



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

**Α.ΔΙ.Π.**

**H.Q.A.A.**

ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ ΠΟΙΟΤΗΤΑΣ

HELLENIC QUALITY ASSURANCE AGENCY

ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

FOR HIGHER EDUCATION

## **EXTERNAL EVALUATION REPORT**

DEPARTMENT of MATHEMATICS

UNIVERSITY of CRETE

December 2011

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### External Evaluation Committee

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

1. Professor Vasilios Alexiades \_\_\_\_\_ (Coordinator)  
University of Tennessee \_\_\_\_\_
  
2. Professor Pantelis Damianou \_\_\_\_\_  
University of Cyprus \_\_\_\_\_
  
3. Professor Nikolaos Limnios \_\_\_\_\_  
Université de Technologie de Compiègne \_\_\_\_\_
  
4. Professor George Michailidis \_\_\_\_\_  
University of Michigan \_\_\_\_\_
  
5. Professor Christodoulos Sophocleous \_\_\_\_\_  
University of 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 External Evaluation Committee (EEC) arrived in Crete on November 28<sup>th</sup>, and had an initial meeting with the Vice-Rector for Academic Affairs Prof. Tzanakis and the Chair of the Department Prof. Antoniadis. During this meeting a preliminary introduction to the University of Crete and the Department of Mathematics was made.

The following day, November 29<sup>th</sup>, 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. Antoniadis, followed by:
2. A presentation of the Department’s Undergraduate Program by Prof. Kourouniotis
3. A presentation of the Practical Training and ERASMUS programs by Prof. Garefalakis
4. A presentation of the Graduate Program by Prof. Papadopoulou
5. A presentation of the Joint Interdisciplinary Program "Optics and Vision" by Prof. Taroudakis
6. Presentations by Professors Kouloutzakis, Athanasopoulos and Tertikas of the research activities of the Analysis, Algebra/Geometry and Applied Mathematics/Statistics divisions of the Department, respectively.
7. Presentation of the collaboration with FORTH by Prof. Taroudakis

There followed:

8. Individual meetings of the EEC members with 23 faculty members (including Visiting 407 ones)
9. A meeting with the administrative and technical support staff
10. A meeting with some graduate students (5 M.A. and 1 Ph.D.)
11. A meeting with 22 undergraduate students

Finally, the EEC visited the campus cafeteria and sampled its offerings.

On Wednesday, November 30th, the EEC visited the future home building of the Department in the Voutes campus, followed by a visit to the athletic center. The EEC also visited various classrooms, and attended presentations of the Department's library operations by Ms. Vitsaxaki and of the Computer Labs by Mr. Vitsakis. The visit closed with a meeting with the Chair and selected faculty members (Professors Kourouniotis, Papadopoulou, Taroudakis, Tertikas, Tzanakis), during which the EEC shared with them some preliminary observations. The EEC started its deliberations shortly thereafter.

The Committee examined the following documents:

1. The Departmental Internal Evaluation Report (December 2009)
2. The Department Course Guide (Πρόγραμμα Σπουδών)
3. The detailed weekly course schedule for the Winter 2011 and Spring 2012 semesters
4. The Departmental Research Publication record
5. Electronic copies of all the presentation material detailed in items 1-7 above
6. Samples of educational material, including instructors' course notes, Ph.D. theses
7. The Departmental website

The EEC was provided with all relevant data and additional documentation in a timely manner. It would also like to acknowledge the quality of their internal report that provided a comprehensive overview of the Department's activities up to 2009, as well as the excellent job the Department did in preparing for the visit by the EEC. Nevertheless, the EEC would like to point out that some faculty members did not participate in the process.

In closing, the EEC would like to thank the Chair Prof. Antoniadis and faculty members for their eagerness to provide it with input, share their thoughts and plans about the Department and for their kind hospitality.

## **A. Curriculum – Undergraduate Program**

*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?

The curriculum of the Department aims to offer its students a comprehensive mathematical education to allow them to pursue diverse careers that require an enhanced ability for analysis and quantitative reasoning, as well as prepare them for graduate studies in mathematics and its applications. It consists of a core (approximately 5 semesters of coursework) and a large number of elective courses, organized in groups. The first group comprises of advanced mathematics courses, the second group of courses offered by the School of Natural and Technological Sciences (e.g. Computer Science, Physics) and the Department of Economics and the third one by other Departments of the University. Courses belonging to the first group are further organized into subgroups, reflecting different directions in mathematics (algebra, analysis, geometry, discrete mathematics, numerical analysis, probability and statistics, modeling and optimization, etc.). Further, the study guide offers two sample curricula for students interested in pursuing graduate studies or teaching careers in secondary education. Finally, the program offers the option of an undergraduate thesis.

The cornerstones of the curriculum are to provide solid mathematical foundations in calculus, analysis and algebra, together with a wide range of more advanced/specialized courses. It is characterized by a high degree of flexibility (with approximately 40% of ECTS units required and 60% of electives) in selecting directions and courses, which coupled with the possibility of taking courses in other departments is rather unique amongst Greek Universities.

The offered curriculum is consistent with its stated aims, as well as broader societal requirements.

The curriculum is continuously monitored by a standing committee that proposes revisions to the full faculty. Since the Department started its operations, the curriculum has undergone several major revisions, the last one taking place in the time period 2006-09. Hence, the Department has been responsive to new scientific developments, demand for directions/courses by the students and the overall preparation level of the entering class.

## 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?

The implementation of the curriculum aims is effective. Its structure with core courses and advanced/specialized ones, coupled with the organization of the latter in groups and subgroups offer a clear organization, so that informed students can pursue the direction they are interested in. Further, the availability of sample curricula in the study guide enhances this clarity.

The curriculum is characterized by both significant breadth and depth. The EEC felt that the standards are very high, even higher than in comparable international curricula.

The structure of the curriculum is clearly articulated and fairly rational. However, the EEC, after examining the syllabi of many core courses felt that there is a certain degree of overlap and repetition. The Department could further streamline the structure by reorganizing some courses and potentially eliminate a few; the freed resources should be allocated to additional sections of core courses (e.g. calculus I, II, III, linear algebra I).

The EEC finds the curriculum coherent and comprehensive. However, as already mentioned the overlap in the material of core courses is certainly an issue. Further, advanced course offerings on a regular basis in directions where the Department does not have a critical mass of faculty is a concern.

The time allotted to course instruction (4 hrs/week), together with laboratory hours (2 hrs/week) for the core courses, is certainly adequate for covering the material in depth. In general, the material covered in each is appropriate. The availability and offerings of advanced special topics courses, although extremely stimulating and advantageous if adequately attended, may not be the best allocation of available human resources.

To a large extent, the Department has the necessary resources and qualified staff to implement the curriculum. The EEC would like to commend the Department for its decision to request a position in Mathematics Education to strengthen that direction.

## 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?

The Department's predefined educational goals and objectives are to date achieved at varying levels of success. A serious concern is that the failure rate in required core courses is quite high, thus resulting in slowing the progress of a large number of students towards their



degree. On the other hand, the EEC acknowledges that the level of preparation and interest in the subject of a significant portion of entering students is quite low (as outlined in the Department's internal evaluation report). It also understands that addressing this concern is a delicate issue since it impinges upon the academic freedom of faculty members. Nevertheless, the EEC would encourage the members of the Department to continue having unofficial and official (faculty meetings) discussions about this issue.

Another concern is that some required courses outside the Department are hard to take on time due to the existence of quotas for non-majors, thus slowing the students' progress.

The Department is aware of these issues and efforts have been undertaken by the Chair to address them to a large extent, although some faculty members have shown resistance.

#### IMPROVEMENT

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

The Department is cognizant that certain aspects of the curriculum require improvement. The position request in Mathematics Education would enhance the course offerings in that direction.

Continuous evaluation of the program should be continued.

Streamlining of courses should be undertaken, by redistributing material among fewer core courses if possible.

## ***B. Curriculum – Graduate Programs***

*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?

The Department offers two Masters programs, one in “Mathematics and Applications” joint with the Applied Mathematics Department and an interdisciplinary one with the Medical School, the Department of Physics and Materials Science in “Optics and Vision.”

The joint Masters Program titled “Mathematics and Applications” and administered by the Department of Mathematics has the following five tracks:

1. Theoretical Mathematics
2. Mathematical Modeling and Computational methods
3. Mathematics of Operations Research
4. Mathematical Foundations of Informatics and applications
5. Mathematics for Education

These five tracks offer students a large number of choices to continue their education in Mathematics and its applications. The goal of this program is to provide a solid educational in Pure and Applied Mathematics, as well as their applications.

Next, we give some context for the available five tracks.

Theoretical Mathematics is the most popular direction and best fits the expertise available in the Department. It provides an excellent background to students wishing to pursue a doctoral degree.

Mathematical Modeling and Computational methods aims to familiarize students with problems arising in the biological, engineering and physical sciences.

Mathematics of Operations Research aims to educate students in quantitative methods on problems in management sciences.

Mathematical Foundations of Informatics and applications draws heavily from discrete mathematics and algorithms and addresses problems in computer science.

Mathematics for Education is also a very popular track and aims to prepare students for pursuing careers in secondary education.

The interdisciplinary program “Optics and Vision” represents an excellent example of the importance of mathematics in biomedical sciences.

#### 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?

Regarding the first track, it is clear that it represents a core area of the Department and is supported by a good number of course offerings, thus ensuring its high quality. The second track represents a core area for the Applied Mathematics Department and is of high standards. The fifth track, despite its popularity, is characterized by fairly slim course offerings. On the other hand, the EEC strongly feels that the third and fourth tracks require improvements (see discussion below).

Finally, the “Optics and Vision” program is very well structured, popular and of high quality. In the EEC’s opinion, it could serve as a model for other interdisciplinary Masters programs involving mathematics.

#### 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?

The Masters program has been successful in graduating high quality students, with a cumulative output of 99 in the last 10 years, out of which 35 continued on with doctoral studies and 24 are employed as teachers. The “Optics and Vision” program has graduated 75 students (21 students alone this year).

Further, the Mathematics Education track has been successful in attracting high school teachers, thus contributing to the enhancement of secondary education in Greece.

The Department has also conferred 28 doctoral degrees in total. The EEC notes in particular that 18 Ph.D. graduates are currently in academia or research centers (13 in Greece and 5 abroad), an additional evidence of the high quality of this program.

At the Ph.D. level there is a graduate committee overseeing all doctoral students, in addition to the thesis advisor. The Ph.D. thesis is defended in the presence of a seven member committee; a requirement for the degree is the publication of part of the thesis in an international journal or the presence of a specialist in the area during the defence.

Finally, the EEC notes the great success of the Summer School run by the Department and encourages it to secure the necessary funding for its uninterrupted operation.

#### IMPROVEMENT

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

For the Mathematics of Operations Research and Mathematical Foundations of Informatics and applications, the EEC believes that these tracks could be jointly offered with the Computer Science Department. This would result in a stronger and more comprehensive program.

For the Mathematics Education track, the EEC believes that stronger collaboration with the Department of Education will be helpful.

Regarding the Ph.D. program, the EEC notes the dearth of financial support offered to students. It represents a significant impediment to attracting good students and negatively impacts the research achievements of the Department.

### ***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

A fundamental and unusual for Greece feature of the Undergraduate Mathematics Program is its flexibility. Only 40% of coursework consists for required Math courses.

The remainder 60% can come from recommended elective courses from Math and other departments, and 25% can be chosen freely.

Each course carries a specified number of ECTS units, varying from 6 to 8.

Teaching employs classroom lectures (four 45-minute lectures per week) and recitation/problem sessions (two 45-min sessions), as well as computer-assisted instruction in appropriate courses.

Teaching of most courses is rotated amongst interested faculty, much to the delight of both faculty and students.

A remarkable advising system is in place. Each entering student is assigned an advisor/tutor who can be consulted weekly (during the first year) about any aspect of student concern, including homework.

Resources seem adequate and well utilized. The Department maintains a very well organized and well run Computational Laboratory, which is heavily used for classes and projects.

Email and login access to linux servers is provided to all faculty, students and staff. All computing capabilities are provided by a single technical person who is Departmental staff.

The examination system is based on the traditional Final Examination at the end of the term, which can be taken again in September. However, many instructors have continuous assessment with, quizzes, tests, homework assignments or class projects, with the final grade based on overall performance. The student is entitled to inspect and discuss the fairness of grading with the instructor.

There is an optional Practical Training program, supported by a grant that can support up to 50 students, under which undergraduates can work Full Time for 3 months at the ITE or some company (bank, etc).

#### 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

Multiple resources, including free lecture notes and books, are distributed to the students in almost all courses. Many of these can be downloaded from the Mathematics Department web site. The content and level are similar to those in American and European universities.

The Department has taken measures to help with the worsening preparation of incoming students. It introduced an additional required course "General Mathematics" in the first semester to review high school material. Further, an unusual and innovative approach practiced at the Department pertains to "epistemological obstacles". For certain mathematical concepts which students usually find difficult to understand, e.g. convergence, uniform continuity, etc., the faculty conduct special sessions for detailed discussion and solving of exercises. The effort is very effective as feedback from students is very positive.

Teaching evaluations are filled out by students near the end of each semester, which is not a common practice in Greek universities. These are mostly for the benefit of the instructor as they are not yet processed statistically to reveal relative scores and trends.

The ERASMUS program provides opportunities for students to study for up to a year at another European university. However, few students (fewer than 5 per year) take advantage of this for various reasons, such as: language problems, difficulty in transferring credit due to incompatible course content, time pressures, etc.

## 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?

Clearly, the undergraduate program, including teaching, is well structured and well implemented.

Both undergraduate and graduate students expressed great satisfaction about the availability, accessibility, and friendliness of professors, who are eager to interact with students at any time of day (and often evening!). This is a very positive aspect of the Department.

In many courses, continuous assessment of students is practiced with assignments, quizzes, tests during the semester, in addition to final exams.

The course evaluation system by students, an innovation for a Greek university, shows the respect faculty have for student opinion. Most faculty members seem to appreciate and benefit from the feedback, but not all.

Practical Training: 12 participated in 2011. Limited placement opportunities exist during the summer which most students prefer. If done during the academic year, the student cannot attend classes.

The undergraduate Thesis option allows motivated students to get involved in research early on to prepare for graduate school.

Almost 40% of graduates go on to graduate school, while 75% are employed in secondary education, many of them after obtaining a Masters degree.

The advising system could be very time demanding on faculty, but few first year students take advantage, so the burden is not excessive.

The student/instructor ratio, 37:1 is rather high, imposing heavy grading load on instructors.

#### IMPROVEMENT

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

The failure rate is certainly excessive, especially in some core courses. As a result the percentage of students graduating in four years is low. The Department attributes it mostly to weak preparation of incoming students. However, a potential contributing factor, about which students complained strongly, is that final exams in some basic classes contain tricky questions and questions "out of the taught material". These issues should be discussed by the entire department to possibly offer some guidelines.

There is demand and need for more hands-on math education classes.

It was brought to the attention of the EEC that the programming course taught by the Computer Science Department presents great difficulties to the students. This may be due to the level of presentation and/or difficulty of exams, and should be looked into.

Some students may need better guidance in choosing elective courses according to their background and future plans.

Every possible effort should be made to continue funding of the Summer School since it greatly enhances the visibility of the Department and it provides potential graduate students.

## **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?

The research activities of the Department of Mathematics are organized along the following sections (**to me is**):

1. Algebra and Geometry with 10 faculty members
2. Analysis with 11 faculty members
3. Applied Mathematics and Statistics with 10 faculty members

We note that the research focus of the Applied Mathematics and Statistics section exhibits overlaps with the recently founded Department of Applied Mathematics.

The Department's members are involved in a number of research projects that cover all major areas of analysis, algebra, geometry, number theory, numerical analysis, differential equations and statistics.

Research represents one of the main objectives of the Department and activities of its members. The majority of the faculty (80% according to the internal evaluation report) is actively engaged in research. Part of the remaining 20% is currently making significant contributions to the educational mission of the Department. The EEC believes that this percentage represents one of the highest (if not the highest) among Mathematics departments in Greece.

The quality of research is of high standard as is evident from a number of factors, including the quality of the journals it has appeared in (mostly very good and occasionally the top ones in a particular field), the number of citations received, the ranking of the department by external agencies (i.e. Center for Higher Education Development) and by the overall visibility of the Department. There is collaboration with colleagues and researchers from other Departments (e.g. Applied Mathematics), the Institute of Applied and Computational Mathematics in FORTH), other national and international Universities and research centers.

The faculty is very active in participating, as well as organizing local, national and international conferences. It is worth mentioning the very successful Euro-conferences in Anogia village, supported by European Union funding. The number of research grants and projects secured by the faculty members is very satisfactory.

The EEC notes that due to current and future cuts in funding, the Department should intensify its efforts in pursuing research funding to ensure the international outlook of its members through faculty visits for collaborations and participation in meetings and conferences. The individual ERC grants, as well as the Framework Program ones represent such opportunities. Further, collaborations with researchers from other Departments offer additional possibilities.

The emphasis on research is also highlighted by the weight the Department places on it for hiring and promotion decisions. The EEC commends the Department for its adherence to the international practice of soliciting up to 6 external evaluation letters for such decisions.



Further, a number of quantitative measures of scholarship (e.g. non-self citations, h-factor) are collected and assessed.

The research activity is enhanced and complimented by the research of masters, doctoral and post-doctoral students. The Department was the first in Greece to establish a formally structured Masters and Ph.D. program. Unfortunately, lack of scholarships and other support funding together with bureaucratic hurdles and delays in release of funds limits the number of doctoral students.

Overall, the Department continuously strives for excellence in research since its establishment and despite numerous challenges has achieved remarkable results, summarized above.

#### IMPLEMENTATION

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

There is a strong research ethos in the Department. Further, the availability of weekly seminars in the three main research directions enhances its intellectual atmosphere. There are collaborations between members in the three groups and across groups, but there are also researchers that work individually. There is limited support for Ph.D. students and an inadequate level of research funding. The EEC feels that there is great potential for securing EU funding, especially through collaboration with other units within and outside the University.

The research infrastructure in the University is quite good. The computer facilities are very good, with each faculty office equipped with a desktop, printer and access to the necessary software. There is also a full time IT technician managing the computing resources of the Department. The library is also top quality providing access to a large number of books, online and print journals and electronic databases. At times, there are some problems with access to online resources due to late payments by the Greek government to the HEAL Link network.

The EEC observes that the faculty expressed a high level of satisfaction with the intellectual environment in the Department, the overall climate and the received support.

#### RESULTS

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

The EEC feels that the research activity of the Department is of great quality, clearly placing it in the upper tier of mathematics departments in the country. As discussed above, this is corroborated by the faculty publication record, the numerous research collaborations and the active participation in conference and workshops. The funded visiting “Pichoridis” position has been strategically used to attract top notch international researchers for longer visits to the Department.

#### IMPROVEMENT

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

However, there is room for improvement. Funding certainly represents a limiting factor, both in terms of supporting graduate students and attending conferences. Addressing this issue should be a high priority for the Department, but also for the main University administration and even the Ministry of Education.

Faculty not engaged in research ought to contribute heavily in the teaching, administrative and/or service efforts of the Department.

## ***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?

The Department employs 7 full time staff members (6 secretaries and 1 computer systems support administrator). The IT manager also maintains the comprehensive website and e-mail server of the Department. Further, a strong effort is made to keep the hardware reasonably up-to-date.

The secretariat of the Department processes most procedures electronically.

All graduate students are provided with office space. However, due to the working hours of the library, there is limited study space available to the undergraduate students after 3 pm. The upcoming move of the Department to the more spacious building in the Voutes campus would alleviate the latter problem. In principle, it should also enhance students' 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.

#### **(1) Secretarial Support and Staff**

The feedback the EEC received from both undergraduate and graduate students about the secretarial support was uniformly negative. The following issues were highlighted: (1) hours of operation of the Department office. In principle, the office is open to students only between 11.00-13.00, but according to the students these hours are seldom kept. (2) It was pointed out that the level of service received was not consistent, occasionally marred by errors. On the other hand, most faculty members expressed a high level of satisfaction about the professionalism of the staff and the quality of service received.

## **(2) Computer Lab**

The EEC visited the teaching computer laboratory. It is a large room with sufficient number of PCs used for classes requiring computer support. The computer facilities and support are overall very good, although funding constraints represent a limiting factor.

## **(3) Library**

The EEC visited the departmental library and attended a presentation about the services offered. This is the mathematical section of the central University library. The library is one of the most complete in Greece, offering high quality services (see discussion under Research). The short operation hours (8.00 am to 3.00 pm) was identified as a serious problem. The Department as well as the University should ensure that the library in the Voutes campus stays open during evening hours, as well as weekends.

## **(4) Buildings-Offices-Classes-Cafeteria**

The current building of the Department is very old and not in the best condition. Fortunately, the new building is near completion and the EEC believes that a great deal of problems will be resolved in the near future. The new building is spacious, with adequate availability of parking places, big classrooms equipped with visual equipment, numerous offices, reading and conference rooms, modern auditoriums and a cafeteria.

## **(5) Student Housing**

We received a number of complaints from students about housing and food. The current practice of renting hotel rooms at the cost of about 600 euros per month per student is a waste of public money in the opinion of the EEC. It would have been definitely more efficient to allocate this money over the years to build a permanent student dormitory or as a worst case alternative distribute this money in the form of vouchers directly to the students for room and board.

## **IMPROVEMENTS**

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

The EEC considers the number of secretaries in the Department (6) as being on the high side. A reallocation of resources either to the library for extended hours (at least to 8 pm) or for the addition of a second IT support person would be beneficial to the operations of the Department.

At a high level, it is the responsibility of the Greek government to ensure timely payments to the HEAL Link network for its smooth operation, which is vital to the educational and research mission of the Department. Finally, the move to the new building should not be delayed any longer and the University should consider creative alternative options to the student housing problem.

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

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

The Department has undertaken a number of initiatives to educate the local public and in particular high school students, about the mission of the Department.

### ***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.

The EEC identified the following inhibiting factors:

1. The building situation: as mentioned before, it has become an impediment to the smooth operation of the Department and negatively impacts its mission. The pending move to the Voutes campus will resolve this issue, but should not face any further delays.
2. Mathematics Education represents a strong direction of the Department with high demand from students. Hence, it should be nourished and the University and the Ministry should approve the corresponding position request by the Department.
3. Admissions to the Department: as described in the Department's internal evaluation and also discussed in this report, a number of entering students are poorly prepared and/or show limited interest in the subject. The Greek state should allow Departments to have a stronger say in the admissions policy.
4. The Department should seriously consider developing a strategic plan for future hiring. Its aim should be strengthening existing areas and further enhancing collaborations within and between its sections.
5. Lack of financial support on a consistent basis for graduate education, postdocs and short term visitors. It deprives the Department of valuable human resources and hinders its research mission. The EEC acknowledges that this is a problem affecting all Greek Universities and should be addressed at the State level.
6. Tight funding of the Department by the Ministry of Education. Specifically, its operating budget has been severely slashed over the last 3 years. When State finances improve, increased funding should follow immediately.
7. The great degree of uncertainty facing visiting (407) faculty that are currently appointed from semester to semester, and often experience delayed payments. This acts as a deterrent for many bright young scientists to pursue an academic career and the State should address this issue.

8. The Department should make additional efforts to encourage its students to take advantage of available programs for international training (e.g. ERASMUS).
9. At present, a number of departments teach introductory mathematics courses (service courses) required in their respective curricula. The EEC believes that integration of instruction would be beneficial not only to this Department, but also lead to a more rational allocation of resources. This is an Institutional problem and should be addressed at that level.

Regarding goals the EEC has the following remarks:

In the short term, the Department should address the recommendations raised in Sections A-D of the present report.

In the medium term, it is important for the Department to have a rigorous discussion about strategic initiatives that would lead to new collaborations and could also be beneficial in terms of funding. Further, the Department should seriously think about its role and scope within the School of Natural Sciences and Technology, as well as within the broader University.

In the long-term, the Department should identify target areas and develop the corresponding hiring strategy.

## ***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.

The Department of Mathematics is a founding one in the University of Crete. It received the first students during the 1977-78 academic year. It began its operation with great aspirations and tried to attract top Greek speaking mathematicians from both overseas and Greece. Historically, the Department tried to establish itself as a modern high standards mathematics department and made some innovations that traditionally did not exist in Greek Universities. The Department was the first in Greece to establish a formal structured Masters and Ph.D. program. It operated on a semester system, as opposed to the traditional yearly one. Further, it introduced a flexible undergraduate degree program with a wide choice of electives for the student. It was also the first to introduce the use of computers in relevant courses and the continuous assessment approach to teaching.

Research is a major priority of the faculty members which are involved in a number of wide ranging and interesting projects. The faculty participates and organizes a number of highly visible national and international conferences. There is a flow of mathematicians visiting the Department both as teaching faculty and Pichorides ITE scholars. There is collaboration with colleagues and researchers from other Departments (e.g. Applied Mathematics), the Institute of Applied and Computational Mathematics in FORTH), other national and international Universities and research centers. The Department has an internationally respected faculty and provides high quality undergraduate and graduate education. It is very successful in preparing its students for various professional directions, but also to pursue graduate studies at the Masters and Ph. D level. The Practical Training Program encourages students to obtain work experience with local companies and organizations. The Summer School gives the opportunity to science students from various universities to attend classes on modern topics in mathematics and it is a source of attracting new graduate students. The learning environment is overall very positive and the students find the faculty both accessible and willing to help them. A great number of Ph.D. students continue in academia after graduation and a number of them has appointments in various Universities in Greece and abroad.

The present report identifies a number of issues that require the attention of the Department. Further, it makes a number of suggestions and specific recommendations outlined in detail in Sections A-E, that if followed the EEC strongly believes would enable the Department to continue its successful educational, research and broader mission.

#### **READINESS TO CHANGE/IMPROVE**

The EEC believes that the department has the will and determination to continue its innovative and ambitious vision to be a leading department of mathematics not only in Greece but at the international level as well, despite the serious economic problems currently facing the country. The Department's readiness to change, improve, innovate and lead the way is self-evident and needs no further comments.

#### **QUALITY ASSURANCE**

At the Ph.D. level there is a graduate committee overseeing all doctoral students, in addition to the thesis advisor. The Ph.D. thesis is defended in the presence of a seven member committee; a requirement for the degree is the publication of part of the thesis in an international journal or the presence of a specialist in the area during the defence. There is also a graduate committee responsible for the Masters program. At the undergraduate level the department is one of the first to introduce teaching evaluations, a tradition that proved very useful for the success of the program.

The hiring of new faculty is taken very seriously and the quality of appointments is guaranteed not only by the underlying legal requirements and University regulations, but also by the practice of soliciting letters from arms-length experts in the area of the candidate. The fact that the Department has had its own external evaluation in 2000 and recent internal evaluations and is participating with such enthusiasm in this current external one is a strong indication of quality assurance.

## The Members of the Committee

Name and Surname

Signature

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

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