



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

**Α.ΔΙ.Π.**

**H.Q.A.**

ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ ΚΑΙ  
ΠΙΣΤΟΠΟΙΗΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ  
ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

HELLENIC QUALITY ASSURANCE AND  
ACCREDITATION AGENCY

## EXTERNAL EVALUATION REPORT

**SCHOOL OF APPLIED MATHEMATICAL & PHYSICAL SCIENCE  
NATIONAL TECHNICAL UNIVERSITY OF ATHENS**

Version 2.0

March 2010



## TABLE OF CONTENTS

### **The External Evaluation Committee**

#### ***Introduction***

##### I. The External Evaluation Procedure

- Brief account of documents examined, of the Site Visit, meetings and facilities visited.

##### II. The Internal Evaluation Procedure

- Comments on the quality and completeness of the documentation provided and on the overall acceptance of and participation in the Quality Assurance procedures by the Department.

#### ***A. Curriculum***

##### APPROACH

- Goals and objectives of the Curriculum, structure and content, intended learning outcomes.

##### IMPLEMENTATION

- Rationality, functionality, effectiveness of the Curriculum.

##### RESULTS

- Maximizing success and dealing with potential inhibiting factors.

##### IMPROVEMENT

- Planned improvements.

#### ***B. Teaching***

##### APPROACH:

- Pedagogic policy and methodology, means and resources.

##### IMPLEMENTATION

- Quality and evaluation of teaching procedures, teaching materials and resources, mobility.

##### RESULTS

- Efficacy of teaching, understanding of positive or negative results.

##### IMPROVEMENT

- Proposed methods for improvement.

#### ***C. Research***

##### APPROACH

- Research policy and main objectives.

##### IMPLEMENTATION

- Research promotion and assessment, quality of support and infrastructure.

##### RESULTS

- Research projects and collaborations, scientific publications and applied results.

##### IMPROVEMENT

- Proposed initiatives aiming at improvement.

#### ***D. All Other Services***

##### APPROACH

- Quality and effectiveness of services provided by the Department.

##### IMPLEMENTATION

- Organization and infrastructure of the Department's administration (e.g. secretariat of the Department).

##### RESULTS

- Adequateness and functionality of administrative and other services.

**IMPROVEMENTS**

- Proposed initiatives aiming at improvement.

**Collaboration with social, cultural and production organizations*****E. Strategic Planning, Perspectives for Improvement and Dealing with Potential Inhibiting Factors***

- Short-, medium- and long-term goals and plans of action proposed by the Department.

***F. Final Conclusions and recommendations of the EEC on:***

- The development and present situation of the Department, good practices and weaknesses identified through the External Evaluation process, recommendations for improvement.

### **External Evaluation Committee**

The Committee responsible for the External Evaluation of the School of Applied Mathematical and Physical Science of the National Technical University of Athens consisted of the following five (5) expert evaluators drawn from the Registry constituted by the HQA in accordance with Law 3374/2005:

1. Professor George Roussas, University of California - Davis, Davis, California, U.S.A.  
(Coordinator)
2. Professor Costas Bachas, Ecole Normale, Supérieure, Paris, France
3. Professor Ioannis Botsis, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
4. Professor Pavlos Lagoudakis, University of Southampton, Southampton, United Kingdom
5. Professor Yiorgos - Sokratis Smyrlis, University of Cyprus, Nicosia, Cyprus

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

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

## ***Introduction***

### I. The External Evaluation Procedure

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

### II. The Internal Evaluation Procedure

Please comment on:

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

The evaluation committee arrived at the prescribed Athens hotel in the evening of Sunday, September 15, 2013. In the evening of the same day, it held an informal organizational meeting, and next day, Monday September 16, visited the A.ΔΙ.Π headquarters. The committee was received by the president and other staff members of the agency. In the sequel, a presentation was made to a number of similar committees, regarding procedural matters.

At this point, we were informed that the meetings-evaluation could not take place in the natural environment of the School (SEMF), due to occupation of the physical facilities by striking administrative employees and sympathizing students. Instead, it was decided that all meetings would take place in the headquarters of A.ΔΙ.Π. It is obvious that this fact presented the committee with a disadvantage, by not being able to personally visit the physical plant of the School.

The Dean of the School, Professor K. Farakos, provided the committee with an updated schedule for the assessment process. This schedule was a modification of a previous programme, provided to the committee by A.ΔΙ.Π. At this point, it should be noted that the committee would expect to be a participant in the composition of the schedule well in advance. We hope that this process will be adapted in future assessments.

It is important to mention that the material provided before the trip to Athens was based on activities in the School covering the period of time 2005-10, thus leaving out the activity of the period 2010-13. Upon our request, additional material was provided by the Dean’s Office

and the Directors of the Divisions (τομείς), greatly enhancing the committee's ability to form a global view about the School and its subunits. Obviously, it is regrettable that the material was not updated promptly for the evaluation process.

The programme presented to the committee by the dean has been attached to this document. This programme was followed except for the modifications cited below: (1) the Rector (πρυτανίς), Professor Simopoulos, and the Vice-Vector, Professor Moropoulou, did not come to the scheduled meeting; instead, the meeting was rescheduled and took place on Friday morning at 9:30; (2) the presentations of graduate studies were moved to Wednesday morning; (3) on Wednesday afternoon, the committee met with two administrative staff, and a number of faculty members upon their own request. In addition, there were informal discussions among the members of the committee with students, as well as staff members at various times during the evaluation week. Finally, an ad hoc tele-conference with six graduates of the School at CERN, Geneva, was held, upon their own request, on Monday evening.

#### RELEVANT COMMENTS:

The organization of the visit and evaluation process can be considerably improved. In particular, the committee should be consulted about the agenda of the visit, and the sequence and duration of events.

We are grateful to the dean, to the academic staff and to the graduate students for making every effort, in the midst of exceptional circumstances, to help the committee in its evaluation work.

The committee also appreciated the fact that the leadership of the NTUA did find the time to meet at Α.ΔΙ.Π., despite their unexpectedly heavy agenda.

## **A. Curriculum**

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

### **APPROACH**

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

### **IMPLEMENTATION**

- How effectively is the Department's goal implemented by the curriculum?
- How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?
- Is the structure of the curriculum rational and clearly articulated?
- Is the curriculum coherent and functional?
- Is the material for each course appropriate and the time offered sufficient?
- Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?

### **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?

### **IMPROVEMENT**

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

### **IMPROVEMENT**

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

The multidisciplinary nature of the School is to be lauded. The fact that the School provides a general and solid background in mathematics, physics, mechanics, in addition to general courses in humanities, social sciences and economics, as well as the possibility for students to choose the subject of a major at a later stage is, indeed, unique in the Greek educational landscape. Such a curriculum prepares adequately the students for a broad kind of professional careers.

The component of practical training is a very useful element of the programme. Furthermore,

it was noted that it is not uncommon that the practical training is followed by further contacts and cases of employment of students. It is important that this programme be further supported and appropriate sources of funding be secured.

The committee believes that the curriculum should be made shorter and more flexible, without losing its effectiveness. The committee was happy to observe that the faculty has already taken steps to reduce the volume of coursework, and plans to do so further. This effort is applauded and it is recommended that the volume of coursework be even further reduced in order to harmonise the curriculum with international standards. Students should be allowed to devote more time to personal study and to developing their critical thinking.

Efforts should be made to connect certain courses with applications; for instance, the course on computing and on specific languages and software packages should be connected to numerical implementations/applications. Along these same lines, theoretical courses should be enriched, where possible, with pertinent applications and examples.

Another issue that came to the committee's attention is the declining level of the mathematics curriculum in the secondary education system. This impedes the transition of students to the level required at the School, and could be addressed by providing a first semester course that familiarizes the students with abstract mathematical thinking and proofs.

To make the curriculum shorter, one could suppress some courses with significant overlaps, and merge other courses that belong to the same thematic area. Specialized courses need not be offered on a permanent basis. Their offering should instead evolve and allow for the introduction of new fields of research, such as those at the multiple interfaces of mathematics and physics with biology. Furthermore, it would be appropriate that certain courses be co-taught by two instructors.

In what concerns the flexibility of the curriculum, the committee believes that there is significant room for improvements: the current five year education programme does not lead to a degree that is recognised as equivalent to a Master's degree in European higher education institutions. Furthermore, students cannot transfer to another higher education institution before the five-year programme is completed.

The committee was informed by the rectorship of the NTUA and the dean of the School about practical and legal obstacles in carrying out a restructuring of the teaching programme. Nevertheless, the committee believes that it is important to find a way to harmonise the curriculum and study programme with those of other European higher education institutions, by following the example of other leading European universities (in Germany, Switzerland, France, Holland, and elsewhere), so as to provide this added flexibility. This harmonisation will also greatly facilitate the exchange of students between Hellenic and European institutions after three or four years of study.

The committee has found the role of ΑΚΕΑ important in supplementing the scientific curriculum of the undergraduate studies with some basic courses in humanities and the social sciences. However, the existing offerings in economics do not seem to be adequate in serving the needs of certain programmes, such as financial mathematics. Courses in ethics and legal issues, as they pertain to technological innovation relevant to sustainable development, are



missing from the curriculum. Even if the required expertise does not exist within the SEMFE faculty at present, these courses are important for a well-rounded education and ways to allow their offering should be explored.

## **B. Teaching**

### **APPROACH:**

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

Please comment on :

- Teaching methods used
- Teaching staff/ student ratio
- Teacher/student collaboration
- Adequacy of means and resources
- Use of information technologies
- Examination system

### **IMPLEMENTATION**

Please comment on:

- 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

### **RESULTS**

Please comment on:

- 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?

### **IMPROVEMENT**

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

A concerted effort should be made so that courses at the level of the Master's degree programme and beyond be taught in English. This will enable the exchange of students bilaterally, in contrast to the actual situation now, where few foreign science students ask to spend a semester or a year in Greece. This is a common practice in other, non-English speaking countries. This idea was very positively received by the students and academic staff we interviewed.

Technical support staff for the teaching labs seems to be inadequate, and tends to becoming even more so. This fact hinders the implementation of laboratory sessions, given the large number of undergraduate students from all nine Schools of the NTUA that attend the labs on a weekly basis.

Although inadequately supported at the technical level, the laboratory component and infrastructure are good as it was judged by various presentations in the meeting.

The non-replacement of retiring academic staff inevitably will have devastating results for the School, in general, and the implementation of the teaching programme, in particular. *Experience has shown that lack of recruitment for an extended period of time has irreversible negative effects in the quality of education and research.*

A major problem is the "accumulation" of students who fail the exams (on average, an unacceptably low percentage of students enrolled finally pass the exam of any given course). This is a major waste of resources, both of academic staff and student time alike. Addressing this problem, without lowering the required standards, should be of high priority for the School. Some recommendations to this effect have been made at the curriculum section, and some more follow below.

We reiterate that the reduction of the course load--currently equal to about 30 hours/week--within reasonable limits is desirable and should be implemented as soon as possible. Equally positive is the limitation of the number of times a student can take an exam for the same course.

Course evaluation by students is a good practice and should be continued. However, the low participation of students in this evaluation is an issue that should be addressed. An evaluation from early alumni should be conducted on a regular basis to take advantage of their accumulated experience. Periodically, an evaluation of the programme at large should be carried out by the students and alumni, alike. Obviously, it is imperative that negative evaluations lead to corrective action.

The final grade in a course should be based on the final exam, on at least one written midterm exam, and homework assigned and graded, rather than basing everything on the performance of students in the final exams. The corresponding weights may vary according to the subject matter, and the relevant grading policy should be announced well ahead of time, in the form of a syllabus for the course. The committee was pleased to be informed that in about 53% of the courses the final grade is the result of combination of grading student performance on such areas as projects, laboratory work, and laboratory work and projects. The committee strongly encourages the School to generalize this --or any other suitable-- multiple evaluation to the remaining 47% of the courses. It seems it is the intention of the School to do so. It is to be pointed out that correction of homework, midterm, and final need not be carried out by ΔΕΠ, but rather by compensated postgraduate students, always under the supervision of the instructor concerned, who is eventually responsible for the course. In case of an oral examination, the presence of an external independent observer would be recommended.

The committee finds that the PhD program is well defined and compares well with international standards. On the average, the quality of the Master's and PhD theses is commendable. In order to increase the exposure and international visibility of the research work, it is highly advisable that the PhD theses be written in English, with an extended abstract in Greek; it should not be compulsory to write the theses in Greek. This is an accepted practice in countries like France, Germany, Netherlands, and Switzerland. In addition, it is a good idea that theses be available online.

The committee would like to comment that a good part of the faculty is dedicated and has an enthusiastic attitude towards teaching. Emeriti continue to offer their services without compensation.

It is highly disappointing that only a small percentage of undergraduate students do attend classes until the completion of the course. This is partly due to the opportunity students have of retaking the exams for the same course several times. Computing the semester grade by combining the final exam grade, the midterm exam grade, and the homework grade should help address this issue of absenteeism. The very fact that the concept of a prerequisite is badly violated cannot possibly lead to a coherent programme of study.

## **C. Research**

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

### **APPROACH**

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

### **IMPLEMENTATION**

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

### **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.

### **IMPROVEMENT**

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

The divisions of the School carry out research standing up to international standards. Some of the teams have an impressive presence in the international scene of their respective research fields, and are remarkably successful in obtaining competitive funding. However, the lack of technical personnel will inescapably result in inefficient functioning of the experimental infrastructure, consisting of capital equipment acquired mostly through competitive projects and public investment. This is not acceptable for a School with a strong experimental mission.

The committee was happy to note that recent recruitments (both at junior and senior levels) were, generally, of high quality. This fact helps dilute presently, and will eventually extinguish the phenomenon of inbreeding – a problem that is frequently encountered in many academic departments in Greece.

As a result of the situation in the country, all recruitments have been essentially frozen. The non-replacement of retiring academic staff inevitably will have devastating results, and will threaten the very existence of the School. In addition, the unreasonable delay of appointment of already elected faculty members has serious effects, both for teaching and the research activities of the School. A coherent academic programme takes several years to be built and a short time to be taken apart.

The recent changes in the law governing the higher educational institutions seem to contain some constructive elements with respect to research assessment. In particular, in reference to

periodic assessment of the performance of faculty, as well as opening up the process for promotions. There are cases where the implementation of the open process has led to impressive results. However, there are also cases where much was left to be desired. The committee does not wish to enter into details.

The periodic review of academic staff, provided by the changes made in the law, is certainly a step towards the right direction. Nevertheless, as far as we know, there is nothing which prohibits the School to undertake informal internal reviews more frequently than the times provided for by the law. This activity will improve the overall performance of the academic staff involved, by emphasizing their strong points and pointing out perceived weaknesses. Also, it should be used as a tool in rebalancing research and teaching responsibilities.

Postdoctoral researchers are in short supply. They play a crucial role in the life of well-functioning departments worldwide, bridging the gap between doctoral students and faculty. It is important to think of ways to close this gap by investing part of (even meager) resources to the hiring of postdoctoral researchers.

Members of the School have significant involvement in the organization of advanced Summer Programmes for graduate and postgraduate students. These programmes have played an important role in the education of young Greek scientists, particularly in the area of high energy physics. The committee recommends that these programmes enjoy continued support, and that similar programmes be introduced to other fields.

The committee was pleased to see that the collaboration between members of the same division and the divisions at large was good, despite the fragmentation into smaller research units or teams. Nevertheless, strategic planning to define future research directions and recruitments, at the level of the entire division, is not evident. Efforts should be made to avoid fragmentation into autonomous research teams at this level.

## **D. All Other Services**

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

### **APPROACH**

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

### **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.).

### **RESULTS**

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

### **IMPROVEMENTS**

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

Membership to the Technical Chamber of Greece (TEE) of the School should be pursued vigorously at all levels. In addition to the School, the NTUA itself should throw its weight towards achieving this end. The committee's view is that membership to the TEE should depend on course content, as it is done in other countries, rather than course and/or diploma titles. In this respect, the graduates of the School are fully entitled to this membership. The committee was informed that some progress has already been made in this respect between the School and the TEE. The committee was also informed that, according to the existing laws, the graduates of SEMFE have the right of teaching mathematics and physics in high schools. It is therefore not clear what the real obstacle to the TEE membership is. Whatever that may be, no narrow interests should be allowed to prevent the completion of the process. TEE membership would be an enormous potential for technology transfer, and the contribution of the School's graduates to a knowledge based economy.

An institutional framework for students with foreign degrees wishing to carry out research work towards a PhD thesis in Greece is cumbersome. Defining the requirements should not be the responsibility of DOATAP, but rather that of the School where the student would be enrolled.

The strong connection between research, technology development, and its transfer to the economy, via spinoff companies, becomes more and more important in today's technology driven economies. While there may have been spinoff companies created in the past from activities in the School, the committee received the impression that there is a technology transfer office, patent authorship, etc., but it is not functioning efficiently. It is imperative that due emphasis be given at no time at all to the technology transfer activity of the School. Its benefits to the knowledge based economy are apparent. Otherwise, the existing high

quality human resources of the institution are simply unexploited or being exported.

Outreach of science and technology to the community is a desirable activity that has been vigorously pursued by the School. The committee commends all people involved, and recommends that these activities be extended to more fields of knowledge.

The number and the average grades of incoming students have been declining, even though the School still attracts some of the best students in the country, a tribute to the breadth and quality of the education provided. Efforts should be made to reverse this trend. Harmonising the curriculum with European standards curricula, and outreach activities can help raise again the average quality of incoming students.

In conclusion, the committee believes that, on the educational level, certain changes are necessary, so that the institution will better fit into the international environment of university programmes, enhancing its visibility and the exchange of students and faculty.

Regarding the research activity, it is noted that certain individuals within all programmes are of international stature, as demonstrated by the bibliography, the impact of their research and the success of their graduate students. It should be a noble goal for the rest.

### **Collaboration with social, cultural and production organizations**

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

The Outreach Activities of the School (Elementary Particle Master-Classes) contribute to the dissemination of scientific and technological concepts in the secondary education. The same is expected of the collaboration of the School with a pilot High School program (Protypa Peiramatika Gymnasia-Lykeia) initiated last year. Such activities should be extended to other research activities in the School. Furthermore, workshops and seminars, organized by some of the graduate programs in the School with the objective of linking education and production, should be strengthened and also adopted by all the graduate programs in the School.



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

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

Please, comment on the Department's:

- 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.

(See Section F below)

### ***F. Final Conclusions and recommendations of the EEC***

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

Conclusions and recommendations of the EEC on:

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

#### Grading + Curriculum

Consolidate overlapping courses, and reduce significantly required courses towards a degree.

Reduction of the number of repeated exams in any given course is one of the key tools of preventing the formation of a permanent, "professional" class of students.

The School should furthermore require that the semester grade in each course be the weighted average of the grades of the final exam, of at least one midterm, and of homework (or lab work) assigned and graded. Active participation in classes should be rewarded, and absenteeism discouraged. In particular, as is commonly understood and practiced, students should be assured by the instructor that "*no question is a stupid question*".

The School should provide the human resources (suitably compensated postgraduate students) for the purpose of correcting homeworks under the supervision of the instructor involved.

Announcement of the semester grade should be made available promptly after the final exam.

In the first one or two semesters, introduce suitable courses for the purpose of bridging the gap between students' High School mind framework, and the advanced and abstract thinking required at the University level.

English has become the scientific language worldwide. As in many other European countries, its use in advanced and graduate courses can facilitate the bilateral exchange of students, and enhance the possibility of turning Greece into a destination where to pursue educational and intellectual goals.

#### Quality and Evaluation of teaching and research

[Rotate the teaching assignment of the basic courses among the teaching staff.] The present rotation of the teaching assignment of about 50% of basic courses should be applied to as many as possible of the remaining basic courses.

Require evaluation of every course/instructor at the end of each semester by all students enrolled in the course. For this purpose, the School should use versions of a basic questionnaire, allowing for inherent differences between theoretical and applied courses.

The evaluations should be handled by persons other than the instructor involved, and should be kept in the School's files to be used in the periodic reviews of a faculty member. Also, copies of them should be made available to the instructors concerned, and in a concise form (such as citing the median for each question), they should be posted in the School's website.

In the same way that an applied course should be based on relevant theory, likewise a theoretical course should be accompanied by examples, illustrations, and applications.

All instructors should supply a brief-yet, fairly complete-Syllabus for the course, providing information about the course, such as: Instructor's name, e-mail address, office hours, list of prerequisites, book(s) to be used, brief description of the material to be discussed, grading policy, etc. This could be accomplished through the "mycourse" platform, and it should be mandatory for all instructors of the School. The committee was pleased to be informed that faculty members do list translated well-known and up-to-date textbooks for their courses.

Periodic review of faculty members is a critical instrument in ensuring the delivery of competent teaching and the production of research of quality. Within this framework, the concept of re-balancing teaching/research should be adopted. The law correctly requires of faculty members, both to discharge their teaching duties and also engage in research. However, it is a matter of fact that some do better than others when it comes to research. In this context, the "re-balancing" principle does make sense, and it should be applied. Assignment of increased teaching load to those faculty members ceased to produce research, should not be looked upon as a punishment, but rather as an opportunity to contribute to the common effort by different means.

Continue to encourage and reward excellence.

The committee has already mentioned the commendable free contribution in teaching of some retired faculty members. It has also become aware that academic administrators in the School do not exercise their right to reduced teaching loads. Although this is altruistic on their part, it does fall into the hands of those who make irresponsible decisions. If required courses cannot be offered, then students would have something meaningful to strike for.

Regarding research, the committee wishes to reiterate its satisfaction for the high quality of research work produced by a significant number of faculty members, as evidenced by concrete data. The School should strongly encourage the rest to intensify their efforts towards improving the quality of their research.

### **Outreach, Technology transfer, Communication**

Intensify efforts to reach, inform, and educate incoming students, High School teachers, and others concerned, about the unique flexibility and opportunities the School of EMFE provides, alone within the Greek postsecondary education framework.

Advertise success stories, such as the standing of the NTUA in international/global rankings of institutions of higher learning, awards/distinctions of faculty members, research productivity associated with quality, high profile of faculty members in international scientific activities, successful drawing of competitive research funding, successful placement of graduates of the School in respectable foreign institutions of higher learning, etc. The School has many such stories to show.

The School, through the NTUA, should intensify its efforts for knowledge/technology transfer, both to the public and private sector. It is unacceptable to consume with voracity products (industrial, as well as agricultural) supplied by foreigners, but be inhibited from implementing the results of our own intellectual efforts and pains. This is, clearly, the recipe for ensuring permanent backwardness for the country.

The concept of knowledge/technology transfer and that of service are akin to each other, but not identical; the latter is certainly useful and potentially revenue producing for the institution, but the former is of a different order of magnitude. The leadership of the institution and its subdivisions should take appropriate steps to implement/expedite knowledge/technology transfer.

### **General remarks and Inhibiting factors**

Being part of it, SEMFE suffers from many of the known pathologies of the Greek higher-educational system. Concepts like “*occupation*”, and “*asylum*” as a shelter for political and other non-academic activities, rather than for the free and unmolested exchange of ideas, should be eradicated. Elected officers should be able to serve the true interests of the University community, without being captive to organized, vocal, and noisy ideological groups, or self-serving groups of narrow interests. The recent modifications in the law take steps in the right direction, for these concerns, and should be implemented without delay.

The morbid concept of the legendary “*Greek reality*” is, by and large, a self-serving device/excuse perpetrated for too long. This should end the soonest possible.

The School of EMFE is a very useful model of training students, and preparing the next generation of scientists/engineers; this has already been mentioned elsewhere. However, alternative models are available and used in other European countries. Such models should not be rejected on the basis of undue pressures by the “*usual suspects*”, but rather be given

due consideration.

Greece, in addition to being a tourist destination, has the potential to become a heaven of educational and intellectual pursuits. The flagship of the Greek technical universities-the NTUA-can be a leader in this respect; do grasp this opportunity.

In conclusion, it should be stated that the committee is aware that the content of the above paragraphs does not refer to this particular School. Rather, it is a sad phenomenon prevailing all across the spectrum of the postsecondary education in Greece, and it adversely affects even the best academic units, as the SEMFE is.

Members of the Committee

**NATIONAL TECHNICAL UNIVERSITY OF ATHENS**  
**SCHOOL OF APPLIED MATHEMATICAL &**  
**PHYSICAL SCIENCE**

Name and Surname

Signature

**Professor George Roussas**

University of California - Davis, Davis, California, U.S.A.

**Professor Costas Bachas**

Ecole Normale Supérieure, Paris, France

**Professor Ioannis Botsis**

École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

**Professor Pavlos Lagoudakis**

University of Southampton, Southampton, United Kingdom

**Professor Yiorgos - Sokratis Smyrlis**

University of Cyprus, Nicosia, Cyprus