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ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ ΚΑΙ
ΠΙΣΤΟΠΟΙΗΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ
ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC

H.Q.A.

HELLENIC QUALITY ASSURANCE AND
ACCREDITATION AGENCY

EXTERNAL EVALUATION REPORT

DEPARTMENT OF MATHEMATICS

UNIVERSITY OF AEGEAN

December 2013

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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Mathematics of the University of Aegean consisted of the following five (5) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. Professor Basilis Gidas (Coordinator)
   Brown University, USA

2. Professor Pantelis Damianou

   University of Cyprus, Cyprus

3. Professor Marianthi Markatou
   University at Buffalo, SUNY, USA

4. Professor Panayotis Kevrekidis

   University of Massachusetts, USA

5. Professor Constantine Tsinakis

   Vanderbilt University, USA

Introduction

I.   The External Evaluation Procedure

The External Evaluation Committee (EEC) arrived in Samos on December 9. The members of the committee attended a presentation by the Vice-Rector for Academic Affairs Prof. Nikos Soulakellis, who reported on the history and goals of the University of Aegean as a whole. The presentation was followed by a meeting with the Chair of the Department Professor Vasileios Metaftsis, the Dean of the School of Science Yiorgos Tsapogas, and members of the Department of Mathematics.

The following day, December 10, the EEC attended the following presentations by members of the Department:

1.   A brief overview of the history, mission and structure of the Department by the Chair Prof. Metaftsis. The presentation covered both the Track of Mathematics and the Track of Statistics and Actuarial-Financial Mathematics (ΣΑΧΜ)
2.   A presentation of the Undergraduate and Graduate Program of the Track of Mathematics by Professors Metaftsis and Michael Anousis, respectively
3.   A presentation of the Strategic Planning of the Department of Mathematics by Prof. Metaftsis
4.   A presentation of Undergraduate and Graduate Program in *the* Track of Statistics and Actuarial-Financial Mathematics by Professors Stelios Xanthopoulos and John Tsimikas, respectively
5.   A presentation of topics common to both directions by Prof. Metaftsis. The topics included the Ph.D. Programs, Practical Training and the research areas of the Department.

Following the presentations, the EEC had:

6.   Individual meetings with 25 faculty members
7.   A meeting with a group of undergraduate students
8.   A meeting with the lab assistants and technical support staff
9.   A meeting with a group of graduate students (both M.Sc. and Ph.D.)
10.   A meeting with some alumni of the former departments of Mathematics and ΣΑΧΜ.

On Wednesday, December 11, the EEC visited several buildings of the Department which included various classrooms, offices,   the Computer Lab and the Library. Afterwards, it had a meeting with the administrative staff of the Department (Γραμματεία). The last scheduled meeting was with the Chair of the Department during which the committee shared with him some preliminary observations. The EEC started its deliberations shortly thereafter.

The Committee examined the following documents:

1.   The Departmental Internal Evaluation Reports of the Department of Mathematics and also of the Department of Statistics and Actuarial-Financial Mathematics (2009-2010, 2011-2012, 2013). [EEC notes that these reports were written before the merger of the two departments]
2.   The Department Course Guide (Πρόγραμμα Σπουδών)
3.   The detailed course schedule for the past few academic years
4.   The Departmental Research Publication record and the personal C.V.'s of the faculty
5.   Electronic copies of all the presentation material detailed in items 1-5 above

6. Samples of educational material, including instructors' course notes, course examinations, Masters and   Ph.D. theses
7. The Departmental website.

II. <u>The Internal Evaluation Procedure</u>

The Department did an excellent job in providing the committee with all relevant data and additional documentation in a timely manner. We also appreciated the presence of Mrs. Eleni Kitrinou who was sent by the central administration of Mytilene to assist with the evaluation process. The presentations by the Vice-Rector, Chairman and faculty members were informative and well-prepared, and requests and questions by the committee were promptly addressed. Nevertheless, the committee would like to note that one or two faculty members chose not to participate in the process.

In closing, the committee would like to thank Prof. Metaftsis and the faculty of the Department for their eagerness to provide all necessary information and prompt response to all our requests and their willingness to share their thoughts about the future of the Department. We would also like to acknowledge the excellent job the Department did in preparing for the visit by the EEC.

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

UNDERGRADUATE PROGRAM

The undergraduate curriculum of the Department of Mathematics is divided into two tracks: the Track of Mathematics and the Track of Statistics and Actuarial-Financial Mathematics. These tracks have arisen from the enforced merger of the former two Departments (with the corresponding titles) under the roof of the Department of Mathematics. In what follows, we describe each of them separately. The list of the undergraduate courses of the former Department of Mathematics will be referred to as List A and those in the former of Statistics and Actuarial-Financial Mathematics as List B.

Track of Mathematics

The courses in the Track of Mathematics are divided in three groups, broadly described as mandatory, selected mandatory (KEY) and elective. For a degree in the Track of Mathematics to be conferred, a student must obtain a passing grade in a total of thirty-four courses:

1) The mandatory course category that every student has to take includes 16 courses. These are basic mathematical background courses and are selected from List A.
2) A set of 11 courses is selected from the selected mandatory courses (KEY). The latter consist of 47 courses, of which 33 are selected from List A, 7 from the Department of Engineering of Informatics and Communication Systems, and 7 from List B.
3) Lastly, there are 7 elective courses chosen from a list of 86 listed such courses. Of these, 32 are drawn from List A, 30 are offered by the Department of Engineering of Informatics and Communication Systems, and 24 are drawn from List B.

Generally, the curriculum of the Department of Mathematics in the Mathematics Track appears to broadly cover the needs of a modern undergraduate education in mathematics. It also appears to be structured in a logical progression of levels of difficulty. Nevertheless, there are elements that need to be re-examined. For example:

(a) It appears to be redundant to have a course that covers Linear Algebra and Analytic Geometry, while there is another mandatory course on Linear Algebra I (and a KEY course of Linear Algebra II). Analytic Geometry seems like a topic that used to be covered in the high school curriculum. A course such as Linear Algebra and Analytic Geometry does not have a place in a modern mathematics curriculum, and we recommend that it be abolished especially in light of the heavy teaching load of the Department.
(b) On the basis of the information given to EEC, the committee proposes that the Department seriously consider starting the Analysis sequence earlier than the 5th semester. Given that this is both an important tool and direction of Modern Mathematics, it may be advisable e.g. to move Analysis I to the 3rd semester. Nevertheless, the committee was pleased to find out during the presentations that this change has already been implemented as of this academic year. This indeed partially illustrates the point indicated in the self-study that the Department dynamically assesses and re-evaluates the format of its Curriculum and makes suitable adjustments as needed every year.
(c) In the 2013/2014 Study Guide, there appears to be a relatively large number of courses especially in electives but even in KEY courses that related to the history of mathematics/sciences and whose title begins "History of …." (e.g. Mathematics, Euclidean and Non-Euclidean Geometries, Mathematical Education, Sciences, or Analysis). For example, in the 8th semester there are two courses titled "History of Euclidean and non-Euclidian Geometry" (331-2850) and "History of Analysis" (331-

3170). In addition there is (in the same semester) a course titled "Philosophy of Mathematics" (331-3180) whose emphasis is on the philosophy of mathematics, but the course does have relevance to history. There are history courses in other semesters as well -- 3d, 6th, and 7th semesters. Some of these courses are not taught every year. Nevertheless, EEC feels that, although the historical perspective is important and valuable, the number of courses on the history of mathematics is relatively large, and that there is no need in a today's department of mathematics to have overspecialized courses on the historical aspects of mathematics or mathematical sciences in general. For example, there is no need to have a specialized course in the "History of Euclidean and non-Euclidian Geometry" and another specialized course on the "History of Analysis" while at the same time there are courses such as "History of Mathematics" (311-0832) and "History of Sciences" (311-3190). EEC suggests that the history courses be replaced by a smaller number of courses – perhaps one KEY and one elective – that are designed to provide a coherent and solid picture of the history of mathematics, and of mathematical sciences in general.

(d) There appears to be a very large volume of courses available to be taken as elective. We believe that the Department should undertake a close inspection of them — especially the ones coming from List B and the Department of Informatics and Communication Systems Engineering— and determine whether their mathematical content justifies their curricular inclusion in the Mathematics Track. For instance, we are a bit concerned about the content of an Applied Mathematics course offered by the Department of Informatics and Communication Systems Engineering and how much overlap this may have with material already taught to the students of the Department of Mathematics.

Track of Statistics and Actuarial-Financial Mathematics

In this track, the Department offers 35 Mandatory courses, 17 elective courses and 34 optional courses (all representing the aforementioned List B). There also exist 14 courses from other divisions, namely 7 available from List A and 7 from the Department of Informatics and Communication Systems Engineering. The number of courses necessary for obtaining the degree is 35.

The committee was admittedly impressed with the presentation of the undergraduate curriculum of this track and felt that not only was it well thought out, but also that it is quite unique and serves a corresponding scope that is very clearly distinct than the scope of the Mathematics Track or more generally the track of a typical Mathematics Department. It is in that light that the division of the current structure in its earlier state of two independent departments seems to better serve the interests of the two sets of faculty and not only their research interests but really their curricular representation and overall teaching mission.

An example of the aspects that were very favorably viewed during the relevant presentation concerned the effort to intrigue and attract students from very early on. This is done by capturing their attention with relevant statistics, actuarial and financial courses, partitioned in a way so as to render each semester quite exciting from the point of view of learning perspectives.

The program of studies here too reveals, based on the full range of (intended to be taught within the Program of studies) a very broad selection and a noteworthy breadth and depth, as is the case also in the Track of Mathematics.

Nevertheless, here too, the committee identified a number of points that merited further consideration and potential action from the point of view of the Department. More specifically:

(a) In discussing with the Department's undergraduate students, the Committee repeatedly identified a serious issue that is not reflected in the Full Curriculum offered to us by the two Tracks. In particular, while the number of courses, in principle, offered is both broad and diverse on paper, in practice numerous students felt that the number of elective courses offered any particular year is so limited that, in their own words, almost everyone had taken the same elective courses. While to a non-trivial extent this may be outside of the Department's reach (due to various leaves, lack of faculty positions with respect to the desirable departmental target etc.), nevertheless, we believe that the Department should seriously consider a rotation of its elective offerings. This would serve to expand the horizons of its students and help them acquire a breadth of background that could be critical in their career path thereafter.

(b) Apparently, the Department is expending a considerable volume of resources in teaching a redundant number of courses in the different tracks in different sections and fully preserving the entirely non-communicative character of the two tracks. For example, courses such as Calculus I, or Linear Algebra (although in Statistics, Actuarial and Financial Mathematics Track this has a more applied flavor) or, for that matter, the first course of Statistics, are taught entirely independently between the two Tracks. While some of the faculty remain adamant that the different orientation of the two sets of students merits this complete separation, some of their colleagues admitted that the material covered in at least some of these courses has very serious overlaps (if not identical). In the current culture of progressively more scarce resources, the committee feels that it is in the Department's best interest to revisit this topic with a fresh view, aiming at an optimization of its resources and the consolidation of the relevant classes, if at all possible. All of us in this committee have seen this type of approach work very efficiently in numerous Universities elsewhere, without sacrificing the corresponding course quality. We thus encourage the Department to seek the (curricular, in this case) synergies that will increase its flexibility, versatility and ability to cover the high level of its students' demands, without sacrificing its curricular breadth, as is apparently happening at present.

GRADUATE PROGRAM

The Department of Mathematics is preserving at the Graduate Level the two M.Sc. Programs that the two former Departments had. In particular, there is a M.Sc. Program in the Mathematics Track, entitled: "Mathematical Modeling in the Physical Sciences and the Modern Technologies", while there is also a M.Sc. Program in the other track focusing on advanced studies in Statistics, Actuarial and Financial Mathematics. Below we comment on the two separate tracks.

Track of Mathematics

In the Mathematics Track, courses from different subgroups are used to reach a minimum of 21 educational units (typical advanced courses count for 3 such units, while topical courses count for 2 units and seminars for 1 unit) and the students also have to complete a M.Sc. thesis. The latter is most commonly not a research caliber project, but rather one of more "bibliographic" character, i.e., an exploration or reproduction of results of a recent bibliographic piece.

The topics covered in the Curriculum of this Program are fairly broad with a sufficient emphasis on Applications, per the degree's scope, but concurrently offering the ability to the M.Sc. candidate to visit advanced material in more pure or stochastic disciplines (such as Algebra-Geometry, Topology or Probability-Statistics). Both the students and the faculty seem satisfied with the breadth and depth of the relevant topics and the committee was satisfied too. Some faculty expressed the thought that a significant number of M.Sc. Theses come from quite theoretical topics, not really representing Mathematical Modeling. The committee found this to be partially true and indeed while this Applied Mathematics M.Sc. serves the needs of more applied-inclined students, a modern Mathematics Department should have a separate program towards an M.Sc. degree in Mathematics and a (possibly more professionally-oriented) degree in Applied Mathematics. However, and while such a

broader scope of the graduate program would be desirable, we are afraid that the local resources do not allow for this at present.

Track of Statistics and Actuarial-Financial Mathematics

Many conclusions reached for the Track of Mathematics as regards the M.Sc. program are applicable here as well. In particular, the curriculum of the M.Sc. Track, while more focused on perhaps the Actuarial and Financial aspects, nevertheless offers a diverse framework encompassing modern directions in the subjects of interest and works to the satisfaction of the students, faculty and of the committee.

Here, a fundamental difference is that the students pay a one-time nominal tuition fee of 1500 Euros for their participation in the program. The generated revenue covers a large number of critical needs, including the stipends of some doctoral students operating as teaching assistants in the program and some of the support material/staff of the program. Some incentives are given to top students to attend via the waiver of the corresponding fees (at the entrance stage) and through the payment of a stipend of 1500 Euros, upon exiting the program [this is done for the top two students at the entrance and exiting stage of the program].

On the contrary, it should be mentioned here that the Mathematics Track M.Sc. program does not request student fees. While in an ideal world the latter would be desirable and might render the program self-supported, it appears to be an untenable possibility in the current financial realm. At the same time, the ministry's support of the program has declined to almost 25% of what it used to be creating critical problems for the sustainability of the track. This meager investment (currently of the order of a few thousand Euros) had a major impact in the Track, enabling the organization of mini-workshops and bringing in outside visitors to expose the students to different perspectives and cultures, as well as the updating of software and related resources. Now, this is next to impossible, doing a disservice to the students and partially invalidating the tremendous efforts of both students and faculty. *The committee wishes to express its genuine disappointment regarding this state of affairs and hopes that the professed gradual improvement of the Greek economic indices will soon reflect itself in the quality of support of the tremendous educational efforts made in this Department and University.*

Doctoral Program

Quite unfortunately, the Department does not possess an organized doctoral program. There exist about 7 doctoral students in the Mathematics Track, and perhaps a bit over 10 in the Statistics and Actuarial-Financial Mathematics Track. Some of the students in both tracks are inactive or partially inactive. The meager number of students and the inactive status of some of them can be explained by the nearly complete lack of support of their studies.

Given the quality and dynamic character of the faculty of this Department, given their research efforts and the quality of instruction that they deliver (even under these highly adverse circumstances), it is very unfortunate that no organized doctoral program exists. We urge the Department to do its best to create/support such an organized program either through seeking funding through ESPA packages, or through applying for funding to the European Union. An example of recent success is the Archimedes Center founded at the University of Crete's Applied Math Department a few years ago to establish itself on the map of doctoral programs. In our opinion, an organized and sustainable Doctoral program that would promote both its research and educational mission is a real must for a competitive, strong and healthy Mathematics Department. This is one of the MAJOR directions where this external study found that there are efforts needed on the side of the Department. In addition, we felt that the current structure of doctoral degrees is really lacking in many ways as regards the quality of education of the corresponding doctoral students. For instance, if someone is interested in a Ph.D. in pure mathematics, the few courses in that direction of the Mathematics Modeling M.Sc. are inadequate to provide this student with the needed background. Given this and other deficiencies of the current structure in place, the committee strongly feels that one of the principal axes of future self-study, planning and mobilization of the departmental efforts should be geared towards the creation of a doctoral

degree commensurate to the high quality of its current faculty.

It may be worth mentioning that we became aware of the new program Ipatia by the University aiming at the support through Fellowships of a few top graduate students towards the Doctoral Program. We applaud this effort, yet note that its minimal present character (4 fellowships for the entire School of Natural Sciences of the University) should be rapidly expanded to facilitate the attraction and retention of some of the high caliber students who are interested in a doctoral degree from the Department.

B. Teaching

The teaching of the Department contains a very significant number of success stories, but also a considerable number of weaknesses, some of which are systemic and which will be briefly analyzed here.

On the one hand, there exists the very positive aspect of a closely knit department, where despite the high (and ever increasing) student-to-faculty ratio, the undergraduate students feel the genuine interest, care, accessibility, helpfulness and stimulation towards learning that their professors offer. This viewpoint was very passionately communicated to us by both undergraduate and graduate students alike, who amply confirmed the availability of their instructors, the usefulness of their office hours, their own feeling-at-ease to ask their instructors to help with any problems they face. The point was also clearly made by the instructors/professors who communicated how much this remoteness and smallness of this community has brought them close together with their students and has created this strong and enviable bond that obviously facilitates the educational process, helps its effectiveness, and mitigates the unimaginable obstacles mentioned below.

It is worth stressing once again that the sources of a significant number of problems related to teaching reside outside the Department. On the other hand, there are some obvious problems that can be addressed at the departmental level.

(1) The current volume of students and their continuous increase is clearly untenable. The volume of students has been steadily increasing in the undergraduate program over the past few years, presently reaching the truly staggering number of almost 1000 students in the Track of Mathematics and over 550 in the Track of Statistics, Actuarial and Financial Mathematics. The number of graduating students over the past 4 years has been fluctuating between 35 (in 2010-2011) and 70 (in 2012-2013), with the number of incoming students being higher than double that number. This is clearly a situation that needs to be addressed and this trend needs to be stabilized, while the number of students has to be significantly reduced. Here there are some non-trivial systemic issues and additional parameters:

   a) The law about inactive (so-called "αιώνιοι") students must be vigorously applied. This would eliminate students beyond the interval of 6 years and would genuinely force the students to focus and limit the interval of their studies. It would also significantly bring down the number of active students in the Department.

   b) The faculty members of the Department seem to feel that the growth mentioned above is due to the fact that the Ministry of Education has consistently ignored their suggested numbers for incoming student classes by allocating whichever number its officials deem politically appropriate (without properly assessing the needs and capacity of the Department for instruction). While this is a sad practice on the side of the Greek State and must be stopped, we cannot overlook the fact the Department has been asking for a larger number of incoming students than it could meaningfully accommodate (in partial fear that if they ask for too few students, the ministry might find a lesser reason for their overall existence). Clearly these are pathologies that need to stop and on the one hand, the Department must be asking for the number of students that it can properly instruct given its significant limitations in resources (personnel and material-wise), while on the other hand, as regards the Greek State, it is about time to start respecting that request. This increasing number of students and the ballooning of the duration of studies (currently e.g. at the evidently unacceptable mean of 6.12 years at the Mathematics Track!) are doing a disservice to the students and the educational process, not to mention the tremendous efforts of the faculty and staff. There must be some *drastic* measures to cease this untenable inflation, and the Department must do its part in this effort.

c) An important and strongly evident (by looking at the Tables) problem concerns the numbers of students who take a course on a given semester versus the number of those who take the final examination, and perhaps most importantly, the often-minimal fraction of students that pass the course. It is unclear to us why less than 60% of the students who sign up for courses appear in exams. We surmise that this relates to the issue of inactive students mentioned above. However, among the students taking the exams, the common success rates of below 30% and even the sometimes staggering success rates of 10%, as well as the extremely low average grades of the students graduating with the Mathematics degree (from either Track!), we feel should greatly trouble the Department. The easier road is to blame everything else — and indeed, there is a lot of blame to be assigned. Yes, the ministry provides every year a larger number of students than can be properly educated by the Department; yes, the crisis has hit hard the Greek families, including many of the families of current students who can barely afford to live in the island and away from their homes; and, yes, many of the students only come to the exams just to give their signed blank sheet, but how can the Department facilitate the learning process despite all these handicaps?

(2) The students clearly felt that in most courses the instructional process has been both efficient and effective, and that their instructors go above and beyond what they can do to help them. But, it is also evident that in some classes the same instructor was used without rotation for a few years, and they strongly felt that such rotation would be beneficial. In addition, they felt that for some of these courses, the material taught was way over the norm of other comparable courses and made it extremely difficult for them to follow at a regular pace.

(3) The students also clearly seemed to concur with the committee's recommendation that midterm exams should be implemented. They felt that some effort to apply such a system and coordinate it between instructors of the same term would substantially benefit their learning process and facilitate their comprehension of the material by breaking it in smaller units/building blocks of mastered syllabus, moving more gradually from more elementary to more advanced such blocks. While some of the faculty seemed somewhat resistant to such a process (because, for instance, it might decrease the attendance of other concurrent courses), both the input of the students and the experience of the committee suggests that considering instituting such one or more midterm exams would be a significant plus to the educational procedure.

(4) The committee also proposes that the Department attempt to use more broadly the system of homework. This is only applied to very limited courses, to our understanding. The reason is partially obvious: there are scarcely the resources to teach the courses and with the ever-increasing enrollments and teaching loads, it is hard to imagine juggling also a continuous exercise preparation and grading process. To that effect, the committee feels that exploring electronic homework platforms, especially open and fairly broadly used ones, such as WebWork might provide major advantages in that such grading or other similar overhead is absolutely minimized. WebWork (http://webwork.maa.org/), as its website explains: "is an open-source online homework system for math and science courses. WebWork is supported by the MAA and the NSF and comes with a National Problem Library (NPL) of over 20,000 homework problems. Problems in the NPL target most lower division undergraduate math courses and some advanced courses.   Supported courses include college algebra, discrete mathematics, probability and statistics, single and multivariable calculus, differential equations, linear algebra and complex analysis." We very much think that such an attractive, open, continuously updated and with minimal overhead type of platform might present substantial benefits to a Department with scarce resources but which actively wishes to use e-learning to improve its educational process.

The preceding undergraduate teaching issues affect both tracks within the Mathematics Department.

Graduate Teaching

In the M.Sc. Programs, teaching is again well received. It is clear (from both sides) that in addition to the high quality of instruction, there is a strong link and a common well-served scope shared among the Professors and the graduate M.Sc. students in both tracks. In addition to the high quality of the instructors, the students highlighted the significant efforts made by many faculty members to organize summer schools and other such additional activities that have facilitated and broadened their exposition to their research subject.

Most of the problems again here were attributed to the clearly unacceptable level of infrastructure supporting such a commendable effort (and which will be detailed below). Moreover in the Statistics and Actuarial-Financial Mathematics track (which is also essentially self-funded), the rates of graduation and completion time for the program appear to be quite good. In the Mathematics track, there appears to be a decreasing number of graduating students, despite the steady number of incoming students, again a trait that increases the average graduation time. This has been attributed by the faculty to systemic reasons again, namely the completion of the courses and subsequent potential departure or even eventual dropout of the students due to financial reasons or due to finding a job etc. Whatever the reason (and while some further examination of this decreasing rate of graduation in the Mathematics Track is needed), the quality of instruction in the M.Sc. program appears to be both well received and successful. Moreover, despite the scarcity of relevant data about post-graduation employment (an aspect that we would strongly advise the Department to make a conscientious effort to amend), it is clear that such a graduate degree has been significantly beneficial to a multitude of recent graduates.

An aspect that the students (including doctoral ones) felt should be enhanced — and we very much agree — to the extent possible, concerns the international character of the program. This might involve the possibility for students to attend a meeting or spend a semester abroad, practices that would significantly enhance their educational experience. Apparently such funds are essentially absent (even for faculty members, as we understood), severely hampering the learning, exchange and professional development of junior mathematicians. In this direction, some modest funding, if not by the Greek State, then by the Research Account of the University could go a really long way.

In conclusion, it seems that a very high quality effort is being conducted by the Department, under highly adverse (facility and infrastructure) conditions that are not consonant with the premise and scope of a major research and teaching institution of higher learning. This was impressed upon the committee by the commitment and genuine interest and care of the faculty, by the enthusiasm and support of the Program by the undergraduate students, by the interest and involvement of the M.Sc. students, and the unheard of (in our institutions) dedication of the (unfunded) doctoral students. It was even conferred by numerous graduates of the institution that took the time and effort to meet with us late in the evening after their demanding job schedule. They uniformly praised the efforts of the department both back when they were students (through a M.Sc. thesis on subprime mortgage crisis conducted well before 2008 (!) of a current bank employee, or through the critical way of thinking developed through his degree years by a current air traffic controller) and even today (through the synergies in chess learning between local junior high and high schools and the University or a Math Club that high school teachers and principals of the island are involved in jointly with the Department). A side product of this meeting was the relevance of and interest in the exploration of attracting gifted high school students to attend lectures at the University. We would encourage the Department to look into that as a part of its multi-faceted educational and community contribution mission, in spite some obvious bureaucratic obstacles.

We were genuinely impressed with what the Department does with such scarce resources and with what it offers to the local community in terms of additional services, an aspect that will be further discussed below.

C. Research

The Department has two tracks: (1) Mathematics (to be referred below as MATH), and (2) Statistics and Actuarial-Financial Mathematics (to be referred below as ΣAXM).

Research in MATH covers a broad spectrum of mathematical areas which can be grouped in six general areas:

1)
- Hyperbolic Groups, Geometric/Topological Groups
- Hyperbolic Geometry, Geometric Topology
- Differential Geometry

2)
- PDE
- Fluid Mechanics
- Dynamical Systems
- Numerical Analysis

3)
- C* -algebras, Operator Spaces
- Functional Analysis, Operator Theory
- Lie groups, Harmonic Analysis

4)
- Topology, Set Theory
- K-Theory, Spectra on Graphs

5)
- Convex Geometric Analysis
- Mathematical Physics, String Theory, Quantum Field Theory
- Cryptography, Coding

6)
- History of Mathematics, Education

Research in ΣAXM covers broad areas in statistics and mathematical economics – ranging from very applied to theoretical. There are two main directions of research; one is in Statistics, the other in actuarial sciences and financial mathematics (actuarial-financial mathematics). The statistics direction includes Biostatistics, Biomedical Statistics (Survival Analysis, Analysis of ROC Curves with Applications to Biomarker Identification, and issues in the Analysis of Medical Data), Experimental Design and model selection problems, Time Series Analysis, Contingency tables analysis (cross-sectional with the actuarial-financial mathematics research direction), Risk Theory (with applications to engineering and insurance sciences), Bayesian and non-parametric Bayesian Statistics, Reliability theory, and Environmental Statistics.

The area of Actuarial-Financial Mathematics includes Mathematical Economics, Stochastic Differential Equations, Probability (Queuing Theory and Extreme Value Theory), and Economic Demography.

In both tracks, the main policy and objective in research is to encourage publications in high quality journals and to use such scholarly activities in evaluating promotions. For faculty appointments and promotions the Department follows standards set by the University rules. Regarding the process of promotions, the EEC understands that the Department carries out this process within the confines of the national law. However, the committee did not see any evidence of strategic efforts by the Department toward the identification of excellent faculty members and the facilitation of their promotion, so that it increases the possibility of retaining the best people. As we suggest in Section F, the Department needs to develop internal mechanisms that assess the performance and progress of starting and mid-career faculty, and act timely to avoid the loss of strong faculty to other institutions. For example, following a well-established practice in top research universities, the Department may require the submission of an annual faculty report.

Concerning the selection and research of doctoral candidates: The two tracks have slightly different admission criteria for choosing doctoral candidates and for following their research activities, but the basic strategies are similar and their procedures are adequate. In the EEC's view both tracks have produced good quality doctoral students.

 Members of the Department publish in some of the top journals in their fields and this is commendable. Both tracks make a great deal of effort (despite the limited resources) to organize international conferences and workshops as well as summer schools. This is not only a great service to mathematical sciences, but also makes the department more visible. The EEC also notices that in contrast to what normally observes in many departments (nationally and internationally), all the members in both tracts are active – though some members are only minimally active. There is a satisfactory collaboration among members in the same tract – but minimal collaborations across tracts. The EEC believes that the there is a great deal of potential for collaboration across tracts and further potential within each tract that needs to be explored by members that have overlapping interests. This would be beneficial to both tracts and the research environment in the Department. There is a satisfactory level of international collaborations by many members in both tracts. For example, members of the Statistics and Actuarial-Financial Mathematics track collaborate with research institutions in Greece (such as the Michalinion Pediatric Development Center in Athens) and abroad (such as The Swedish Meteorological and Hydrological Institute, Sweden and the Medical Center of the University of Connecticut, U.S.A.), while in the Math Tract, there exist collaborations with top academic institutions in Greece (such as University of Athens and the National Technical University of Athens), as well as abroad (Europe, US and Australia). Furthermore, Statistics and Actuarial-Financial Mathematics track members have collaborations with other

departmental units in the University of Aegean, such as the Department of Environmental Studies, the artificial intelligence researchers of the Department of Cultural Technology and Communication Systems and the Information and Communication Systems Engineering Department. However, the EEC feels that international and cross-tracks collaboration should not only be increased but also should be targeted towards attracting funds both from within Greece and the European Union. Current external funding both for student fellowships and for research is minimal.

Faculty in both tracts have good recognition and are highly qualified to participate in international conferences. But there is a total lack of State and University funds for travel and conference participation of faculty and students. Research suffers also from inadequate research infrastructure. There is an excellent library of the School of Natural Sciences in Samos supported by a highly qualified library staff, but the limitation of State and University funds for the library is a big obstacle in extending the collection of academic journals and books. Computer labs have both window based and LINUX based operating systems, and the technical staff of these labs is highly dedicated and qualified. But the computational facilities are inadequate because of the number of the students being so large relative to the size of the labs. The EEC feels that the situation is critical and that the State (and the University) should make a serious effort to address the problem.

The recent hires by the two tracks are very strong. And most of the faculty are highly active and have excellent visibility individually. But both tracks, especially the MATH track, lack the existence of particular groups with a critical mass that would make the Department the "place to be" in this or that particular area. The EEC recommends that future hires should be chosen with the aim of strengthening a small number of areas that could become the identity of the Department.

D. All Other Services

A. Staff Administration and Support

The administrative staff is quite good. It consists of 5 members: a chief secretary that works closely with the chair of the Department; two secretaries for the Mathematics track; and two secretaries for the Statistics track. Both the faculty and the students were highly praising the secretarial staff. For example, the student told EEC that the secretaries were always available for assistants both directly and by telephone. The students also stated that even their parents were impressed by the interactions they had with the secretaries. The secretarial staff indicated that one of the most difficult part in their work is the lack of sufficient classroom space and this makes classroom assignment particularly difficult.

The EEC completely agrees with the staff and strongly suggests that the State should address the space problem in a serious way. The secretarial staff also suggested that an online system should be introduced for registration and for announcing the grades. The EEC is happy that the University has plans for doing exactly that.

B. Information Technology Labs

The EEC visited the two teaching computer laboratories. The labs have a number of PCs and the availability of both window and LINUX based operating systems. The technical staff for the lap is highly qualified and does a dedicated work. But the number of PCs is small relative to the number of students, and so is the physical space of the labs. EEC feels that it is very important that the University and the State address these issues.

The Department has a web site both in Greek and in English, but the information on the web site, especially from the point of providing complete information about the faculty (their scientific interests, their backgrounds, and scientific activities0) needs to be improved.

C. Library

The EEC visited the School of Sciences library. The Library is housed in a renovated 1903 neoclassical building. While the building is quite beautiful it is not big enough to cover the needs of the School of Science. In addition to science books (mathematics, statistics, and computer science) has a very nice private collection donated by Panayotis Magiras – a well-known mathematics scholar from the 1920's. The library seems to be complete in terms of books but there are several problems in terms of electronic access to journals due to delayed payment of subscriptions by the Heal Link consortium. It is of the highest importance that the Greek Government pays the dues to the various Publishers on time so that the Universities all over Greece have uninterrupted service -- a service which is essential in carrying out research activities effectively.

D. Buildings for Classrooms and Faculty/Student Offices

The various buildings of the Department are scattered around the town of Karlovasi – the distance between buildings is around 2.5 kilometers. This creates a serious problem for students that have consecutive classes in such distance. This problem is amplified by the fact that there are not sufficient plans to pay for transportation buses. In addition to this problem, the buildings are very old and in quite bad condition. During our visit the various classrooms and offices lacked heating, resulting in temperatures close to freezing. Students, administrators and faculty members complained about the lack of space that makes teaching

and work in general very difficult. There is a serious shortage of space for classrooms and offices. The Department is in need of at least a large amphitheatre to serve the needs of the compulsory courses, especially for the first two years. The Committee feels that it is a disgrace that the government of Greece and especially the Ministry of Education allows a University to operate under such miserable conditions

E. Student Housing

We received some complaints from students about housing and food. The current number of student dormitories and allowance for food is very limited and it covers only a small portion of the student population that does not have the means to support itself.

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

Departmental level inhibitory factors together with the Department's proposal and EEC's recommendations for overcoming them have been addressed in previous sections, as well in Section F below. Here we focus primarily (but not exclusively) on State level inhibitory factors – factors that in our opinion need to be seriously addressed in order for this high quality department to attain its full potential and become an outstanding center for mathematical/statistical sciences research and education within Greece and be competitive in the international arena.

1. An issue of particular importance that the EEC wishes to discuss is the recent merger of the former Departments of Mathematics with the former Department of Statistics and Actuarial-Financial Mathematics. In the committee's opinion the merger makes no sense, if one takes into account the circumstances of the birth of these departments, their overall goals, and the scientific areas they represent. While, in principle, one could envision the merger of a department of mathematics with a department of statistics, such a merger would be contrary to current trends in educationally advanced countries. Even more to the point, this decision ignored the particular circumstances associated with these departments. The Department of Statistics, Actuarial-Financial Mathematics was created in 2000 in order to fill a specific need, namely the creation of the first regional department that combined statistics together with actuarial science and financial mathematics. Consider the following description of the objectives of the Department from Εφημερὶς της Κυβερνήσεως (Τεύχος Πρώτο, Αρ. Φύλλου 72):

   Το τμήμα της Στατιστικής και Αναλογιστικής Επιστήμης την καλλιέργεια, προαγωγή και μετάδοση της γνώσης, με τη διδασκαλία και έρευνα, στο γνωστικό πεδίο της στατιστικής και της αναλογιστικής επιστήμης και την κατάρτιση επιστημόνων οι οποίοι χρησιμοποιώντας σύνθετες μαθηματικές μεθόδους, ιδίως της θεωρίας των πιθανοτήτων, με μεθόδους άλλων επιστημών, ιδίως οικονομικών, μπορούν να εκτιμήσουν επιχειρηματικούς κινδύνους ἠ να πάρουν αποφάσεις για την τιμολόγηση αγαθών και υπηρεσιών ἠ να καταρτίσουν ασφαλιστικά, χρηματοδοτικά ἠ συνταξιοδοτικά σχέδια ἠ να προτείνουν επενδυτικές στρατηγικές με στόχο την αποδοτικότερη λειτουργία του κοινωνικοοικονομικού συστήματος. Οι πτυχιούχοι, έχουν ως κύριο αντικείμενο ενασχόλησης τη συγκέντρωση και ανάλυση των απαραιτήτων στοιχείων για την εξακρίβωση, διερεύνηση και εκτίμηση των οικονομικών επιπτώσεων που μπορούν να έχουν διάφορα αβέβαια γεγονότα όπως ασφαλιστικοί κίνδυνοι, δημογραφικά δεδομένα, οικονομικά μεγέθη, τεχνολογικές εξελίξεις ἠ οποιοδήποτε συνδυασμός όλων αυτών, ιδιαίτερα κατά τη διάρκεια μακροπρόθεσμων χρονικών διαστημάτων. Οι πτυχιούχοι μπορούν να

απασχολούνται, ως στελέχη, ερευνητές ή οικονομικοί σύμβουλοι σε φορείς του δημοσίου και ιδιωτικού τομέα όπως δημόσιες υπηρεσίες, επιχειρήσεις, οργανισμούς, εργατικές ενώσεις, τραπεζικά ιδρύματα, κοινωνικές ασφαλίσεις, ασφαλιστικές ή χρηματιστηριακές οικονομικές μονάδες, νοσοκομεία, επιχειρήσεις συγκοινωνιών και τηλεπικοινωνιών, σε εταιρείες πληροφορικής για τη δημιουργία λογισμικού σε αναλογικές μελέτες ή τέλος ως ελεύθεροι επαγγελματίες, για παροχή υπηρεσιών. Οι πτυχιούχοι μπορούν να αποκτούν την άδεια άσκησης του επαγγέλματος του αναλογιστή σύμφωνα με τις κείμενες διατάξεις (Ν.Δ. 400/1970, και Π.Δ. 56/1995).

Such a description refers to a department that is scientifically closer to a department of economics or business administration rather than a department of mathematics. In addition, the graduates of this department were employed mostly as economists and statisticians in financial institutions, such as banks and insurance companies, which require a degree in statistics or actuarial-financial mathematics for employment. On the other hand, the former Department of Mathematics is a traditional department whose research focus has almost an empty intersection with that of the other department. The point the committee wishes to stress here is that this unnatural merger of the two former departments will negatively affect their ability to attain their research and educational objectives. To this end, we propose that the present tracks within the Department be separated as independent departments as soon as the circumstances allow it. Their separation will enable them to streamline their research and educational products and focus on activities that have distinguished them, including their outreach efforts with the local community.

2. The Department itself is essentially not a Department but almost a whole large campus, given the spatial distribution of its buildings—the distance between some of the buildings that house the Department is of the order of 2.5Km. Housing the Department in a single building (or in a single location consisting of a limited number of buildings) would go a long way towards facilitating both the work of the faculty and the efforts of the students. The transportation of the students who may have one class in one building and the next class in a distant building is further complicated by the embarrassing fact the there are no funds to pay for buses to transport the students.

3. The current space available to the Department is more than just inadequate. In some classes the students are "hanging" over the doors and balconies due to the fact that often classrooms are extremely overcrowded. In addition to the physical space, there is no heating during the winter. Student stories about attending classes in extremely cold classrooms were a common theme in our discussions with them. We witnessed a bit of this problem ourselves in one of the classrooms where the Department presented its documentation during our site visit. It is incomprehensible – if not disgraceful -- that these problems occur at an educational institution –especially in a department of high caliber.

4. The student residences, and even their food, are also highly embarrassing. The demand for student housing is (because of the law's cutoff income) double than the currently available space. As a result, numerous students cannot make ends meet and interrupt their studies. Clearly this has serious implications about education in Greece. The neglect of support for students is also reflected in various other problems such as the lack of paper to write their exams – even the lack of markers to write on the board. These problems have serious direct educational consequences, and indirect ones on the Greek economy and international economic competitiveness. Additionally, often textbooks for many courses arrive more than two months after the semester begins.

5. Both the faculty and doctoral students indicated to the EEC that their research is often impeded by the fact that subscriptions for journals and books are often interrupted for indefinite intervals of time. This inexcusable.

6. The EEC feels that the number of students entering the Department needs to be seriously addressed for the Department to attain a high quality education. Currently, the number of students the State requires the Department to accept is considerably larger than the number of students requested by the Department. This practice should be terminated because its implication on the quality of student education is huge. Moreover, the EEC feels that the number of students requested by the

Department is high relative to the department's manpower. EEC recommends that the Department make a serious effort to alleviate the problem, by addressing the following points:

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- In addition to requesting a more suitable number of incoming undergraduates, the Department must take a close look at the ``bottleneck'' courses. These are courses with huge enrollments and minimal (10-30%) success rates. A potential rotation of instructors and a potential allocation of some of the demonstrably efficient instructors in such classes could help reverse this trend which prolongs the duration of studies and lowers the average graduation grades. In addition, the coordination and collaboration of the faculty teaching courses in the two current undergraduate tracks could considerably help economize resources (e.g. by teaching only one version of courses such as Calculus I) in a time where they certainly do not abound. This would also help enhance the breadth of the undergraduate curricular offerings on any given year.

- The Department needs to seriously look into how to change the way it is instructing its students in order to harmonize itself with both modern tools of computationally-assisted instruction, as well as with the need to help its students acquire a better/more organized grasp of the material. While instruction itself is quite efficient, the system of a single final exam is rather antiquated and demonstrably less helpful. The use of midterm exams and possibly even of electronic and systematic homework would force students into a weekly routine and pattern of continuous learning effort, would improve, in our opinion, their grades and strengthen their understanding. In all these respects, we believe that this would be a helpful practice for the students and for their future perspectives.

- The Department needs to closely look into the possibility of creating an organized doctoral program. The current structure is doing a disservice to the students from the point of view of either the available offerings (especially e.g. for more Pure Mathematics oriented students) and from the point of view of the near-complete absence of support of the doctoral students. Such students represent a vibrant and critical contribution to any research oriented modern Mathematics Department. In that light, the absence (or extremely limited existence) of such a program clearly detracts from the proper realization of the Department's full research potential. The Department has to try to seek the seed funding resources from either within the University or externally (e.g. from the EU) in order to institution such a program in our view.

- Another major direction of potential future improvement, especially so for the faculty associated with the former Department of Mathematics (there is more activity in the Statistics, Actuarial and Financial Mathematics Track, although there too this activity could be significantly enhanced), is that of attracting external funding. The faculty members need to appreciate the importance and (in the current setting) urgency of deploying their efforts towards building synergies both within and outside the University that would optimally place them towards obtaining such funds. This would strengthen their research efforts, enhance their doctoral program, enable them to become as visible as their research suggests they should be and overall achieve the potential that the committee can clearly discern they have. We cannot over-stress the importance of such an effort, especially in the current fiscal climate. Given that opportunities have arisen especially in the last few years (through the programs Thales and Aristeia I and II), the Department members we believe should continue to vigorously seek to take advantage of such opportunities.

F. Final Conclusions and recommendations of the EEC

- Since their creation as separate departments, the two tracks in the current Department of Mathematics have contributed in an essential way in education, research, economic wellbeing, and society in general. We propose that the present tracks within the Department be separated as independent departments as soon as the circumstances allow it. Their separation will enable them to streamline their research and educational products and focus on activities that have distinguished them, such as their outreach efforts with the local community.

- There is a serious shortage of space for classrooms and offices. The Department is in need of at least a large amphitheatre to serve the needs of the compulsory courses, especially for the first two years. The Committee feels that it is a disgrace that the Greek government, and especially the Ministry of Education, allows a University to operate under such miserable conditions. We propose that the appropriate steps be taken to improve this serious shortcoming.

- The Department needs to re-examine its undergraduate offerings and their delivery, and facilitate and promote interaction between the two tracks.

- There must be a dramatic reduction on the number of students in the Department, and the Department must do its part in reducing the number of incoming students. Further, it needs to apply vigorously the law about inactive students (so-called "αιώνιοι φοιτητὲς"). Adherence to the law would eliminate students beyond the interval of 6 years and would genuinely force them to focus and limit the time of their studies.

- Given the quality and dynamic character of the faculty of this department, and given their research efforts and the quality of instruction that they deliver, it is very unfortunate that no organized doctoral program exists. We urge the Department to do its best to create/support such an organized program either by seeking funding through ESPA packages, or by applying for funding to the European Union.

- We also urge the Department to seek the synergies and collaborations, as well as to invest into the efforts that will leverage its broad and diverse research strengths towards attracting significant extra-mural funding. It is clear to us that in the present fiscal climate of meager State support, this is a quintessential step for the Department, if it wants to continue its research growth and overall upward trajectory.

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AEGEAN UNIVERSITY

DEPARTMENT OF MATHEMATICS

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