



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
HELLENIC REPUBLIC



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Accreditation Report **for the Undergraduate Study Programme of:**

Mathematics

Institution: Aristotle University of Thessaloniki (AUTH)

Date: 20 February 2021

Report of the Panel appointed by the HAHE to undertake the review of the
Undergraduate Study Programme of **Mathematics** of the **Aristotle**
University of Thessaloniki for the purposes of granting accreditation

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PART A: BACKGROUND AND CONTEXT OF THE REVIEW

I. The External Evaluation & Accreditation Panel

The Panel responsible for the Accreditation Review of the Undergraduate Study Programme of **Mathematics** of the **Aristotle University of Thessaloniki** comprised the following three (3) members, drawn from the HAHE Register, in accordance with Laws 4009/2011 & 4653/2020:

- 1. Prof. Alekos Vidras (Chair)**
University of Cyprus, Nicosia, Cyprus
- 2. Prof. Aris Daniilidis**
Universidad de Chile, Chile
- 3. Prof. Nikolaos Stylianopoulos**
University of Cyprus, Nicosia, Cyprus

II. Review Procedure and Documentation

The External Evaluation & Accreditation Panel (henceforth: EEAP) conducted the accreditation evaluation of the Undergraduate Program in Mathematics of the AUTH (henceforth: program) during the period 15-20th of February 2021. Due to the COVID-19 pandemic, EEAP could not visit the site physically, but conducted the accreditation evaluation via Zoom teleconferencing. From February 18th- 20th the EEAP prepared the report using Zoom teleconferencing meetings. On Thursday, January 28th, some members of EEAP attended a Zoom teleconference briefing by HAHE's General Director Dr. Christina Besta, during which the procedures and rationale for the accreditation were outlined and explained. Afterwards, Dr. Besta's presentation was sent to the participating EEAP members.

The EEAP members received in advance from HAHE the following documentation and supporting material:

1. Guidelines for accreditation, created by HAHE
2. The mapping grid, created by HAHE
3. A tabulation (prepared by HAHE) of the scores of the department regarding the quality indexes for the years 2017 – 2020
4. The accreditation information prepared by the department
5. A set of annexes to the accreditation proposal, including the study guide, course descriptions, etc.
6. Statistical data regarding the department and the specific program of studies
7. The Quality Assurance policy of the specific program of studies
8. A set of documents presenting quality indicators both for the department and the program
9. The report of the 2011 external evaluation conducted by HQA for the program
10. The results of the internal evaluation of the program

The EEAP also had access to links of the University and departmental websites, including the 2011 External Evaluation of the department. In addition, during the virtual on-site visit, the Department Head Prof. D. Poulakis, the Head of OMEA Prof. N. Karampetakis and members of the OMEA team provided additional materials (electronic versions of power-point presentations prepared and presented by the department, selected undergraduate exams, problem sets and their solutions)

On Monday, February 15, the EEAP had a preliminary zoom meeting to prepare for the evaluation process. On Tuesday, February 16, EEAP met the Vice-Rector for Academic and Students Affairs /President of MODIP Professor Koveos, and the Head of the Department of Mathematics Professor D. Poulakis. Subsequently, the Head of the Department introduced the members of OMEA and MODIP and gave a brief presentation, focusing on (a) the history and structure of the department, (b) teaching, (c) research, and (d) outreach activities and other matters related to the program. Discussion followed with emphasis on the revised program of studies that the department has implemented in the last few years as a result of the previous departmental external evaluation of 2011. The same day (Tuesday, February 16), after a short break, the EEAP had a series of teleconference meeting with departmental personnel, including:

1. The administration unit of the department
2. Members of teaching staff
3. Representatives of students

The day was concluded with EEAP's debriefing.

On Wednesday February 17, EEAP had an online video tour of the facilities of the department including lecture halls, classrooms, libraries, laboratories and other facilities. EEAP had the opportunity to evaluate the resources available to the department, and to interact with the Head of the Department as well as with teaching staff and administrative staff members. The program of the day continued with teleconference meetings involving:

1. Graduates of the program
2. Employers and social partners

The day was concluded with a final teleconference meeting with OMEA members and MODIP representatives. During the Tuesday and Wednesday meetings the Panel had the opportunity to request additional information and clarifications regarding pending issues.

Due to the COVID-19 pandemic and the fact that it was a first week of classes for the Spring semester, EEAP did not have the opportunity to observe any teaching.

The schedule of the two-day e-visit was very well organized and gave to EEAP a thorough picture of the department's vision and efforts for the undergraduate student education. The quality of the department's undergraduate program conforms fully with international standards. As it will be indicated in the various parts of this report, EEAP was impressed by the dedication and commitment of the teaching staff, the department's stringent procedures for checking the assurance quality and in general the effectiveness of their undergraduate program. As it will also be indicated in the report, while teaching and training of the students can be improved within the department, some of the weaknesses of undergraduate program are due to factors beyond the department. Key such factors include the very large number of incoming first year students, which is regulated by the Ministry of Education and Religious Affairs (thereafter called ME for brevity) and to the recent economic hardships that have led to shrinking the teaching staff.

On Thursday, February 18, EEAP began the preparation of this report, which was completed with EEAP on February 18-19-20. The report was submitted on the due date of February 20, 2021.

III. Study Programme Profile

The Department of Mathematics was established almost upon the creation of AUTH in 1928 as a unit within the School of Sciences admitting its first five students in November of 1928. Since the academic year 1982-1983, the Mathematics department is administratively autonomous unit within the School of Natural Sciences which includes the departments of Chemistry, Physics, Geology, Biology, Computer Science.

The Department of Mathematics has currently 19 faculty members (7 assistant professors, 3 associate professors, and 9 full professors), 8 instruction staff, with one of them having also the responsibilities of computer lab assistant, 7 administrative personnel. The past 10 years about 15 members (of all ranks) of the department have been retired, but during the same period the department has been given only 10 positions. This includes 3 recent hiring and one opening for junior faculty member in the field of Numerical Analysis. Within the next two years more members of the department will retire. In 2011 the already severely understaffed department had 27 faculty members, today (including expected arrivals) the number stands at 22.

On the basis of our meetings with alumni and other records, EEAP observed that the department has produced graduates who have ended up in high-ranking international universities or have been very successful in the business and industrial world or have been distinguished in teaching in secondary education. EEAP believes that in order for the department to continue this strong success and maintain and even improve the quality of the mathematical education provided, the ME should replace the vacancies due to retirements on one-to-one basis at least. The department has 5 scientific Divisions: 1. Mathematical Analysis, 2. Algebra, Number Theory and Mathematical Logic, 3. Geometry, 4. Computer Science and Numerical Analysis, 5. Statistics and Operational Research. In addition to the undergraduate program, the department has a Master program as well as a Ph.D. program.

The completion of a degree in the mathematics department at AUTH requires a minimum of 25 compulsory mathematics/statistics courses and 4 compulsory elective mathematics/statistics courses from a restricted list of the department. In addition, a number of elective courses from the department and from other departments as well is required in order to accumulate the mandatory 240 ECTS units for graduation. The program is designed for 8 semesters or equivalently for 4 years. However, the majority of students take much longer than 4 years to complete their degree. According to the data provided to EEAP, for the academic year 2018-2019 the average number of years to complete the degree is 6.09. The EEAP feels that a further effort should be made to reduce the time required for the completion of the degree. The total number of currently enlisted undergraduate students is approximately 3000, while the number of actually registered (active) students is only about 1400. In EEAP's opinion this is very serious problem due to a number of factors some of which will be addressed in this report. EEAP recommends that the department in coordination with the University and higher government authorities analyse and address the problem of the relatively large number of inactive students, in particular by enforcing the current University legislation.

The latest data of the HAHE indicate that the undergraduate program admitted 286 students for the academic year 2018-2019. The number of admitted students for the current academic year (2020-2021) was basically the same. This number includes not only about 150 students admitted to the department through central state exams, but also students who transfer from other universities or enter the department through other mechanisms. While there are legitimate

reasons for the transfer, the large number of students resulting by the transfer policy does create problems in the education process and it contributes (though there are no official data about it) to the large length of graduation period. The final number of admitted students (286 in the academic year 2018-2019) is dictated by the ME; EEAP strongly feels that this number is exceedingly high for a department of 19 faculty members and cannot be sustained; it has a negative impact on the quality of offered education. According to the data provided to the EEAP regarding the academic year 2018-2019, about 18% of that year graduates did so in 4 years. The rest of the students who graduated in 2018-2019 (about 82%) took more than 4 years to finish. The Department has already taken some constructive measures to ease the problem, however the statistics above show that the issue pertains.

The department offers a Ph.D. degree as well as a Master's program. The master program in mathematics has 3 specializations:

- Pure Mathematics
- Theoretical Informatics and System Theory and Control
- Statistics and Modelling

The Statistics and Modelling part is EMOS certified.

The department also participates in inter-University program that awards master's degrees in Networks and Complexity.

The external evaluation of the DM took place in 2011. On the basis of the recommendations made in that review, the department revised substantially many of its curriculum procedures in a positive way. However, some of the suggestions made in the review had not yet been addressed, primarily because of prolonged economic crisis in the country. Some of these suggestions will be re-visited in this report.

PART B: COMPLIANCE WITH THE PRINCIPLES

Principle 1: Academic Unit Policy for Quality Assurance

INSTITUTIONS SHOULD APPLY A QUALITY ASSURANCE POLICY AS PART OF THEIR STRATEGIC MANAGEMENT. THIS POLICY SHOULD EXPAND AND BE AIMED (WITH THE COLLABORATION OF EXTERNAL STAKEHOLDERS) AT ALL INSTITUTION'S AREAS OF ACTIVITY, AND PARTICULARLY AT THE FULFILMENT OF QUALITY REQUIREMENTS OF UNDERGRADUATE PROGRAMMES. THIS POLICY SHOULD BE PUBLISHED AND IMPLEMENTED BY ALL STAKEHOLDERS.

The quality assurance policy of the academic unit is in line with the Institutional policy on quality, and is included in a published statement that is implemented by all stakeholders. It focuses on the achievement of special objectives related to the quality assurance of study programmes offered by the academic unit.

The quality policy statement of the academic unit includes its commitment to implement a quality policy that will promote the academic profile and orientation of the programme, its purpose and field of study; it will realize the programme's strategic goals and it will determine the means and ways for attaining them; it will implement the appropriate quality procedures, aiming at the programme's continuous improvement.

In particular, in order to carry out this policy, the academic unit commits itself to put into practice quality procedures that will demonstrate:

- a) the suitability of the structure and organization of the curriculum;*
- b) the pursuit of learning outcomes and qualifications in accordance with the European and the National Qualifications Framework for Higher Education;*
- c) the promotion of the quality and effectiveness of teaching;*
- d) the appropriateness of the qualifications of the teaching staff;*
- e) the enhancement of the quality and quantity of the research output among faculty members of the academic unit;*
- f) ways for linking teaching and research;*
- g) the level of demand for qualifications acquired by graduates, in the labour market;*
- h) the quality of support services such as the administrative services, the Library, and the student welfare office;*
- i) the conduct of an annual review and an internal audit of the quality assurance system of the undergraduate programme(s) offered, as well as the collaboration of the Internal Evaluation Group (IEG) with the Institution's Quality Assurance Unit (QAU).*

Study Programme Compliance

AUTH has established an appropriate Quality Assurance Policy fully satisfying relevant requirements. The Key Performance Indicators (KPIs) are regularly updated. The department follows the guidelines of the institutional policy. MODIP monitors and enforces the Quality Assurance. The department general assembly has the overall responsibility for reviewing its

entire study program and ensures its consistency with the institutional Quality Assurance standards.

The department initiated an essential restructuring of its undergraduate curricula in 2012. It dropped courses that had not been offered for a long time, it eliminated elective courses or replaced some of them by new courses reflecting modern trends in mathematical sciences. As it will be indicated in Principle 2 below, EEAP suggests that an effort should be made to reduce the number of required courses to 32. Nevertheless, the revised curriculum provides solid mathematical background and uses novel teaching methods. Overall, the undergraduate program meets international standards. EEAP met with a number of students and graduates who indicated that they are satisfied with the program and their education. However, a number of them stressed the need for closer connection of the mathematics education with present day industrial and societal needs and trends. EEAP has been informed that the department has already initiated a process towards that goal.

The Department has very active researchers with some of them publishing in high impact journals and this affects positively the work with graduate students. At present there is no official process for recording annual activities of the academic staff. Nevertheless, MODIP has an effective system in place to monitor the publication record of the academic staff.

While the department maintains information about research and academic activities of faculty members, this is not done in a comprehensive way. EEAP suggests that at the beginning of every academic year each faculty member submits an updated CV and a stimulating 1-2 pages “annual report of activities”. More suggestions about documentation regarding faculty academic activities are given in the section of Principle 5 of this report.

The QA policy is in place and the MODIP within the university structure oversees its proper and regular implementation.

Panel Judgement

Principle 1: Institution Policy for Quality Assurance	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

- Continue to have all relevant policy documents pertaining to the department, readily available and accessible.
- Each year, the faculty should provide information (1 or 2 pages) concerning their academic and scientific activities for previous academic year. (More detailed comments concerning this issue are given in Principle 5).

Principle 2: Design and Approval of Programmes

INSTITUTIONS SHOULD DEVELOP THEIR UNDERGRADUATE PROGRAMMES FOLLOWING A DEFINED WRITTEN PROCESS WHICH WILL INVOLVE THE PARTICIPANTS, INFORMATION SOURCES AND THE APPROVAL COMMITTEES FOR THE PROGRAMME. THE OBJECTIVES, THE EXPECTED LEARNING OUTCOMES, THE INTENDED PROFESSIONAL QUALIFICATIONS AND THE WAYS TO ACHIEVE THEM ARE SET OUT IN THE PROGRAMME DESIGN. THE ABOVE DETAILS AS WELL AS INFORMATION ON THE PROGRAMME'S STRUCTURE ARE PUBLISHED IN THE STUDENT GUIDE.

Academic units develop their programmes following a well-defined procedure. The academic profile and orientation of the programme, the objectives, the subject areas, the structure and organization, the expected learning outcomes and the intended professional qualifications according to the National Qualifications Framework for Higher Education are described at this stage. The approval or revision process for programmes includes a check of compliance with the basic requirements described in the Standards, on behalf of the Institution's Quality Assurance Unit (QAU).

Furthermore, the programme design should take into consideration the following:

- *the Institutional strategy*
- *the active participation of students*
- *the experience of external stakeholders from the labor market*
- *the smooth progression of students throughout the stages of the programme*
- *the anticipated student workload according to the European Credit Transfer and Accumulation System*
- *the option to provide work experience to the students*
- *the linking of teaching and research*
- *the relevant regulatory framework and the official procedure for the approval of the programme by the Institution*

Study Programme Compliance

The program is designed by a departmental committee and is considered and approved by the general assembly. EEAP believes that the overall structure aligns well with similar programs in Greece and abroad. The student guide is complete, concise, appropriate and well thought of. In designing the program, the department considers the previous evaluation and input from students and alumni. The entire process, including program revisions, is overseen by the MODIP.

As we mentioned earlier in this report, currently the ECTS's required for the degree are 240. That is, 220 ECTS in mathematics /statistics and 20 ECTS outside the department. This corresponds to about 35 mathematics/statistics courses of 6 ECTS each as an average. EEAP feels that the number of 35 courses is too high and an effort should be made to reduce the number of courses to about 32, corresponding to 4 courses per semester (equivalently 8 courses per year). This will require more standardized distribution of ECTS units between compulsory and elective course. For example, compulsory mathematics courses could be all of 7 ECTS units and elective mathematics courses could all be of 6 ECTS units after suitable adjustment of the contents. Furthermore, EEAP feels that it is important that the basic mathematics courses of the first 3 or 4 semesters be taught by any member of the department, independently of the division he or she belongs to. Another factor that needs to be seriously addressed by the Department (and

maybe by the University) is the fact that the median (or average) number of years for a student to graduate is large. In particular, after recent changes of University Law this issue becomes of critical importance.

Given the reality of the diversity in knowledge and preparation as well as quality and interests of the undergraduate students, EEAP strongly believes that the Department should make a serious effort to support the majority of the students by providing them with the training needed to have viable career opportunities after graduation. This means that some of the courses must address the needs of “modern society and employers”, who seek more applications-oriented employees.

This may require adding new material in the existing courses in Applied Mathematics. For example, numerical solutions of PDEs or convex/nonlinear optimization. Similar actions may be required in the field of Statistics. Concerning more theoretical courses, the course 0206 (Differential Equations) can also contain an introduction to dynamical systems, which could be pursued by a follow-up course in discrete and continuous dynamical systems. It is also advisable to relate the course 0133 (Mathematical Logic) with topics in Algebra and Real/Complex Algebraic Geometry. Naturally, these efforts should be supported through the hiring of new faculty members in these mathematical areas.

Recent decades produced an explosion of research in the area of Applied and Computational Mathematics/Statistics. This is not completely reflected in the course content of the undergraduate classes. Our suggestion is that some courses of theoretical computer science students can take from the Computer Science Department and the academic staff connected be freed to offer other applied mathematics courses. We observed, for example, that Cryptography courses (0434 in Math Department and NGE-06-03 in CS Department) offered in both departments have basically the same material. Taking such courses in CS Department will add in value to the degree awarded by the Mathematics Department. This effort can be greatly helped by further enhancing the current Internship program of the Department.

Panel Judgement

Principle 2: Design and Approval of Programmes	
Fully compliant	
Substantially compliant	X
Partially compliant	
Non-compliant	

Panel Recommendations

- Develop a more transparent and efficient mechanism for teaching assignments.
- Develop extended relationships with national and international private employers.
- Continue the revision of the curriculum.
- Improve the academic supervision of the students.
- All classes should have mandatory midterm exams and graded mandatory homework.
- Establish weekly multi-hour labs for each of the compulsory courses of the first 2 years.

- Improve the “applied” training of the undergraduates so that their degree is marketable for the private sector.
- EEAP recommends that the department should encourage the strengthening of the Alumni Society. A strong Alumni society could be very important in providing suggestions in the design of the educational program, and in assisting the graduates in their future endeavours. In addition, we suggest that the Department develops some systematic mechanism for getting input from Stakeholders and former graduates.

Principle 3: Student- centred Learning, Teaching and Assessment

INSTITUTIONS SHOULD ENSURE THAT THE UNDERGRADUATE PROGRAMMES ARE DELIVERED IN A WAY THAT ENCOURAGES STUDENTS TO TAKE AN ACTIVE ROLE IN CREATING THE LEARNING PROCESS. THE ASSESSMENT METHODS SHOULD REFLECT THIS APPROACH.

Student-centered learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process. The above entail continuous consideration of the programme's delivery and the assessment of the related outcomes.

The student-centered learning and teaching process

- *respects and attends to the diversity of students and their needs, enabling flexible learning paths;*
- *considers and uses different modes of delivery, where appropriate;*
- *flexibly uses a variety of pedagogical methods;*
- *regularly evaluates and adjusts the modes of delivery and pedagogical methods aiming at improvement;*
- *regularly evaluates the quality and effectiveness of teaching, as documented especially through student surveys;*
- *reinforces the student's sense of autonomy, while ensuring adequate guidance and support from the teaching staff;*
- *promotes mutual respect in the student - teacher relationship;*
- *applies appropriate procedures for dealing with students' complaints.*

In addition:

- *the academic staff are familiar with the existing examination system and methods and are supported in developing their own skills in this field;*
- *the assessment criteria and methods are published in advance;*
- *the assessment allows students to demonstrate the extent to which the intended learning outcomes have been achieved. Students are given feedback, which, if necessary is linked to advice on the learning process;*
- *student assessment is conducted by more than one examiner, where possible;*
- *the regulations for assessment take into account mitigating circumstances;*
- *assessment is consistent, fairly applied to all students and carried out in accordance with the stated procedures;*
- *a formal procedure for student appeals is in place.*

Study Programme Compliance

The department has clear assessment criteria, and these are communicated to the students at the beginning of each course, through a Guide (the "Περίγραμμα" Guide). This Guide is nicely designed and is posted on the Department's functional webpage. The Guide contains an extensive syllabus and detailed description of the course. EEAP suggests that the course description be sent to the student at the beginning of the semester. In addition, it would be very helpful if the instructors provide the students (at the beginning of the semester) with information about exams, homework, projects, presentation, office hours and factors that determine the final grade of the student; at present this is done only on a voluntary basis. EEAP thinks that it should become

a usual practice of the department. Student complaints or other student-instructor issues are usually handled on an individual base. Being severely understaffed, the Department assigns yearly three academic advisors for the whole body of students. EEAP strongly feels that advising should be more extensive, especially during the first semesters of studies. Ideally, every student should have an academic advisor.

EEAP realized that in many cases there is a substantial delay in returning exams as well as substantial delay in instructors posting the grades. We are conscious of the immense difficulties an instructor has in correcting exams and posting grades within a reasonable period of time for classes with a huge number of students (for example of 200 or even 500). However, we strongly recommend that the department creates coherent and explicit rules with specific time limits concerning the exam returns and grade posting.

Students can take courses (up to 20 ECTS) from other departments (Physics, Computer Science, Economics), but not from other departments such as Electrical Engineering. However, the students and Alumni who met with EEAP strongly indicated that they would like to have the above options. EEAP concurs with the students and strongly recommends that the department makes this possible. EEAP commends the fact that good undergraduate students can attend graduate course and get credits for them through use of “special topic” courses. EEAP suggests that it would be useful if there were official mechanisms which would allow undergraduates to interact with graduate students (say, as TA’s or as tutors in a drop-in-for-help office).

Traditional teaching methods (chalk and blackboard) are utilized in the required courses which have large audiences. In more advanced, specialty and elective courses, many professors use, in addition to traditional (chalk and blackboard) approach to teaching, modern methods such as computers, videos, and other information transfer technology means. They also employ (especially in elective courses) teaching procedures based on student participation via, for example, student lecturing. Moreover, in some selective courses as well in some other courses, teaching faculty employ evaluation procedures complementary to those of written exams; e.g., student presentations, homework, and even small projects. These tendencies are becoming standard these days due to COVID-19 pandemic. Nevertheless, students strongly indicated that novel information technology methods should be more broadly utilized. EEAP concurs with the students and strongly suggest that the evaluation procedures complementary to written exams, are strengthened and expanded.

Panel Judgement

Principle 3: Student- centered Learning, Teaching and Assessment	
Fully compliant	
Substantially compliant	X
Partially compliant	
Non-compliant	

Panel Recommendations

- EEAP believes that there should be a systematic interaction between graduate and undergraduate students. For example: graduate students could be used as teaching assistants in undergraduate courses, grading homework assignments, offering recitations, or be used as tutors in a drop-in-for-help office. This is an international practice. The department is only minimally successful in this direction mainly because of legal constraints imposed by the ME. Nevertheless, EEAP encourages the department to seek an arrangement with the university whereby graduate students are employed, within the legal parameters, by the university for tasks as the ones mentioned above.
- The students strongly indicated that they should have the option to take courses from other departments, which are not in the current list allowed by the mathematics department (the current list includes the departments of Physics, Economics, Computer Science and Education). Moreover, these courses should count towards their degree requirements, replacing certain elective mathematics or other courses. Of course, the students should choose such course upon consultation and approval by the department. In addition, the number of ECTS allowed for such substitutions should be decided by the Mathematics Department. EAAP agrees with the students and strongly recommends that all present official/bureaucratic obstacles be removed.
- In some advanced/special topic courses instructors incorporate projects (which include a write-up and a presentation) in addition to exams. This has excellent benefits in independence, problem solving ability and presentation skills. EEAP encourages this practice and suggests that it is stream-lined in most advanced selective courses.
- Currently there are two labs with total 66 (29+37) computers available. This is relatively small number of computers for the large student body of the Department. EEAP believes that serious effort should be made to increase the numbers of the computers (at a minimum to double the size of the lab) and the required IT support staff.
- The Department has an adequately designed “Περίγραμμα” Guide containing an extensive syllabus and detailed description of the course. EEAP suggests that it should be posted on the Department’s webpage in English too, as it increases its international visibility. In addition, the course description should be sent and communicated to the student at the beginning of the semester. It would be very helpful if all instructors provide the students (at the beginning of the semester) with information about exams, homework, projects, presentation, office hours and factors that determine the final grade of the student.
- The department should create coherent and explicit rules with specific time limits concerning the exam returns and grade posting.

EEAP realizes that some of the above recommendations would be difficult to implement due to the small number of faculty, the large number of students and above all, the lack of funding and legal restrictions that are beyond the control of the department. However, the EEAP feels that despite these difficulties, a conscious effort should be made in this direction. The above principles are internationally accepted practices and have a definite positive impact in the educational process.

Principle 4: Student Admission, Progression, Recognition and Certification

INSTITUTIONS SHOULD DEVELOP AND APPLY PUBLISHED REGULATIONS COVERING ALL ASPECTS AND PHASES OF STUDIES (ADMISSION, PROGRESSION, RECOGNITION AND CERTIFICATION).

Institutions and academic units need to put in place both processes and tools to collect, manage and act on information regarding student progression.

Procedures concerning the award and recognition of higher education degrees, the duration of studies, rules ensuring students progression, terms and conditions for student mobility should be based on the institutional study regulations. Appropriate recognition procedures rely on institutional practice for recognition of credits among various European academic departments and Institutions, in line with the principles of the Lisbon Recognition Convention.

Graduation represents the culmination of the students' study period. Students need to receive documentation explaining the qualification gained, including achieved learning outcomes and the context, level, content and status of the studies that were pursued and successfully completed (Diploma Supplement).

Study Programme Compliance.

The Study Guide includes instructions on several processes and services and is made available through the department's home page. An orientation week when students arrive in the campus, is in place organized by the university and First Year Student Guide is posted online in the university and departmental websites. The Department also has a yearly welcome meeting with the newly coming students.

Apparently, the Department (and to EEAP understanding, the entire University) does not have a well-defined student progression monitoring process. Despite this issue, Department's undergraduate program works sufficiently well, and indeed produces a relatively large body of excellent students. This fact is reflected by successful careers of the Alumni in a wide range of professions; for example, the acceptance of students to top graduate schools all over the world for Ph.D. studies. Many of them end up with academic positions in established Universities in Greece and abroad. Despite this, EEAP suggests that some type of student progression monitoring method should be in place.

Student mobility is encouraged via the ERASMUS project as well as the concept of Practical Training. The students usually take advantage of these opportunities in the 6th through the 8th semester of studies. The ERASMUS option has been under-utilized. The Practical Training has been quite popular and successful according to information provided to EEAP by employers participating in the training.

ECTS is applied across the curriculum for the sake of student's recognition and certification. The department has made serious efforts to consider student and faculty feedback, as well as the recommendations of the last external evaluation 2011. The workload of the courses is adjusted to the ECTS. At present, the Diploma supplement is provided upon request. Teaching Ability Certificate is given to students who attended successfully the required courses.

The Practical Training Program is deemed very valuable and a preferred choice by many students. This experience is highly important for opening their horizon and future employment perspectives.

Panel Judgement

Principle 4: Student Admission, Progression, Recognition and Certification	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

- An orientation week when students arrive in the campus is in place organized by the university. EEAP thinks that it would be extremely helpful if the department had some similar initiative for its new coming students, besides their welcome meeting. In addition, a well-designed 3-4 pages long, First Year Student Guide providing practical information such as familiarity with facilities, housing and transportation be made available. EEAP understands that most of this material can be found elsewhere, but practise shows that freshmen rarely do it as they prefer to question senior students.
EEAP suggests that faculty encourages the students to take advantage of the ERASMUS mobility program despite the expenses involved.
- As mentioned above the Department lacks a systematic student progression monitoring. EEAP suggests that some type of such mechanism should be in place, considering recent changes of the University law imposing upper limit on the years of study. EEAP understands that this is a challenging task given the ratio of the enrolled students with respect to the size of the department.
- EEAP recommends that transcripts and degree certificates should be provided in English upon request. This will accommodate students seeking graduate studies abroad by reducing their financial burden and time delay.

Principle 5: Teaching Staff

INSTITUTIONS SHOULD ASSURE THEMSELVES OF THE QUALIFICATIONS AND COMPETENCE OF THE TEACHING STAFF. THEY SHOULD APPLY FAIR AND TRANSPARENT PROCESSES FOR THE RECRUITMENT AND DEVELOPMENT OF THE TEACHING STAFF.

The Institutions and their academic units have a major responsibility as to the standard of their teaching staff providing them with a supportive environment that promotes the advancement of their scientific work. In particular, the academic unit should:

- *set up and follow clear, transparent and fair processes for the recruitment of properly qualified staff and offer them conditions of employment that recognize the importance of teaching and research;*
- *offer opportunities and promote the professional development of the teaching staff;*
- *encourage scholarly activity to strengthen the link between education and research;*
- *encourage innovation in teaching methods and the use of new technologies;*
- *promote the increase of the volume and quality of the research output within the academic unit;*
- *follow quality assurance processes for all staff members (with respect to attendance requirements, performance, self-assessment, training etc.);*
- *develop policies to attract highly qualified academic staff.*

Study Programme Compliance

The department has quality faculty members and special teaching staff (EDIP) – committed to their duties. The department aims to attract and hire highly qualified researchers. They apply similar standards in the promotion of the faculty. Hiring and promotion in the last few years demonstrate that the department aims at scientific excellence. Furthermore, in addition to research, commitment to teaching weights considerably. Both hiring and promotion follow the criteria mandated by Greek law.

EEAP was informed that the current annual budget of the Department from different sources is about 32.000 Euros and a substantial part of it will be spent on improving the infrastructure related to e-teaching. Obviously, this is extremely limited budget for the size of the department. Under such a limited budget the department cannot sustain its academic standards.

The student/faculty ratio is extremely high. As a consequence, the teaching load of the faculty is heavy. This is also amplified by the fact that the graduate students are not allowed to tutor or to assist in courses. EEAP was impressed that despite the heavy teaching load the faculty has considerable research output. This cannot be sustained without increasing substantially financial resources and new faculty hiring.

Linking teaching with research is an important mechanism to stimulate students. Currently, the department uses the “special topic” courses and special problem-solving seminars training students for participation in international mathematics Olympiads towards that goal. Furthermore, joint reading e-seminars are currently held to motivate graduate students and faculty members in their research. EEAP suggest in this direction to the Department to persevere in the establishment of a weekly or bi-weekly “undergraduate seminar”, whose activity was

undermined by the pandemic, where the speakers could be graduate students, undergraduate students working on some research project with faculty members from the mathematics or other departments.

Presently the department has 5 distinct Divisions representing main research areas in mathematical sciences. EEAP feels that the present organization of the Department in Divisions leads to fragmentation and artificial barriers to the education of the students. The current structure also creates a confusing system for teaching assignments. EEAP was unable to reach a firm conclusion about how this is done and left with the impression that the current process of assigning classes is held hostage to the decisions of the Divisions. It is strongly recommended that the Department abolishes the current 5 Divisions, namely Mathematical Analysis (5 members), Algebra, Number Theory & Mathematical Logic (4 members), Statistics & Operational Research (4 members), Computer Science & Numerical Analysis (3 members), and Geometry (3 members) and create only two Divisions, one in Pure and one in Applied Mathematics. Members of the current Divisions can either join the Pure or the Applied Mathematics Divisions (or even both), the two divisions not being mutually exclusive. For example, some of the Applied Analysts or Probabilists may choose to belong to both. The current Computer Science & Numerical Analysis and Statistics & Operational Research Divisions can support an excellent Data Science program within the Applied Mathematics Division. When implemented, these changes will improve substantially the quality of the program and allow the students to receive more well-rounded education.

The Department may consider the perspective for undergraduate program to award degrees with two or three specializations. Students specializing in one of the two or three directions should be required to take a minimum number of related courses.

Since its last external review (2011), the department has done a very good job in attracting strong young mathematicians, resulting in the strengthening of existing areas as well as developing strength in new areas. Recent hiring is in the same positive direction. A current trend in mathematics is the integration of different sub-areas. This is healthy both for research and teaching. EEAP observed healthy collaborative interactions among many faculty members in the department. It strongly recommends that the cross-fertilization among the sub-areas be continued and strengthened, and the department formulates an overall coherent vision for the future. This approach will facilitate the participation of members of the department in funded research projects, both national and international. In particular, we encourage the participation in research projects within EU.

A minimum requirement for maintaining and strengthening the quality of the department's members is that the university support the research and visibility of the young faculty in particular. EEAP suggest the department allocates part of its small budget towards supporting the scientific activities of the young faculty members. However, because the departmental budget is so small, EEAP strongly urges the University to provide more support to the department for such purposes.

Beyond the above, EEAP suggests that the Department keeps its Library and related infrastructure at the same level of activity, considering this is an important stimulating "laboratory" for Mathematics.

Panel Judgement

Principle 5: Teaching Staff	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

- Merge the current 5 Divisions to create only 2 (Pure and Applied Mathematics) allowing joined membership.
- As we indicated above, the university and the department should support young faculty in their research and visibility. In particular, it should support conference participation, visiting other institutions, research collaborations and preparation of research proposals.
- The department should provide mentoring to its younger members. More precisely, the department should assign a “mentor” to each new hire (or young professor) to guide them in teaching, interactions with students, administrative issues, research possibilities with people across campus who have similar or overlapping scientific interests, and in general with the academic culture of the university. This type of mentoring is done in many institutions and it is effective. It helps integrate young faculty members into their new environment. EEAP strongly complements the current mentoring practices employed by the department via the chairman of department.
- The department should establish a procedure for documenting annual faculty progress in research and related activities, including research publications, teaching, distributing lecture notes/books to students in a course, departmental service, university service, professional service and conference participation. Much of this is currently documented by MODIP, but EEAP feels that it should be done in a more rigorous and systematic way. In particular, EEAP suggests that at the beginning of every academic year each faculty member submits a 2-3 pages “annual report of activities” containing the above items. This report is then discussed by the Department and the progress of the faculty member is officially recorded.

Principle 6: Learning Resources and Student Support

INSTITUTIONS SHOULD HAVE ADEQUATE FUNDING TO COVER TEACHING AND LEARNING NEEDS. THEY SHOULD –ON THE ONE HAND– PROVIDE SATISFACTORY INFRASTRUCTURE AND SERVICES FOR LEARNING AND STUDENT SUPPORT AND –ON THE OTHER HAND– FACILITATE DIRECT ACCESS TO THEM BY ESTABLISHING INTERNAL RULES TO THIS END (E.G. LECTURE ROOMS, LABORATORIES, LIBRARIES, NETWORKS, BOARDING, CAREER AND SOCIAL POLICY SERVICES ETC.).

Institutions and their academic units must have sufficient funding and means to support learning and academic activity in general, so that they can offer to students the best possible level of studies. The above means could include facilities such as libraries, study rooms, educational and scientific equipment, information and communications services, support or counselling services.

When allocating the available resources, the needs of all students must be taken into consideration (e.g. whether they are full-time or part-time students, employed or international students, students with disabilities) and the shift towards student-centered learning and the adoption of flexible modes of learning and teaching. Support activities and facilities may be organized in various ways, depending on the institutional context. However, the internal quality assurance ensures that all resources are appropriate, adequate, and accessible, and that students are informed about the services available to them.

In delivering support services the role of support and administrative staff is crucial and therefore they need to be qualified and have opportunities to develop their competences.

Study Programme Compliance

The department is situated in its own facilities, containing the Central Amphitheatre in honour of N. Empirikos (with 500 seats) used for conferences, commencement or other ceremonies. It also has three more amphitheatres with 350, 250, 150 seats each. The department has 4 classrooms equipped with video projectors having 45, 50, 75, 80 seats correspondingly. In addition, there is seminar and conference room with 50 seats that is equipped for teleconferencing. Furthermore, there exists one small room with 12 seats for graduate seminars. As mentioned before, there is a computer lab having 37 seats for undergraduate students and 29 seats for graduate students. The Library of the Department has 21000 volumes of books, 396 journal subscriptions, electronic access to full texts for thousands titles of e-books and scientific journals, supports a reading room with 50 seats, in addition to 7 computer places.

A wide range of support services is available to students, including dormitories, counselling services (helpline is available 24/7), sport facilities etc. Facilities are also available for students with disabilities. A number of students indicated that sanitary and some other facilities need a more proper maintenance. EEAP was informed that the administrative support is prompt and competent.

Panel Judgement

Principle 6: Learning Resources and Student Support	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

- The building infrastructure, even though fully functional, requires maintenance and modernization. For example, the new “glass wing” requires waterproofing. The size of the two computer labs (66 seats in total) should be enlarged and the required IT personnel be hired.

EEAP understands that these issues are not Department’s responsibility, however we note them for the University to take the necessary actions.

Principle 7: Information Management

INSTITUTIONS BEAR FULL RESPONSIBILITY FOR COLLECTING, ANALYSING AND USING INFORMATION, AIMED AT THE EFFICIENT MANAGEMENT OF UNDERGRADUATE PROGRAMMES OF STUDY AND RELATED ACTIVITIES, IN AN INTEGRATED, EFFECTIVE AND EASILY ACCESSIBLE WAY.

Institutions are expected to establish and operate an information system for the management and monitoring of data concerning students, teaching staff, course structure and organization, teaching and provision of services to students as well as to the academic community.

Reliable data is essential for accurate information and for decision making, as well as for identifying areas of smooth operation and areas for improvement. Effective procedures for collecting and analyzing information on study programmes and other activities feed data into the internal system of quality assurance.

The information gathered depends, to some extent, on the type and mission of the Institution. The following are of interest:

- *key performance indicators*
- *student population profile*
- *student progression, success and drop-out rates*
- *student satisfaction with their programme(s)*
- *availability of learning resources and student support*
- *career paths of graduates*

A number of methods may be used for collecting information. It is important that students and staff are involved in providing and analyzing information and planning follow-up activities.

Study Programme Compliance

The Department/University has established satisfactory procedures for the collection of data about teaching methods, teaching progression, gender composition of the student body and other items related to undergraduate education. Information regarding students that follow teaching and academic paths is fairly complete. However, data about the employability in other sectors of economy is fairly poor. EEAP suggests that the Department utilizes and strengthens the existing Alumni Society of the University's graduates for developing efficient mechanisms for the collection of data regarding the employment and carrier paths of its former students.

The completion rate of student surveys can be improved, but their result is taken seriously by the Department. The results already had an impact in the quality of teaching and supporting material. The Department could explore creative ways to encourage students to participate in the process in larger numbers.

Panel Judgement

Principle 7: Information Management	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

One way to increase student response rates for teaching evaluations is to make them mandatory as follows: the students cannot see their grades until they participate in the surveys, with the option of abstaining.

Principle 8: Public Information

INSTITUTIONS SHOULD PUBLISH INFORMATION ABOUT THEIR TEACHING AND ACADEMIC ACTIVITIES WHICH IS CLEAR, ACCURATE, OBJECTIVE, UP-TO-DATE AND READILY ACCESSIBLE.

Information on Institution's activities is useful for prospective and current students, graduates, other stakeholders and the public.

Therefore, institutions and their academic units provide information about their activities, including the programmes they offer, the intended learning outcomes, the qualifications awarded, the teaching, learning and assessment procedures used, the pass rates and the learning opportunities available to their students, as well as graduate employment information.

Study Programme Compliance

The department website in Greek language contains information about its facilities, staff, undergraduate and graduate programs and guides, announcements, events, policy of quality assurance, and internal assessment reports. The website is user friendly. However, the English language version of the website is poor in information contained. This should be addressed, since it will improve the international visibility of the department. However, EEAP feels that there should be more complete information about the Faculty. In particular, EEAP observed that some faculty members do not have a personal website in English. EEAP feels that the department should require all faculty members to complete the already existing basic CV template containing education, employment, scientific interests, and a short list of related publications. In addition, EAPP suggests optionally this webpage to contain links to a more detailed personal webpage.

Panel Judgement

Principle 8: Public Information	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

As indicated above, EEAP observed that some faculty members do not have a personal website. EEAP feels that the department should require all faculty members to complete the already existing basic CV template containing education, employment, scientific interest, and a short list of related publications. In addition, EAPP suggests optionally this webpage to contain links to a more detailed personal webpage. For example, the detailed information could include courses taught and resources developed by the instructors, list of grants, collaborations, conference organization and participation, departmental and professional service, complete list of publications and other individual significant activities.

Principle 9: On-going Monitoring and Periodic Internal Review of Programmes

INSTITUTIONS SHOULD HAVE IN PLACE AN INTERNAL QUALITY ASSURANCE SYSTEM FOR THE AUDIT AND ANNUAL INTERNAL REVIEW OF THEIR PROGRAMMES, SO AS TO ACHIEVE THE OBJECTIVES SET FOR THEM, THROUGH MONITORING AND AMENDMENTS, WITH A VIEW TO CONTINUOUS IMPROVEMENT. ANY ACTIONS TAKEN IN THE ABOVE CONTEXT SHOULD BE COMMUNICATED TO ALL PARTIES CONCERNED.

Regular monitoring, review and revision of study programmes aim to maintain the level of educational provision and to create a supportive and effective learning environment for students.

The above comprise the evaluation of:

- *the content of the programme in the light of the latest research in the given discipline, thus ensuring that the programme is up to date;*
- *the changing needs of society;*
- *the students' workload, progression and completion;*
- *the effectiveness of the procedures for the assessment of students;*
- *the students' expectations, needs and satisfaction in relation to the programme;*
- *the learning environment, support services and their fitness for purpose for the programme*

Programmes are reviewed and revised regularly involving students and other stakeholders. The information collected is analyzed and the programme is adapted to ensure that it is up-to-date. Revised programme specifications are published.

Study Programme Compliance

The department annually self-assesses its undergraduate program in a meticulous way and the learning resources and support services are equally well monitored. The undergraduate program has substantially been simplified and streamlined in accordance with the recommendations of the external review (2011). The current program accommodates internationally established norms for mathematical training. The MODIP oversees the overall process.

Panel Judgement

Principle 9: On-going Monitoring and Periodic Internal Review of Programmes	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

The EEAP comments the department for its rigorous monitoring and urges to continue with these sound practices.

Principle 10: Regular External Evaluation of Undergraduate Programmes

PROGRAMMES SHOULD REGULARLY UNDERGO EVALUATION BY COMMITTEES OF EXTERNAL EXPERTS SET BY HAHE, AIMING AT ACCREDITATION. THE TERM OF VALIDITY OF THE ACCREDITATION IS DETERMINED BY HAHE.

HAHE is responsible for administrating the programme accreditation process which is realized as an external evaluation procedure, and implemented by a committee of independent experts. HAHE grants accreditation of programmes, with a specific term of validity, following to which revision is required. The accreditation of the quality of the programmes acts as a means of verification of the compliance of the programme with the template's requirements, and as a catalyst for improvement, while opening new perspectives towards the international standing of the awarded degrees.

Both academic units and institutions participate in the regular external quality assurance process, while respecting the requirements of the legislative framework in which they operate.

The quality assurance, in this case the accreditation, is an on-going process that does not end with the external feedback, or report or its follow-up process within the Institution. Therefore, Institutions and their academic units ensure that the progress made since the last external quality assurance activity is taken into consideration when preparing for the next one.

Study Programme Compliance

EEAP felt that faculty they met was open to constructive suggestions. To EEAP knowledge this is the first external evaluation review devoted to the undergraduate program in the mathematics department at AUTH. There was an overall external evaluation review for the department in the year 2011. According to EEAP opinion and the external review of 2011, the mathematical education provided by the Department of Mathematics at AUTH is very good, broad and stimulating.

As we have indicated in other parts of the report, the procedure of verifying the quality of academic education both at the Department and the University is very rigorous and done meticulously. Faculty and staff are overall highly dedicated to the students learning and education.

The input to EEAP from current, graduated students, and partners (who also graduated from the Department) was very positive. In particular, they strongly indicated that their mathematical studies were sound, thorough and prepared to be competitive in academia and industry.

All the stakeholders, including lab personnel and administrative staff, appreciated the significance of the external review and were excited to participate, help and contribute to the success of the process.

Panel Judgement

Principle 10: Regular External Evaluation of Undergraduate Programmes	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

Panel Recommendations

EEAP was impressed by the effectiveness of the monitoring mechanism by MODIP/OMEA and suggests continuing their rigorous process of self-evaluating. In addition, EEAP observed that the department successfully implemented many of the suggestions made in the last external review (2011).

PART C: CONCLUSIONS

I. Features of Good Practice

The EEAP feels that the following points are well addressed by the department:

- The department's faculty is highly dedicated
- The study guide is well designed, informative and useful
- In some areas the input of the social partners in the design of their academic program is extensively incorporated
- Excellent lecture notes for many courses
- Student feedback and comments are taken seriously into account
- The revision of the curriculum undertaken based on the 2011 evaluation is appropriate given the composition of the student body.
- Excellent appointments since the 2011 evaluation.

II. Areas of Weakness

In the view of the EEAP, the following items need some improvement. EEAP feels that the roots for many of the shortcomings are due to the severe underfunding and the national rigid constraints imposed on the universities.

- The student-to-faculty ratio is very high.
- The lack of framework that would allow graduate and advanced undergraduate students to tutor lower level undergraduate students
- The lack of the option that would allow undergraduate students to take courses in departments other than those contained in the current list of the Mathematics Department
- Faculty's teaching load is relatively high
- Limited integration between teaching and research
- The reduction in the faculty from 45 members to 19 during the last 20 years combined with the constantly large student body.
- The lack of systematic feedback about progress given to the students in the mandatory 1st and 2nd year courses.
- The lack of midterm exams and mandatory graded homework.
- The large number of classes required to obtain the degree.
- The fragmentation of the Department in 5 Divisions.
- Limited relations with employers and societal stakeholders.

III. Recommendations for Follow-up Actions

EEAP strongly recommends that the following be promptly addressed:

- Merge the current 5 Divisions into 2 (Pure and Applied Mathematics) allowing joined membership.
- Develop a more transparent and efficient mechanism for teaching assignments.
- Continue the revision of the curriculum.
- Reduce the number of required courses to 32.
- Incorporate new material within certain mathematics course.

- All compulsory courses should have midterm exams and graded mandatory homework.
- Establish weekly 4-hour tutorial for each of the compulsory courses of the first 2 years of study.
- Provide at the first meeting of each course and maintain on the web a syllabus and expectations for each course including information about exams, homework, projects, presentation, and office hours.
- Continue the practices of the “special topic” courses and “Internships”.
- Create coherent and explicit rules with specific time limits concerning the return of the exams and of grade posting.
- Actively encourage students to take advantage of the ERASMUS mobility program.
- Develop a systematic student progression monitoring system.
- Reinvigorate the system of Academic Advisor by requiring students, at least for the first 2 years, to meet with their advisor at a minimum once per semester.
- Continue pursuing ways to increase the student participation in the teaching evaluations.
- Enhance the support provided by the University to junior faculty for their research and visibility.
- The Department should provide mentoring to its junior members.
- Faculty should actively seek national and international funding.
- Continue the trend of hiring new faculty having experience of working in Universities abroad.
- Establish weekly or bi-weekly undergraduate research seminars.
- Develop extended relationships between the Department and national and international private employers.
- Develop a systematic mechanism for getting input from stakeholders and former graduates.
- Organize an annual “Employment Fare”.
- Improve the English version of the information provided on the departmental website.
- Improve the training of the undergraduates so that their degree is more marketable for the private sector.
- Produce an annual newsletter addressed to students, employers and society stakeholders.
- Continue the very effective way to monitor and record annual activities of the Faculty.

IV. Summary & Overall Assessment

The Principles where full compliance has been achieved are: **1, 4, 5, 6, 7, 8, 9, 10**

The Principles where substantial compliance has been achieved are: **2, 3**

The Principles where partial compliance has been achieved are: **None**

The Principles where failure of compliance was identified are: **None**

Overall Judgement	
Fully compliant	X
Substantially compliant	
Partially compliant	
Non-compliant	

The members of the External Evaluation & Accreditation Panel

Name and Surname

Signature

1. **Prof. Alekos Vidras (Chair)**
University of Cyprus, Nicosia, Cyprus
2. **Prof. Aris Daniilidis**
Universidad de Chile, Chile
3. **Prof. Nikolaos Stylianopoulos**
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