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

EXTERNAL EVALUATION REPORT

TECHNOLOGICAL EDUCATIONAL INSTITUTION OF CRETE

DEPARTMENT OF MECHANICAL ENGINEERING

November 2008

External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Mechanical Engineering of the Technological Educational Institution of Crete consisted of the following five (5) expert evaluators drawn from the Registry constituted by HQAA in accordance with Law 3374/2005:

1. Georgios Vatistas (Chairman)

   Professor

   Concordia University, Canada

2. Paul Maropoulos

   Professor

   University of Bath, UK

3. Tassos Karayiannis

   Professor

   Brunel University, UK

4. Fokion Egolfopoulos

   Professor

   University of Southern California at Los Angeles, USA

5. Dimitrios Kyritsis

   Associate Professor

   University of Illinois, Urbana-Champaign, USA

The structure of the "Format" proposed for the External Evaluation Report is dictated by the requirements of Law 3374/2005 and corresponds generally to the structure of the Internal Evaluation Report submitted by the Department.

Introduction

The Committee for External Evaluation visited the Department of Mechanical Engineering at the TEI of Crete during the period 24th - 26th November, 2008. The team arrived in the evening of 24th November and had a working dinner with the members of the Internal Evaluation Group, the President, Vice-President, and General Secretary of the TEI of Crete, as well as with the Director of the Department of Mechanical Engineering. Campus visits took place on the 25th and 26th November. The Committee met first with the Group for Internal Evaluation and then all the faculty, as well as with the personnel of the Secretariat of the Department. The Committee visited research and educational laboratories as well as lecture halls and the TEI library. Last but not least, a valuable meeting with an exciting group of motivated students took place.

The Committee considered several documents provided by the faculty. In addition to the Internal Evaluation Report, these included the Departmental Study Guide and its recent revisions, the Departmental Strategic Plan, samples of Course Examinations, samples of Course Evaluation forms that were completed by the students, as well as selected research publications.

The visit took place in an atmosphere that combined high level of professionalism with a cordial and collegial atmosphere. The Committee members are unanimous in wishing to express also in writing their gratitude and appreciation to both the Departmental faculty and HQAA for the arrangements of the visit.

A. Curriculum and Teaching

A1. Curriculum

APPROACH

The curriculum of the Mechanical Engineering programme of the Department of Mechanical Engineering of the TEI of Crete has been established in the last six years and has been adapted to cover and meet internationally expected aspects and benchmarks of Mechanical Engineering. It aims to educate and train engineers at University level. In particular, it aims to produce graduates who are able to join relevant industries where they can provide technical support and solutions to existing problems/processes and additionally (and very importantly) be innovative and progressive in their approach, analysis and design – attributes and benchmarks associated with professional engineers.

In setting the objectives and detailed curriculum of the programme of studies, the academic team consulted with their own graduates through the "Enosi Technologon Michanikon", key industrial colleagues and reviewed the curriculum and programme of studies of other more established universities, including universities overseas.

Particular strengths of the programme include:

(i) Two year common (core) part. This allows the academic staff to provide the necessary fundamental education, which forms the basis of good Mechanical Engineering courses. This part is essential not only for part (ii) below but also for enhancing the ability of the graduates to adapt and innovate in their professional work.

(ii) A three semester specialization route, where the students study two of the following:

(a) Building Services
(b) Energy
(c) Manufacturing
(d) Management and Business Administration
(e) Mechatronics

In the final semester the students receive practical experience in their chosen specialization area.

The above specialization routes are relevant in both National and International terms. The fact that the students follow these routes after two years of study enables them to make an informed decision based on their strengths and aspirations. Also, the programme, with its specialization routes, represents, as appropriate, the strengths and aspirations of the academic community of the Department.

The Programme Committee is responsible for revisions to the programme/syllabus. Changes are ratified by the Departmental Board.

As a general point, it would have been desirable for a mechanism to be established allowing the initial vetting of proposed new degree programmes by a Committee which should include both internal and external members. In addition, the very important role played in the accreditation of courses by Professional bodies, such as the Institution of Mechanical Engineers in the UK, is missing in Greece and should be considered across the Higher Education sector.

The internal evaluation report contends that a major problem relates to the lack of enthusiasm and motivation on the part of the students. However, this was not entirely supported by our meeting with the students. In fact, we met with an energizing group of motivated and articulate young people. The resolution of this discrepancy probably lies in that the Committee only met with a group from the most motivated students, which may not constitute a "representative sample". The Committee would like to point out to our colleagues that the enthusiasm of a portion of their students (albeit a possible minority) might deserve more attention than the lack of interest by the perceived or even the actual majority. The Department should institute effective channels of communication with such motivated students. In view of the desire to establish a postgraduate programme, this better faculty-student communication can be instrumental in improving the working atmosphere within the Department and in attracting qualified candidates.

Recommendation 1

- The Committee recommends that the Department needs to consider appointing a "Programme Leader or Course Director". He/she will take overall academic management responsibility of each degree programme.

- The Committee recommends that the Department needs to consider forming a "Board of Studies", an academic body that includes the academic teaching team and selected, co-opted administrative staff, and deals with the overall co-ordination and management of a degree programme. This is usually chaired by the Programme Leader and meets on a regular basis (at least two times a year) to review progress/problems and receive recommendations for curriculum changes. The decision of the Board of Studies will be confirmed by the Departmental Board and recorded as changes or modifications to the programme/syllabus at School and Institutional level.

Recommendation 2

A "Staff Student Liaison Committee" should be established with appropriate representation from the students (one per year of study plus one per specialization area). The recommendations of these meetings should be considered by the Board of Studies and the Department.

IMPLEMENTATION

At present, the student attendance, particularly in non compulsory theoretical subjects, is low. This needs to be addressed by the programme team (e.g. by the adoption of continuous assessments) in collaboration with students. The theoretical and laboratory components of the same subject are treated as completely different parts of the curriculum. Also, regular programme monitoring (evaluation) is not currently carried out.

Recommendation 3

The theoretical and practical parts of a subject (both in teaching and in assessment) should be combined into one subject. This should be taught and assessed as one subject with the two components making up the final mark (even if it is delivered by two or more different members of staff). The students would have to pass both components of assessment.

Recommendation 4

The Department should consider modifying the programme to include, for some subjects, continuous assessments (mid-term assignments) that constitute part of the final mark. These assignments should ideally include (mini) projects and group work.

Recommendation 5

The Department should consider implementing a process of annual monitoring of the degree programme. Such a review should include a critical evaluation of the whole process, critical evaluation of student progress (attendance, failure rates per subject and semester, student satisfaction/feedback). The annual monitoring should be done at Departmental or School/Faculty level. If done at Departmental level, it should include a senior member of staff from another Department/School.

The above are also recommended for any new programmes at postgraduate level that the Department may consider.

RESULTS

The implementation of the degree programme is to a large extent satisfactory. For example, it appears that the majority of the graduates are employed in industries related to Mechanical Engineering (a figure of more that 75% was mentioned by senior staff in the Department) with a small percentage proceeding to postgraduate studies overseas. Areas of serious concern are the low participation rate of the students in the educational process and the high failure rates. The staff in the Department is aware of these problems.

Recommendation 6

The Department should collect detailed data of student destination/employment. This information will be extremely useful not only for verifying the good Departmental and programme performance and the achievement of targets but also it is a useful means of conveying a positive message to current and new students.

Recommendation 7

To follow closely and openly the student participation in the educational process and monitor the failure rates and to initiate corrective actions for both areas of concern (better information to students, incentives, appropriate continuous assessment).

IMPROVEMENT

The Committee noted an active community of academics who are able to be critical and improve both particular aspects of the overall programme of studies as well as update their own particular subject matter.

Recommendation 8

Some of the initiatives for improvement have already been mentioned above. In consultation with senior staff in the Department the following additional items can be recommended:

(i) Create a detailed record of current needs of the local community and subsequently an evaluation of the National and International trends and developments in Mechanical Engineering, which could inform the Board of Studies for further curriculum development.

(ii) A continuous assessment and benchmarking of the curriculum in relation to other universities.

(iii) Cooperation with other, well regarded, universities (home and abroad). This can involve an increased level of staff mobility through short visits for teaching or research collaboration or sabbatical periods.

(iv) The team recognises the need to seek additional resources that will enable them to improve the infrastructure and the subsequent delivery of the programme. This effort should concentrate both on institutional/national funding sources as well as others (e.g. industry, EU). The recourse implications should be considered in all major modifications to the programme.

(v) The establishment of the programme regulation framework.

(vi) The establishment of an "Industrial Advisory Board", which will include key industrialists with expertise in the areas of specialization of the programme. This should meet once or twice a year to review aspects of the curriculum and delivery and will operate in an advisory manner (see Section B for Research Advice).

A2. Teaching

APPROACH

In principle, the overall approach to teaching does not seem to differ notably from what is the norm in the Greek Universities for the last 3 decades or so. This approach to teaching will be judged and shown below as General Observations, based on two criteria. First, the specific conditions that surround the Department. Second, the generally accepted approach to teaching and evaluation by students and faculty in all Greek Universities. Next, recommendations will be given based on the relationship of the teaching approach of the Department to the internationally accepted standards, especially those in developed countries.

General Observations

Regarding the conditions surrounding the Department, there are several points of concern:

1. The high ratio of part time to full time faculty appears to affect the quality of teaching. In general, the full time faculty provides better quality of teaching, as they are more academically oriented. There are cases, though, in which part time faculty are up to date on the discipline that they are teaching and full time faculty do not teach courses in which they are experts. Clearly, the lack of deep knowledge of a subject by an instructor affects negatively the attendant knowledge dissemination and results in lack of enthusiasm in the classroom.

2. The student to faculty ratio is satisfactory considering both part time and full time faculty. However, it must be noted that the hours taught by part-time and full-time staff are of the ratio 3:2.

3. Classrooms, textbooks/notes, and information technologies are satisfactory and they do not appear to affect the quality of teaching to the first order.

4. Certain educational laboratories require upgrades to meet the minimum standards to train the engineers of the 21st Century. New experiments need to be introduced to the students that involve the use of modern electronics, laser diagnostics, and information technology.

5. It was clear to the Committee that there is not much linkage between research and teaching stemming from the fact that the research activities of the Department are limited.

6. As mentioned in A1, there is no major mobility of students and faculty with the exception of conferences that few attend. The lack of mobility has a negative effect on the transfer of knowledge for both students and faculty as it is not possible to

appreciate how knowledge transfer is implemented elsewhere and what are the results. Thus, lack of exposure to different academic cultures does not allow for evolution and excellence as the "business as usual" approach is taken, being the most convenient.

7. Mathematical ability is essential for Mechanical Engineering training. However, a frequent problem faced internationally is the lack of mathematical skills of intakes. The Department is facing this problem, but in a much more pronounced manner than most, due to the background of the students enrolled. The students enroll in two groups, in the Fall Semester and in the Spring Semester, the latter being graduates of technical high schools with arguably weaker background in mathematics and physics. This creates obvious problems during teaching and these are felt by both faculty and students.

8. Part-time faculty frequently lecture once a week by teaching 4-5 hours continuously as they are on campus only that particular day. The attention span of students cannot be that long and no time is given to them to absorb and understand the material. However, some tutorial support is also given during this period.

9. Certain classes involve both theoretical and laboratory components. It was observed that frequently students are allowed to register and pass the laboratory part of the course without having completed the theoretical component of the topic, which compromised the quality of the knowledge that is acquired.

10. Both the part-time and full-time faculty is not readily or not at all accessible to the students after the lecture. More specifically, regular office hours are not held, and in many instances e-mails that the students send are not acknowledged and/or answered. While, part-time faculty is on campus only for a limited time, it is not clear why certain members of the full time faculty are not responsive to meeting with the students outside the classroom.

11. The staff members we saw were enthusiastic regarding their teaching activities and the students we met (albeit a small group) demonstrated a zest for learning. However, we were told that there is a non-active part in the educational process proportion of the student population that seems to distort the perception of success and achievement within the Department.

12. The various problems mentioned above could be responsible for the fact that students rarely achieve high grades, with an average performance around 6.5 out of 10.

13. There is no established mechanism that the students could use to communicate with the members of faculty and the Department regarding problems associated with courses so that corrective action can be taken.

14. As the Department has a clear aspiration to establish a postgraduate program, the Committee recommends that it gives first priority to establish improvement and monitoring mechanisms for the existing undergraduate programmes that will ideally lead to best practice for the postgraduate courses.

Regarding the conditions surrounding the generally accepted approach to teaching and evaluation by students and faculty in all Greek Universities, there is a point of concern:

1. The current system allows a student to pass a class simply by taking a single final exam. Homework assignments, typically weekly, quizzes, and midterm examinations are optional by law and a faculty member has no power to request that such procedures are used to train and evaluate the students. The Committee recommends that the Department and TEI establish and adopt best international practice that might include a hybrid approach consisting of continuously assessed work and final exams as may be appropriate (see also A1).

IMPROVEMENTS

Based on the above observations, the Committee is recommending the following towards the improvement of the teaching quality and effectiveness of the Department. These recommendations are based on standards that, in general, are accepted and followed by leading international Universities.

1. The Department needs to increase significantly the ratio of the hours taught by full-time faculty to those taught by part-time faculty. To that end, additional full time faculty may need to be hired.

2. The courses using mathematics and physics appear to be a major issue in the Department and this stems from three factors. It is recommended that such courses be taught by engineering faculty and in a way that relates the content to applications.

3. Have the very talented in teaching full time faculty teach introductory courses during the first and possible second year. This is common practice in leading Universities abroad, as experience has shown that many incoming students lose interest if part-time instructors are lecturing and they either transfer to other softer disciplines or drop out.

4. The practice of accepting two cohorts of students per annum, in the Fall and Spring Semesters, needs to be revisited.

5. The students need to have effective ways of communicating to the leadership of the Department issues related with teaching both in the classroom and laboratory (as mentioned in A1).

6. The faculty needs to hold regular weekly office hours to interact with students in an appropriate and timely manner.

7. The student assessment process should recognize the need for an appropriate balance between assignments and final examinations.

B. Research

General Statements

- When compared to international standards, the Committee has noted research activities of basic and applied research of good quality with high potential that may lead to significant contributions to technology as well to basic science. The last only applies to some of the present research laboratories.

- We find that the unit is ready and possesses some of the prerequisite elements, in selected areas, for the development of a targeted graduate programme at the Master of Engineering level. The strategy in the latter development must also include the foresight that in the future it may evolve to the provision of research at doctoral level.

- The Committee urges researchers to 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.

APPROACH

In terms of research, the objective of the Department is to successfully undergo, in the near future, the transition from a teaching-focused college to a university that requires the presence of research activities and postgraduate programmes. The present research approach by the Department consists of two main components:

- First, to develop "centers of excellence" in well focused areas that will propel research activity within the Department. A well established such center related to renewable energy with a particular emphasis on wind energy is already producing significant research work. Also, a state-of-the-art laboratory in advanced manufacturing and mechatronics is rapidly developing.

- Second, to aggressively attract external financial support from European Union, national and industrial funds. These funds have been used in order to establish several high-quality facilities.

Much as the objective of a transition to a university model is commendable, its achievement appears to be obstructed by two main hurdles that relate to the broader institutional framework:

- The accounting and management practices of the public sector appear to be complex, rigid and not entirely appropriate for running modern research programmes. Without sacrificing the public character of the institution, a shift towards standard, EU-wide corporate practices (in terms of e.g. financial management, personnel recruitment etc.) is strongly advised.

- Until recently, TEIs were not allowed to administer postgraduate programmes. Nevertheless, it is well known that postgraduate students are the principal workforce of university research. The Department has attempted to overcome this significant disadvantage by establishing domestic and international collaborations with Departments where postgraduate studies were properly instituted. Clearly, though, the main objective of transitioning to internationally accepted university standards will only be achieved through the establishment of high-quality postgraduate programmes.

IMPLEMENTATION

The average publication production of tenured and tenure-track faculty members has increased steadily over the last five years. The average output in the last two years is 0.5 journal papers and 1.0 conference papers per year and faculty member. However, this is a case where statistics does not say the full story. In the last three years, the bulk of scientific publications is authored or co-authored by only 6 of the permanent faculty members in a faculty of 18, which triples the aforementioned figures for the research-active faculty. This points to the need for establishing research criteria in all future academic staff recruitment. With the current rate of hiring (almost one tenure-track faculty member per three years), this will be slow to achieve and the process ought to proceed at a faster pace.

The Department has been successful in attracting external financial support for research and development projects. A total of 176 projects are listed in the internal evaluation report, 56 of which started in the last two years. The average annual research expenditure per faculty member is approximately €200,000, but similarly to the comment of the last paragraph, if this number is normalized per research-active faculty it will immediately triple. Fundraising has been particularly successful in the areas of wind energy and manufacturing, although techniques that were developed in the corresponding laboratories were successfully used in order to attract support in the field of power distribution quality and mechatronics. Funding comes from a healthy mixture of local and national organizations, European Union sources, and Industry. Industrial collaborations have secured effective technology transfer as well as exposure of the students to on-hand research work. This is undoubtedly both effective and rewarding, however the Department ought to “showcase” and promote the work better, e.g. by publishing more consistently, presenting the work in conferences, and pursuing awards, for which a certain part of the work certainly qualifies. This activity should not be seen as purely advertisement and an exercise in vanity. It is actually profoundly substantial, since it will establish visibility for the Department, which will then improve student enrollment, faculty recruitment as well as future research support, thus generating a mechanism of positive feedback.

Research collaborations have been pursued with Universities in Greece and abroad. The number of collaborations is satisfactory; however, the Committee would like to point out that so far the collaborations were to a certain degree one-sided. E.g. it is noted that, although the TEI does not have a Ph.D. programme or even plan to institute one in the near future, six Ph.D. theses have come from work essentially done within the TEI. Clearly, the University institution that “nominally owned” these theses took all the credit as a matter of record, thus

introducing an imbalance in the collaboration. The establishment of at least one programme of graduate studies will allow the TEI to enter more collaborations and from a more established position with respect to its future partners.

RESULTS

The transition of the TEI to a University is currently ongoing and there are tangible results that substantiate this. Especially in the last two years, the publication record is improving rapidly and so does external financial support. The leadership of the Department appears to be committed to research. From our meeting with the students, we were convinced that there is a critical nucleus of students who are genuinely interested in research and can support research oriented activities. The most visible research result relates to technology transfer to the Greek industry. More than 40 for-profit companies have funded applied projects with the Department targeted to technology transfer in the last decade. By any reasonable international standard, this is a good number, especially when normalized by the number of research-active faculty. Now that a basis of research has been set, time has come to increase the visibility of the activities from the national and international research community, so that the quality of the work is appropriately recognized.

IMPROVEMENT

The Department and its leadership have certain ideas on how to move forward that have been articulated in a four-year programme of development for the period 2008-2012, which was shared with the Committee. The main axes of future planning with respect to research were:

- Develop independent postgraduate programs within the TEI. A first programme on Renewable Energy is planned to commence in the next two years, with another programme focused on modern manufacturing and mechatronics following briefly thereafter.

- Further strengthen external financial support in order to bypass the difficulties posed by the low level financial support provided by the state.

These are both commendable targets. Specific recommendations that should complement them are highlighted below:

1. The objectives of the Department should be articulated explicitly in an “Executive Research Planning” document that will be shorter and cover longer-term planning (perhaps with a 10 year horizon), and to which all faculty will commit. The Committee recommends that the principal strategic objectives should be to ensure that the vast majority of faculty members are actively engaged with research (programmes and postgraduate training) and research activities are funded properly.

2. Include in the revised plan additional steps towards the achievement of the overall objective such as:

    a. Define explicit criteria for future faculty recruitment that will ensure that the incoming faculty is research-active. A PhD degree should be required from all new faculty members and junior tenure-track faculty should be mentored by senior, research-active colleagues to make sure that they acquire the appropriate research-oriented mentality.

    b. Introduce explicit statements about the areas of Mechanical Engineering in which the Department aspires to excel. Given the size of the Department, it is highly advisable to focus on selected targeted areas (maximum of 2 areas to begin with). These areas should ideally be linked with the establishment of the desired "centers of excellence" building on current strengths.

    c. The Department should introduce a strategy for the effective dissemination of the research results and the enhancement of the visibility of the Department (publications, organization of conferences in the areas of departmental priority etc.).

3. The Committee recommends that the Department should consider forming an "Industrial Advisory Board" that will meet periodically (e.g. twice annually) to review educational and research activities and provide top level steering and strategic suggestions.

4. Given the success of research-active faculty in attracting external financial support in recent years, perhaps it is a good idea to now include as part of their objectives publications in prestigious peer-reviewed sources (e.g. the ones reviewed by the Thompson International Citation Index – Web of Science).

C. All Other Services

The Department needs to create more effective methods of organisation in order to support its core functions of teaching and research. The Committee notes that, at present, the Departmental organisation contains functional islands, i.e., academics and administrative staff, the functions of which would need to be managed and integrated in order to enhance operational effectiveness and provide the seamless support required for the undergraduate programmes and the future postgraduate programmes.

The Committee noted that there is a gradual decline of the number of technicians within the Department, with retiring members not being replaced. This is a concern, as Mechanical Engineering is a Laboratory based subject and it requires the satisfactory manning and operation of Laboratories. The Committee reviewed the present Library services for students and staff and these were found to be below international norms. The principal concern relates to the numbers of books and journals held in "paper form" in the Library. However, we note that the electronic provision is satisfactory and appropriate.

Having interviewed a group of students from all years, we arrived at the conclusion that the level of advisory support available to students is patchy and insufficient. Whilst there were seminars for students dealing with general awareness and explanation of degree specialisations, there appeared to be a lack of a clear mechanism in providing pastoral and educational advice and support.

The Committee noted that there was a general lack of mechanisms within the Department regarding how to monitor and enhance the organisational effectiveness of the Department and in particular improve the general services it provides to students. It appears to be lack of; (i) clarity regarding role description, (ii) integration between functional activities, and (iii) strategies and mechanisms for organisational improvement.

Recommendation 1

The Department and TEI should consider the introduction of the role of "Administrator" within the Department, with a remit of integrating, synthesising and streamlining the Departmental functions of academic, administrative and technical members of staff. The Administrator will take a central role in managing the introduction of any future postgraduate programmes within the Department that would need a highly professional and student-focused approach for them to prosper and succeed.

Recommendation 2

Each Undergraduate Degree Programme should have a "Course Director" who should be responsible for the organisation, management and operational monitoring of the specific Programme. The Course Director's role has both vertical duties (within the academic unit) and "horizontal" tasks of co-ordinating and organisational nature (with the administrative and technical units), see also Section A.

Recommendation 3

The Department and TEI should review the ways of enhancing the pastoral and educational advice and support for its students. There are various models available internationally and an appropriate mechanism needs to be identified, implemented and communicated to staff and students.

Recommendation 4

The overall Departmental organisation would need to be evaluated on an annual basis in terms of assessing operational effectiveness, according to criteria that have been set and agreed in advance, and defining methods of optimising future operations. Key criteria have to deal with how well the organisational structure supports Teaching, Research and Student Advice and Support tasks. Mechanisms would need to be introduced to facilitate this ethos of continuous improvement.

D. Strategic planning, perspectives for improvement and potential inhibiting factors

A1. Academic program

- It is amply evident that the delivery of the courses in physics and mathematics at the introductory level present major challenges for the students. The reasons behind these difficulties are twofold. First students entering the programme lack some very basic prior knowledge. Second, the courses lack the applied component that it is known to greatly motivate the students. The first can be met by offering entering students remedial help, while including in the course delivery some real engineering examples can rectify the second.
- The Committee finds the proportion of part-time instructors to be exceedingly high. The Department should take all the appropriate measures to increase the full-time instructor's contribution to teaching. Presently, full time instructors teach approximately 40% of the courses leaving the 60 % to the part timers. The Committee suggests that the distribution is gradually reversed.
- In keeping with good academic international practices the external evaluation committee advises the Department in appointing an experienced faculty member to act as the academic undergraduate coordinator. In addition the development of internal academic guidelines is of paramount importance.
- Also, soon and without delay the Department should establish an external advisory board which consists of prominent members from industry and academia. The board deliberates on current and future developmental issues and helps the academic Committee to adjust its curriculum in order to stay continuously relevant to the needs of society.
- The active student participation in the ACADEMIC AFAIRS of the programme should be a primary goal for the department.

A2. Teaching

- The Committee has noted that, at least in one case, the expert in the field does not teach the course.
- The theoretical and experimental components of some courses are not delivered in the best possible manner. In order to maximize the pedagogical effectiveness, courses that have both aspects should be given concurrently.
- Student examinations in the majority of the courses rely on an antiquated method and thus it does not follow the modern international practices.
- The availability of the professors to students as well as the timely communication to

student inquiries by other means should greatly be enhanced.

Research

- With respect to research, and when compared to the international standards, the Committee has noted activities of basic and applied research of good quality with high potential that may lead to significant contributions to technology as well to basic science. The last only applies to some of the present research laboratories.

- We find that the Department is ready and possesses the main requisite elements in the development of a graduate programme at the Master's of engineering level. The strategy in the latter development must also include the foresight that in the future (within a 10 year cycle) it may evolve to a similar programme at the doctoral level.

- The Committee urges researchers to publish their contributions in journals that are included in Thomson's citation index (or equivalent) and are of high international reputation and quality as measured by appropriate metrics.

E. Conclusions

The External Evaluation Committee advises strongly the Department to partake in the creation of a ten-year strategic plan with clear milestones focusing mainly on its academic programmes. It should include modernization of the undergraduate curriculum (in accordance with the international practices), the development of a graduate programme at the Master's of Engineering level, as well as of an administrative structure that will support effectively these programs.

The Members of the Committee

Name and Surname	Signature

1. Professor Georgios Vatistas (Chairman)
2. Professor Paul Maropoulos
3. Professor Tassos Karayiannis
4. Professor Fokion Egolfopoulos
5. Professor Dimitrios Kyritsis