and the support of an ad hoc person is an energetic group of four individuals, who work as a team, and try to fulfill the required duties even during the occasional justified absence of one of the team members, so as not to unduly delay administrative processes at departments level. There is dedicated technical supporting team, which fulfills the needs of the teaching laboratories and it helps to foster the relations to the industry.

The Department administrative team is using the electronic documentation so far but further improvement is needed e.g. the registration of students to the laboratories and the organization of the teaching evaluation and reliable operation of the library system and the eClass services..

The Department administrative team and most faculty members maintain an open-door policy to the student body as far as possible, trying to enhance enhancing the quality of the academic environment and faculty-student interaction. A number of the faculty members and other staff are living in Athens, reducing their accessibility for the students. Many students are able to draw topics for their diploma thesis from industrial problems generated through faculty assistance. The involvement of students in the affairs of the Department needs improvement and consequently the student presence, which is satisfactory, could be improved. There is no evidence of a strategy to increase students presence in the Campus.

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.).

The administrative team of the Department operates well so far and is organized with efficiency to carry out its duties. A large part of this work is performing by an ad hoc person. The committee suggests integrating this person permanently into the department's administration. No other changes are suggested on this front.

Academic services and infrastructure for the students need some enhancement as for example access to digital libraries of major journals (eg. of IEEE, ASME, SME etc.) and these ought to be implemented at the level of TEICG, or even on a country-wide level, to allow better negotiated rates.

Support of the electronic network within the TEICG needs first integration and second enhancement to allow its continuous operation; this is an issue to be addressed at a University level. Student counselling needs improvement at the location of Chalkida.

RESULTS

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

The administrative services of the Department are satisfactory over all. The infrastructure including buildings and implementation of communication technologies need improvement. The involvement of the different statuses of Departments members and the students has to be established. According to the internal evaluation and the in situ evaluation the Department is aware of the needed improvements.

IMPROVEMENTS

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

The Department is interested in improving and strengthening these services. The administrative and technical group of staff has a positive and forward-looking attitude to achieve improvements. This team spirit is a particular strength and should be nourished and maintained developing dedicated plans for improvement. Electronic documentation should be enhanced and would further streamline the administrative load. There are no initiatives yet mainly because of the merging difficulties and the overall economical situation.

Collaboration with social, cultural and production organizations

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

Efforts by many Department faculty members to involve students with industrial projects are based on personal initiatives and connections bringing temporal solutions. The DME should make it a priority to educate engineering students who, by the very nature of their education and profession, should be systematically exposed to industrial projects. This would enhance student learning and motivation, lead to a more peaceful and effective academic environment, and would also increase the professional career opportunities of the graduates. The Department should establish more sustainable networking with industrial partners.

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

- **Potential inhibiting factors at State, Institutional and Departmental level, and proposals on ways to overcome them.**
- **Short-, medium- and long-term goals.**
- **Plan and actions for improvement by the Department/Academic Unit**
- **Long-term actions proposed by the Department.**

The External Evaluation Committee consider to have enough information for a picture about the strategic planning, perspectives for improvement and dealing with potential inhibiting factors, after studying the self-evaluation report of the DME at TEICG, listen to presentations by the Department Chair and its faculty members, and held interviews with the departmental administrative and technical staff as well with a large group of students. Alumni representatives have not been present.

By way of introduction, the TEI Central Greece has been established this year merging the TEI Chalkidas and the TEI Lamias. The merging process is in the very first phase and it influences the Department significantly in operation and definition of its identity. Also the coexistence with the department of aircraft technologies seems to cause irritations. However, the Department leadership, faculty members and other stakeholders have for some time transitioned to a common understanding that the central focus of the Department is in the area of mechanical engineering connecting the technology with the industry.

At the state level, the economic hardship that Greece faces in connection with the merging process has had as consequence the reduction of the Governmental financial support from that envisioned in the foundational legal framework. Difficulties caused of the low or not structured finances appear within the operation of teaching laboratories not having consumables to t run the experimental exercises (fuel for engines).

At the institutional level, a significant factor is the insufficient coordination in the use of resources within the School of Technological Applications (STEF), including the common use of laboratories and human resources with the department of aircraft technologies. Difficulties of building a team spirit along the department have been mentioned. Further malfunctions appear in the e-class system and administrative exchange between department and main administration of the TEI.

Aims of the DME include: (1) Establishment of a postgraduate program curriculum alone or with collaboration with other institutions. (2) Improvement of the collaboration among production engineering departments especially with the aircraft technologies department. (3) The reinforcement of the departmental staff in the short and the medium term.

An important immediate action for improvement by the Department is the strengthening of applied research and technology applications especially in the area of renewable energies.

Long-term actions for improvement proposed by the Department include: (1) Maintain a team spirit between all staff and enhance the accessibility of all students to all faculty members. (2) Dissemination activities towards increasing visibility and contacts of department with the main stakeholders, including students, alumni, industry and professional societies. (3) Effective bi-directional communication of the Department with alumni and industry to establish its long-term relevance to the region and the country.

Summary recommendations of the evaluation Committee:

Recommendation E1:

In the short-term horizon, a process for the better and interlinked management of existing laboratories (fundamental courses, teaching labs) and supporting personnel staff available within all the Departments of the School of Technology Applications) should be introduced, promoting cooperation among Departments and the Dean of STEF, with the involvement of the Rector's office.

Recommendation E2:

In the short-term, the enforcement and practical support of industry internships for undergraduate students needs to be considered as a priority action.

Recommendation E3:

In the medium term, the Department needs to establish a process of internal evaluation, so as to become ready for the accreditation process by HQA with suitable interactions with the sister Departments at other TEI of the country and understanding the best practices of other TEI with similar departments, internationally.

Recommendation E4:

In a longer term, greater integration in the instruction of early fundamental subjects within the first 1-2 years of undergraduate study within the STEF would enhance quality and provide available resources for other initiatives without significant new budget allowances.

Recommendation E5:

In the longer term, the Department needs to establish its unique signature regarding its applied research, education and industry outreach, in order to acquire and maintain an edge in the increasingly competitive academic environment within the country and the EU.

F. Final Conclusions and recommendations of the EEC

Conclusions and recommendations of the EEC (Committee) 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 evaluation of the DME at TEI of Central Greece took place during a very difficult time for the country as a whole, with obvious resource constraints arising from the financial crisis. The Committee understands that the operating and equipment budgets of the Department have been drastically reduced. In this particular case, it was reported to the Committee that the Department was given zero budgets by the central administration for the last four consecutive years with major implications on both its operational functions and implementation of educational programs. Another pressing issue is the presence of only one and a half administrative staff for the entire Department that poses obvious difficulties in managing the related administrative functions of the Department. The observations and conclusions of this Evaluation should be seen in this light.

Overall, the Committee considers that the Department is doing a satisfactory job in terms of carrying out its core tasks, teaching and applied research. The separation of the department of aircraft technologies and the merging of the two TEIs are causing additional difficulties yet. DME staff is generally well motivated across functional roles, the number of the students is high but their quality seems to be low. However, the Department plays an important role educating engineers successfully for the Greek SMEs. There is a direct and vitally important role that the DME can play in the sustainable following of technological innovation for regional and national development and growth, assisting both SMEs and larger companies in implementing new technologies.

The Committee has made numerous recommendations in the previous sections above. All these would need to be considered by the Department. Herein, the Committee wishes to restate and stress a selected number of key recommendations as follows:

Recommendation F1:

In the short-term horizon, a process for the better merging of the institutions and interlinked management of existing laboratories (fundamental courses, teaching labs) and supporting personnel staff available within all the Departments of the School of Technology Applications) should be introduced, promoting cooperation among Departments and the Dean of TEICG.

Recommendation F2:

The Department would need to be pro-active in the identification and implementation of improvements and best practice in all aspects of its operation. It is fair to say that many improvements can be done without incurring any direct cost and this has to be a priority for the leadership of the Department in collaboration with other departments (aircraft technologies, computing) and the dean office.

For instance, the re-organisation of the way staff are dealing with the delivery of the curriculum and the better communication of the curriculum to the students are two typical examples that will deliver direct benefits in terms of the teaching and learning quality without incurring direct costs.

Recommendation F3*: An explicit document showing how the curricular objectives are 'translated' into competency-based learning goals, and those in turn clustered into courses serving a meaningful whole is missing and is advisable*.

The Department's Internal Evaluation Report does not indicate the existence of an annually updated **Study Guide** that provides such information for all years.

This recommendation has been mentioned also in part A but it is an important one.

The courses during the first two years would need to be understood as providing the broad based engineering foundation and after that point the courses would need to be codified and clustered into three thematic streams that correspond to the planned Divisions. The streams would need to be developed in such a manner that a core competency is created based on the combination of several courses, and this would need to be defined and explained to the students.

Also the next recommendation is a repetition from part A (there A7).

Recommendation F4: The Committee recommends that the department should explore the possibility of establishing postgraduate program in collaboration with other departments within TEICG and/or with other institutions.

A common postgraduate programme with the aircraft technologies could be possible without losing the identity of the Department is an essential way to instil pride in its staff and students and increase their motivation to progress.

From part B the committee set priorities on the following recommendations:

Recommendation B1.1:

The Department must make efforts to improve student class attendance and participation. This can be achieved by changing the student advising process but more importantly by changing the testing and course examination system. A continuous assessment element can be an effective method to enforce not only participation in lectures but also improve the quality of the educational and examination process.

Recommendation B4:

The Committee feels that the academics and supporting staff must provide a set time during the week that students, by appointment, can ask questions pertinent to their courses and other departmental functions.

Recommendation F5: *The Committee recommends that the Department should formally define its research strategy to provide clarity to its members in terms of its research direction and priorities. The Department could introduce means and measures to explore appropriated strategies using also external experts.*

The strategy should include the prioritisation of topics and possible investment and should combine considerations such as contributions in terms of publications in high quality journals, the creation of patents and the track record of research income generation. Participation to national and international (EU) applied research projects has to an other subject.

Recommendation F6:

In the medium term, the Department needs to improve the process of internal evaluation, so as to become ready for the accreditation process by HQA with suitable interactions with the sister Departments in Greece and understanding the best practices of other similar Departments also internationally.

This is vitally important in order for the Department to maintain its place in the national framework of technical education, technology and applied research in this area.